starstim NE®

Neuroelectrics User Manual

Starstim 8 / Starstim tES / Starstim-Home tES

CAUTION: INVESTIGATIONAL DEVICE
Limited by United States law to investigational use.

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Manufacturer:

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08035 Barcelona
Spain
Telephone: + 34 93 254 03 66

Code: UM002B
Version: 2.8

Model Name:
Starstim 8
Starstim tES
Starstim-Home tES

The manufacturer should be contacted:

- for assistance, if needed, in setting up, using or maintaining the Starstim 8 system;

- to report unexpected operation of events that result from the usage of the device.

Input: 5W, 4.8 - 5,5V

About the Starstim User Manual

The **Starstim User Manual** belongs to the **Part I** of the Neuroelectrics User Manual.

The **Neuroelectrics User Manual** includes three parts:

- **Part I:** Starstim User Manual
- **Part II:** Electrode User Manual
- **Part III:** NIC User Manual

Before you first use the Starstim system, you should read the three parts of the Neuroelectrics User Manual. The Starstim User Manual does not discard the need of reading the Electrode and NIC parts.

The PDF version of all parts of the Neuroelectrics User Manual can be found under the Documentation section of Neuroelectrics webpage:
www.neuroelectrics.com/documentation

Change of Record

Issue	Date	Changes made
1.0	2012.02.14	First version
2.0	2016.02.18	Neuroelectrics User Manual divided in three parts: **(1)** Enobio / Starstim, **(2)** Electrode and **(3)** NIC.
2.1	2016.05.10	Starstim tCS info added to Starstim 8 manual
2.2	2017.07.25	Product contents update (Starstim tCS info removed).
2.3	2017.08.23	Regulatory info update
2.4	2018.05.07	Starstim BT and Wi-Fi unified Starstim tCS added to the manual
2.5	2018.12.20	Starstim tCS Home added to the manual

Change of Record

Issue	Date	Changes made
2.6	2019.04.04	NG Geltrodes replace Geltrodes Added Testboard section Updated Regulatory Information
2.7	2019.12.03	Extension of product labelling description Naming consistency update Starstim New Image Starstim tCS rebranding to Starstim tES
2.8	2021.01.01	Change of the code of the Sticktrode

Table of Contents

I. Use of Starstim

Starstim is a transcranial electrical stimulation (tES) and an electroencephalogram (EEG) monitoring device, all in one.

Starstim is a modern neurostimulator:

- It is a wireless operating system
- EEG recording is possible before, during and after stimulation
- Multiple independent stimulation channels improve the spatial distribution of the electric field
- Variety of waveforms for stimulation current: tDCS, tACS, tRNS and Sham mode
- NG Pistim: the hybrid Ag/AgCl electrode that can be used for EEG or tES
- Ease of use despite of the complexity of the technology
- Safety features such as maximal currents and impedance control

I.1

Transcranial Electrical Stimulation (tES)

Transcranial electrical stimulation (tES) is a neurophysiological technique capable of modulating the excitability of the neuronal tissue of the central and peripheral nervous system through the application, for a finite time length, of an electrical field. This electric field is generated by the application of weak electrical currents through the scalp and into the brain.

It has been demonstrated in recent years that the technique is safe and beneficial if used within the known bounds of intensity, density and duration. Nevertheless, its application must be controlled by specialized medical personnel able to guarantee the application of correct stimulation parameters.

Brain stimulation can be performed only under medical prescription or under the supervision of an appropriate Ethics Committee as regulated in each country of intended use.

The tES technique is classified into three types according to the waveform of the stimulation current that is applied: tDCS, tACS and tRNS. Additionally, the Sham mode can be used for controlled experiments.

Transcranial Direct Current Stimulation (tDCS)

tDCS is the most popular tES technique, and it is described by stimulation currents that are held constant, like DC current. In general, the current is injected into the brain (anodal stimulation) over a cortical region leading to excitatory effects; and collected from the brain (cathodal stimulation) leading to inhibitory effects. tDCS produces short term effects on neuronal excitability, and long lasting plastic after/effects involving synaptic modification.

Transcranial Alternating Current Stimulation (tACS)

tACS is a form of tES in which the stimulation currents are time dependent with a sinusoidal shape, like AC current. Amplitude, frequency, and relative phases across stimulation electrodes can be defined. tACS provides a powerful way to couple with the oscillatory behaviour of the brain, which is at the present an active research field in basic and clinical Neuroscience.

Transcranial Random Noise Stimulation (tRNS)

tRNS is a type of tES in which the stimulation currents are randomly varied. Unlike tDCS, tRNS has been recently introduced to the Neuroscience community, and there

is little experience with it. However, it appears as if its main effect are excitatory. The lower and upper values of the band frequency of the stimulation signal can be chosen between 0 to 500 Hz.

Sham stimulation mode

Sham stimulation is the term used to describe an inactive form of stimulation which is used in research to control the placebo effect.

Starstim 8, Starstim tES and Starstim-Home tES

Starstim 8, Starstim tES and Starstim-Home tES are neurostimulator devices. They have been designed for research use only, in a clinical environment, hospital, research center, or, in case of tES Home, remotely at study subject's home. They must be always used according to the brain stimulation applications described in the literature. In any other case, the supervision of a local Ethics Commitee, IRB or analogous Body must be required for the experimental use of this device.

Starstim 8, Starstim tES and Starstim-Home tES can only be used with electrodes and cables commercialized by Neuroelectrics.

Read the Neuroelectrics User Manual carefully before using any of the systems.

Starstim 8, Starstim tES and Starstim-Home tES are research use only devices.

Starstim-Home tES is a device aimed at safe use during home studies, it comes with an accessible user interface which guides home users through the treatment.

I.3
Conditions of Use

Starstim must be used with normal temperature, humidity, and pressure conditions:

- Temperature Range: +5 to 40 °C
- Humidity: 15 - 93 %
- Atmospheric Pressure: 700 - 1.000 hPa

The device must be stored inside the box between uses, in the following environmental conditions:

- Temperature Range: -25 to +65 °C
- Humidity: 15 - 93 %

This equipment needs to be installed and put into service in accordance to the information provided in this user manual.

II. Quality and Regulatory Information

II.1
Quality Management System

Neuroelectrics is an ISO 13485 and ISO 9001 certified company. Thus, our medical devices are designed and manufactured following the corresponding ISO quality management systems.

Neuroelectrics complies with Quality System Regulation 21 CFR 820.

II.2
Medical Device Regulations

Europe
In Europe, Starstim 8, Starstim tES, and Starstim-Home tES are intended for research use only.

Canada
In Canada, Starstim 8 and Starstim tES is approved as a medical device and conform with the Canadian Medical Device Regulations SOR/98-282. Starstim-Home tES is intended for research use only.

II.3
For US Audience only

CAUTION:

US Federal Law classifies Neuroelectrics® Starstim 8, Starstim tES, and Starstim-Home tES as Investigational Devices.

III. Safety Information

Starstim 8 conforms to the following standards:

Medical device software life-cycle

- EN 62304:2006 + Corr.:2009 + AC:2010

Biological evaluation

- EN ISO 10993-1:2009 + AC:2010

Usability

- EN 62366-1:2015 + AC:2015

Others

- EN ISO 980:2008
- EN ISO 15223-1:2016
- EN 1041:2008 + A1:2013
- EN 60529:1991 + A1:2000 + A2:2013
- EN ISO 14971:2012
- 2011/65/EU

III.1
Safety Warnings

- Note for clinical use: Brain stimulation must be always used according to medical prescription.
- Brain stimulation must be used AFTER the prescription of a stimulation protocol made by the specialized and qualified medical personnel who owns and operates the Starstim Software.
- Before the brain stimulation is prepared, please inform the prescribing clinician or operator of the presence of any pacemakers, intracranial electrodes, implanted defibrillators, cranial pathologies (e.g. holes, plaques) or any other prosthesis. In these cases the use of the device could become unsafe.
- Before using, please check that the device is undamaged and the packaging has not been affected by transport or storage.
- In the case of malfunction, immediately contact the manufacturer or the distributor.
- The device must never be opened or damaged.
- The battery can only be replaced by authorized personnel.
- The device is not protected against excessive moisture or immersion in liquid. In the case of the device becoming wet or damp, do not use it and immediately contact the manufacturer.
- Do not touch the device during stimulation or while EEG monitoring is on.
- Never use the device or install the electrodes on the head of the patient while connected to the power network.
- Do not switch the device on or off when it is assembled and placed on the subject's scalp.
- Always unplug the USB power supply from the device prior to connecting electrodes to the subject. The device will not work when the battery is charging.
- For EEG monitoring, the device must be used with Ag/AgCl electrodes recommended by the manufacturer.
- For stimulation, Ag/AgCl electrodes or carbon rubber electrodes with sponges soaked with saline solution can be used. The sponges must be bigger than 3 mm^2 to avoid high density currents.
- During each session, it is mandatory to use reference electrodes connected to CMS and DLR cables.
- The device is not protected against other high frequency devices. To avoid risks place the CMS/ DRL as far as possible from the stimulation and return electrodes of the high frequency device.
- The device is wireless and might be affected by other RF devices.
- The device needs special EMC precautions. It needs to be used according to the EMC information at the end of the user manual.
- The EMC emissions and immunity has been tested using the 10-

wire or 12-wire 34 cm cables provided with the system.

- The use of cables or electrodes other than the ones delivered with the product might produce higher EMC emissions and less EMC immunity.
- The device cannot be used beside or piled under other equipment. If such usage is needed, check the normal configuration.
- The device can only be used in healthy skin without wounds.
- The device cannot be used in a MRI room.
- The device is not provided sterile and should not be sterilized.
- The device does not need installation, maintenance or calibration.
- The device and the accessories should be regularly checked by the user.
- If the user wants to use the device in combination to another device connected to the patient, the user should contact Neuroelectrics to check the correct simultaneous use.
- Starstim should not be used in an MRI room or close to CT, diathermy, RFID and electromagnetic security systems such as metal detectors. In the case that there exist RF emitters (e.g. RFID), which might not be visible, the device can potentially be exposed to fields from these RF emitters without the user's awareness and corrupts the signal acquisition. If NIC detects that the signal is very noisy, it will interference with a higher Signal Quality Index.
- The modification of the device is not allowed.
- If the device has not been used during a long period of time, the user should check visually that there is no battery leakage.
- The electrodes and wires or any conductive part cannot touch any other conductive part of any other device including the ground.
- The cap is intended to be on the patient for less than 24 hours.
- Keep out of reach from children and anyone else who might swallow electrodes, otherwise they may cause injury to themselves.
- Keep out of reach from children and anyone else who might strangle with the cables of the devices.
- The result of the recordings must be analysed by a doctor or specialist. No self medication should be done based on this results.
- The result of the recordings is not displayed in legal units or other units within the meaning of Directive 80/181/ ECC. Therefore the device is not considered to have a measuring function.
- If the system encounters the communication between Starstim and the PC is failed, then the NIC software or home interface will inform the user accordingly. Additionally, Starstim incorporates an internal buffer that safeguards the information sent from the device to the PC. If there's a problem of the communication during a period of time, the device will save the data in the internal buffer to ensure than no EEG sample is lost.

IV. The Starstim System

This chapter describes the Starstim system. First, it lists the features and technical specifications of Starstim. Then, the components included in the Starstim 8, Starstim tES and Starstim-Home tES packages are listed and described. For each item, you may find the product code, the product name, a picture and a short description of its function. Lastly, it describes the Neuroelectrics Control Box (Necbox) which is the core and the control unit of Starstim.

For further information regarding the use of the electrodes, please consult the Electrode User Manual. Additionally, to learn how to pair your device with the computer, you should read the NIC User Manual. The NIC User Manual explains the steps needed to correctly conduct a stimulation session, with or without simultaneous EEG monitoring.

IV.1
Features

Wireless, wearable and easy-to-set concept

- Flexible electrode placement based on the 10-10 system
- User-friendly software interface
- Stimulation waveforms: tDCS, tACS and tRNS
- Sham and double-blind modes

EEG monitoring and Stimulation *

- Stimulation compatible with simultaneous EEG monitoring (not in the same site)
- Stimulation and EEG monitoring are possible at the same site with the same electrode (not simultaneously)
- EEG monitoring is possible before, during and after stimulation

Remotely-controlled Home Use **

- Home interface with strict remote control
- Cap, electrodes, and setup instructions optimized for patient

IV.2
Technical Specifications

EEG functionality *

- Number of channels: (up to) 8 channels
- Sampling rate: 500 SPS
- Bandwidth: 0 to 125 Hz (DC coupled)
- Resolution: 24 bits - 0.05 µV
- Measurement noise: < 1 µV RMS
- Common mode rejection ratio: -115 dB
- Input impedance: 1 GΩ

Stimulation functionality

- Number of channels: (up to) 8 channels
- Sampling rate: 1000 SPS
- Frequency range: 0 to 250 Hz (tACS) and 0 to 500 Hz (tRNS)
- Stimulation types: linear combination of tDCS, tACS and tRNS; and Sham
- Maximum current per channel: ± 2 mA
- Current resolution: 1 µA
- Current accuracy: 10%
- Maximum voltage: +- 15V per electrode (allows 30 V of stimulation potential difference)

Stimulation safety features

- Maximum input current per channel: 2 mA
- Maximum total inject current: 4 mA (by all electrodes, at any time)
- Maximum duration per session: 1 hour
- Stimulation session must be pre-programmed
- Electrode impedance check before and during stimulation
- Abort functionality possible at any instant

*EEG monitoring is only avaliable with Starstim 8.
** Available only with Starstim-Home tES

IV.2

Technical Specifications

Other Technical Specifications

- Battery operating time:
  5 hours (combined EEG/tES use)
- Accelerometer: 3-axis
- Communication:
  NE001WF: Wi-Fi IEEE 802.11 g
- Output: EDF+ (16 bits), ASCII data files or TCP/IP raw data streaming
- OS compatibility: Windows (Vista / 7 / 8 /10) and MAC OS X

Minimum Computer Requirements

- Operating System: Windows Vista or MAC OS X Snow Leopard
- Processor: 1.3 GHz
- RAM: 2 GB
- Wi-Fi/USB
- NE001WF: Wi-Fi IEEE802.11g

Wireless Information

Starstim is a wireless device operating at the 2.4GHz Industrial Medical and Scientific (ISM) band. The Nexbox connects through the wireless link to the Neuroelectrics Instrument Controller (NIC) software running on a computer. The EEG data is streamed through the wireless link. The standard operating distance is 10 meters. Below are the technical specifications regarding the Wireless connection used by Necbox.

Wireless Specifications

- Wi-Fi: IEEE 802-11 g
- Operating frequency band:
  from 2.412 to 2472 MHz
- Transmitting power: Max. +16dBm
- Qualifications: CE, FCC, IC,
  Japan and South-Korea
- Data rate: 921600 BPS
- Security details: Encryption WEB

Battery Operating Times

		All Channels
Wi-Fi	SS 8	5 h 10 min
USB	SS 8	11 h 56 min

* No computer required with Starstim-Home tES

IV.3
Contents of the Starstim Package

The Neuroelectrics® Starstim package contains all the components required to perform an EEG monitoring or stimulation session, and some additional items that may be useful during your experiments. Please confirm you have all the items listed below that pertain to your bill of materials.

*Depending on the kit purchased, items included may vary.

Quantity	Code	Name
1	NE012 / NE012WF / NE012HWF	Starstim Necbox
1	NE013 / NE055	USB Power Adapter
1	NE013a NE013b NE013c	EU / US / UK Power Supply Plug
1	NE014	Curved Syringe
1	NE015	USB Stick with Manuals & NIC*
1	NE016a	Electrode Gel 250cl
1	NE017 / NE017-H	10 Electrode Cable / (color-coded)
1	NE019-M / NE019-M-Home	Neoprene Headcap M (54 cm)
8	NE029	Electrode: NG Pistim
1	NE025-P	Electrode: Sticktrode (Bag of 50)
4	NE026a	Electrode: Sponstim 25
4	NE026b	Electrode: Sponstim 8*
8	NE032	Electrode: NG Geltrode*
1	NE027	Electrode: Earclip
1	NE031b	USB Wi-Fi Dongle
1	NE033	Saline Solution 100 ml
1	NE038	Testboard Head
1	NE039	Testboard Cable
1	NE164+NE172	USB Isolator & Extension Cable*
1	NE178	NE Backpack*
1	NE180G	Home Interface Tablet*

In this page we present the electrodes included in the package, but you must read the Electrode User Manual to learn how to use, to assemble and to clean the electrodes. Additionally, in the following three pages, there is a list of the rest of the items of the package and each item is identified with its name and code.

Neuroeletrics Electrodes

EEG

NG Geltrode

NE032

Stimulation (tES)

Sponstim 25

NE026a

Sponstim 8

NE026b

EEG & tES

NG Pistim

NE029

Reference

Sticktrode

NE025-P

Earclip

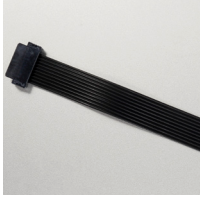
NE027

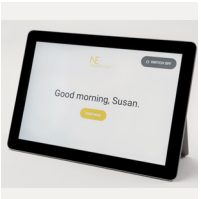
Regarding the electrodes, you must use them according to their functionality. They are grouped above as only-EEG, only-tES, hybrid EEG & tES, and Reference electrodes. Bear in mind that electrodes need to be replaced when they reach the end of their lifetime, in order not to compromise the quality of the EEG signal or the efficacy of the stimulation.

*Depending on the kit purchased, items included can vary.

Item	Name / Description	Code
	**Starstim Necbox** ▶ The Starstim Neuroelectrics Control Box (Necbox) is the core of the Starstim system. ▶ The necbox is battery operated and it is wirelessly paired with the computer using the Nic software. ▶ The necbox battery should never be charging when the device is being used.	NE012 / NE012WF
	**USB Power Adapter & Power Supply Plug** ▶ The USB power adapter is used to charge the Necbox battery. ▶ The type of the power supply plug (EU/US/UK) included in the kit depends on the country of the customer.	NE055 / NE055W & NE013a NE013b NE013c
	**Curved Syringe** ▶ The curved syringe is used to inject either electrode gel or saline solution in the electrodes. ▶ Do not use electrode gel and saline solution simultaneously in the syringe. Wash and clean it when changing the liquid to be used.	NE014
	**USB Stick with Manuals & NIC SW** ▶ The USB stick contains the PDF version of the three parts of the Neuroelectrics User Manual, and the NIC software. ▶ Both items can be also found at www.neuroelectrics.com.	NE015

Item	Name / Description	Code
	**Electrode Gel 250 cl** ▶ The electrode gel is a highly conductive and water soluble gel. It must be applied on the contact surface, between the electrode and the scalp, in order to decrease the impedance and improve the signal quality. It must not be used with sponstim electrodes.	NE016a
	**Saline Solution 100 ml** ▶ The saline solution (NaCl 0.9%) is required to use the stimulation sponstim electrodes. ▶ It should be applied on the yellow exterior face of the sponge that contacts with the scalp.	NE033
	**10 Electrode Cable** ▶ The 10 electrode cable has 10 electrode medical sockets compatible with the electrodes commercialized by Neuroelectrics. ▶ It contains 8 channels for EEG monitoring or for stimulation, and two reference channels labelled with CMS & DRL.	NE017
	**Neoprene Headcap M (54 cm)** ▶ The neoprene cap is a comfortable solution to precisely place the electrodes on the scalp based on the 10-10 system. It provides 39 possible electrode positions, but extra positions can be added using the neoprene punch tool (not included). The cap provided is medium sized, but other sizes are also available.	NE019-M

Item	Name / Description	Code
	**USB Wi-Fi Dongle** ▶ The USB Dongle is used to provide a Wi-Fi port for computers that do not have an incorporated port. The wireless communication between the Necbox and the computer is through Wi-Fi. The USB WiFi Dongle must not be used with Mac OS computers.	NE031b
	**Testboard Head** ▶ The testboard head alllows you to test the system functionalities and rule out potential problems before the real experiment. The necbox can be connected to the testboard using either the testboard cable or the 10 electrode cable. When the device is connected to the testboard, it responds as a properly placed system on the subject's scalp, with a very similar electrical environment.	NE038
	**Testboard Cable** ▶ The testboard cable is the simplest way to connect the necbox with testboard head. This cable is not needed if you choose to connect the necbox and the testboard head using the electrode cable.	NE039
	**USB Cable & Isolator** ▶ The USB Cable & Isolator can be used to transmit EEG and Stimulation data between the device and the computer. This should always be used with the extendor cable. Note that this cable does not charge the device.	NE164/ NE172

Item	Name / Description	Code
	**Home Interface Tablet** ▶ Home interface guides home users through the treatment, providing instructions on device preparation and maintenance, matching high accessibility standards. ▶ It allows strict remote access control and detailed remote progress monitoring. ▶ It matches the highest data transfer and storage security standards. ▶ For details on hardware maintenance, see: Surface Go help [https://support.microsoft.com/en-ca/hub/4346532/surface-go-help]	NE180G

In order to make your Starstim experience more complete, you can add accessories to your stimulation kit.

In our catalog and webpage, you may find:

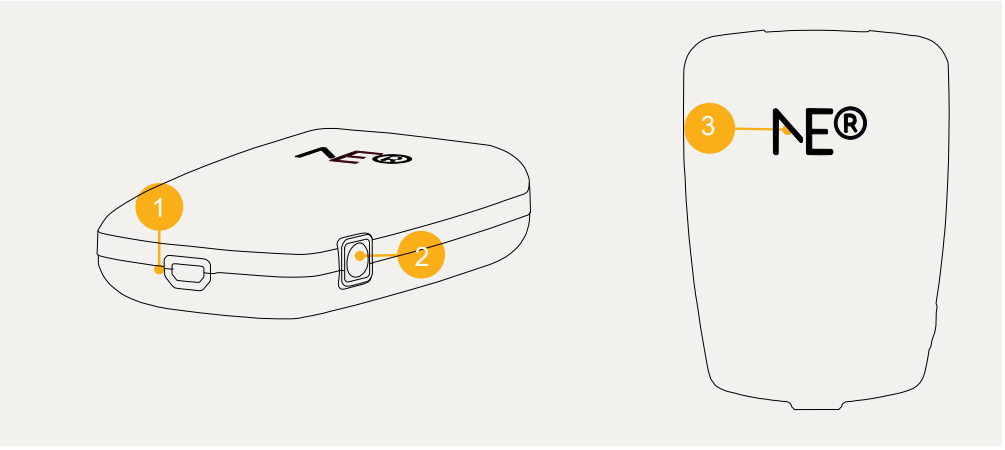
- Different sizes of the neoprene headcap: XL, L, M, S, Kids
- The neoprene punch tool to customize your own cap.
- Mouse Headcap Cover provides kids a fun EEG experience
- Dry electrodes and solid gel technology for EEG monitoring for a fast, gel-free experience
- Different shapes of the sponge electrodes
  Cicular 25 cm² o r 8 cm², or rectangular 5 cm x 7 cm, you choose the contact area.
- MRI kit (Filter & Harness) and MRI compatible electrodes: Take your hybrid EEG/tCS system to the MRI room

These items are available upon request.
Please contact our sales team if you want your Starstim to be more complete.

Mouse Headcap Cover

IV.4
Necbox: Neuroelectrics Control Box

The Necbox is the core and the control unit of Starstim. The Necbox is a battery operated device. It weighs 85 g and its dimensions are 87 mm x 61 mm x 24.8 mm. The following diagrams describe the details of the Necbox



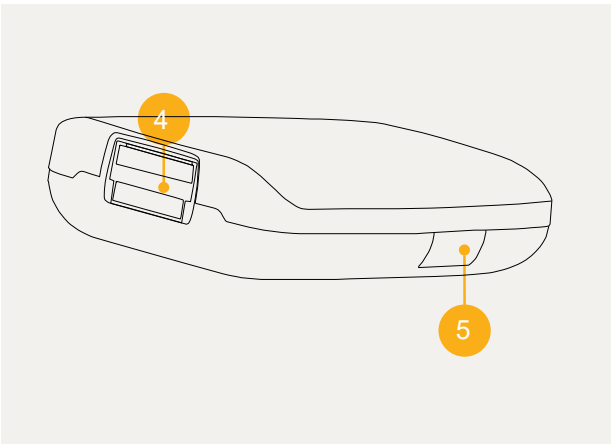
1. Charging LED

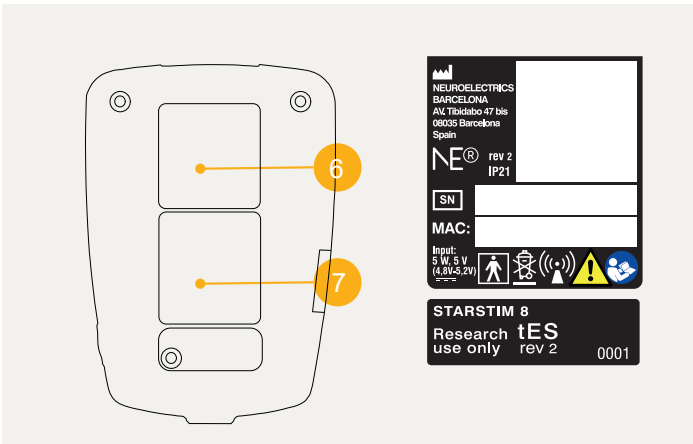
Yellow when charging; green when charged.

2 ON/OFF Push-button

3 Operation LED

The LED behind the logo indicates the normal operation of the device.





4 Pin connector slots

10-pin slot to connect with the electrode cable.

5 MicroSD card slot

Slot for microSD card (Card not included) for online data storage in the “holter” mode

6 Velcro

To attach the Necbox to the neoprene cap.

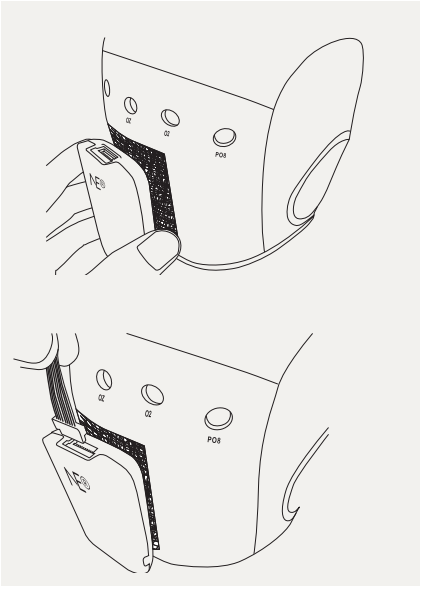
7 Technical Specifications labels

Serial Number (SN), with the EYYYYMMDD format, where YYYY, MM and DD are the manufacturing year, month and day, respectively.

MAC address of the device.

The bottom label contains (from top-left to bottom-right):
- Product name;
- Regulatory mark;
- Technology (tES if absent);
- Label revision (rev 1 if absent).

IV.5
Assembling the Necbox



The Necbox is attached to the neoprene cap using the velcro, and it is connected to the electrode cable using the 10-pin connector.

IV.6
Necbox battery

The battery can only be charged when the power switch is at the OFF position. The battery charger connects to the Necbox through the microUSB / micro HDMI connector located at the rear part of the Necbox. To charge the battery, the following specifications need to be met:

- Nominal output: 3.7 V (3 V - 4.2 V)
- Current output: 1 A
- Battery charger: must comply according to Standard EN 60601-1:2006 + A12:2014
- The battery state of charge is measured by NIC when the device is switched on and paired with the computer.
- The battery should not be over discharged when the device is not used for a long time. It should be periodically charged instead.
- Overdischarging may cause loss of cell performance and/or damage to battery function.
- Expected life cycle: After 500 > 70% of initial capacity
- Charging with higher voltage than specified may damage the cell.
- The usual time to charge a battery from the cut-off voltage to the maximum capacity is around 2 hours, but it depends on each battery (battery life).
- The device can be connected to any Class 2 electrical installation.
- Device will not operate when charging.
- Only use the charger that came with the device to charge the battery.

Operating Temperature

- Charging: 0° C to 45° C
- Discharging: -20° C to 60° C

Storage Temperature

- 1 year at -20 ºC to 65 ºC

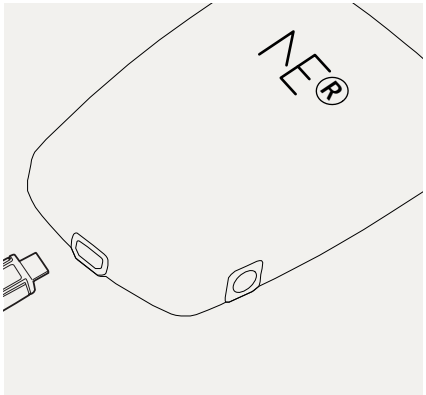
IV.7
Cleaning Instructions

Electrical specifications for charging:

- Voltage nominal input: 5 VDC
- Voltage input min/max: 4.8 VDC - 5.5 VDC
- Power input: 5 W

Output current specifications:

- 2 mA per channel with ± 15 V



Necbox & Electrode Cable

The Starstim Necbox should be cleaned using a dry paper towel after each use.

Neoprene Headcap

The Neoprene Headcap should be cleaned and disinfected as it follows:

- Rinse the gel with warm tap water and ivory soap
- Dry the cap conscientiously using paper towel
- Spray the cap with disinfectant and let it sit for 10 minutes, or use disinfectant wet wipes
- Rinse the cap thoroughly
- Hang up the cap to dry

Electrodes

The cleaning instructions for the electrodes can be found in the Electrodes User Manual.

IV.8
Testboard

The testboard is used for testing stimulation protocols before conducting experiments. It is recommended to use the testboard before applying tES experiments. It is also a good tool for debugging allowing to test different system functionalities as well as discard problem areas.

The Starstim device connected to a testboard will respond as a system properly placed in a subject, with a very similar electrical environment, that is why we refer to it as an “artificial head”.

Testboard setup. The testboard is connected to Starstim Necbox with a testboard cable:

- Connect the testboard cable from the cable slot of the Necbox to the head shaped section of the testboard.

Impedance toubleshooting. Testboard allows to check the correct setup of the system when having high impedance values. Once you set up the testboard, in NIC, click on check impedances. If the values are correct, it means that the device works fine and the impedance issues are due to another component or the wrong setup. For further details about impedance check, please refer to NIC User Manual.

EEG quality check. The testboard can be used to record EEG and testing the quality of the signal. Once you set up the testboard, in NIC, you should observe a small EEG signal with an amplitude of around 10µV. For further details on EEG review in Liveview, please refer to NIC User Manual.

V. Symbols Used

Symbol	Description
	IEC 60417-5333 BF type applicable part according to UNE-EN 60601-1:2008
	IEC 60417-5010 Push ON/OFF button UNE-EN 60601-1=2008
	ISO 7000-2498 Serial Number according to EN 980:2008
	Device manufacturer symbol according to EN 980:2008
	ISO 7000-2606 do not use device if product or packaging have been damaged symbol according to UNE-EN 980
	Do not throw Enobio in generic waste symbol. WARNING! When you want throw away the device, NEVER throw it in the trash, but go to the RECYCLABLE POINT or the nearest waste collection for further treatment, thus contributing to environmental care.
	ISO 60417-5140 Non-Ionizing Electromagnetic radiation.
	ISO 7000-0632 Transport and storage temperature conditions
	ISO 7000-2620 Transport and storage humidity conditions

Symbol	Description
	ISO 7000-2621 Transport and storage atmospheric pressure conditions
	Transport package shall be kept away from rain and in dry conditions.
	Transport package shall not be exposed to sunlight.
	ISO 7010-W001 General warning sign.
	Refer to the manual/booklet

VI. Error Messages

The following messages might appear during normal operation:

Error message	Cause	Actions
Connection lost	The computer cannot communicate with the device.	Check that the device is switched on, that the device has battery, that the computer Wi-Fi / USB communication is working properly, and the device is close to the computer.
Please switch off the device, and after 5 seconds	The computer has the device paired, but the device is at unknown state.	Restart the device.