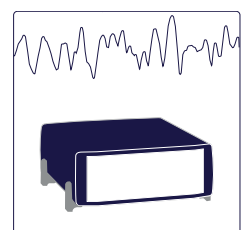




actiCHamp actiCHamp Plus

actiCHamp - Product revision 05
actiCHamp Plus - Product revision 02



Amplifier

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Contents

About this manual	4
About actiCHamp and actiCHamp Plus	7
Safety	12
Chapter 1 Overview	16
1.1 Scope of delivery	16
1.2 actiCHamp and actiCHamp Plus at a glance	19
1.3 32-channel module at a glance	20
1.4 PowerUnit at a glance	22
Chapter 2 Using actiCHamp and actiCHamp Plus	25
2.1 Before use	25
2.2 Using actiCHamp or actiCHamp Plus	26
2.3 After use	31
Chapter 3 Using the actiCAP slim electrode system with actiCHamp and actiCHamp Plus	33
3.1 The role of channel 1 in module 1	34
Chapter 4 Using the BrainCap electrode system with actiCHamp Plus	35
Chapter 5 Using the R-Net electrode system with actiCHamp Plus	36
Chapter 6 Maintenance, repair, and disposal	37
6.1 Maintenance	37
6.2 Repair	37
6.3 Disposal	38
Chapter 7 Troubleshooting	40
7.1 Troubleshooting for actiCHamp, actiCHamp Plus, and Recorder	40
7.2 Troubleshooting for PowerUnit	41
7.3 Saline test	42
7.4 Applying a test signal	42
Appendix A Technical data	44
Appendix B Active electrodes	51
Appendix C Regulatory information (German) – Regulatorische Informationen (Deutsch)	54

About this manual

This manual describes how to use actiCHamp and actiCHamp Plus and how they are integrated into a measurement setup. This manual forms an integral part of the product. It must be precisely adhered to ensure that the product is used as intended and operated correctly to guarantee the concomitant safety of participants, users, and third parties. Keep this manual in a safe place and make sure that it is always available to the users.

No part of this manual may be reproduced or distributed in any form without the express written permission of Brain Products GmbH. The operator may print this manual to make it available for the users of the product.

Ensure that you have the most recent version of this manual for your product or product revision. You can find the most recent version on our [website](#).

Target group of this manual

This manual is intended for users in the psychological and neurophysiological research area who are experienced in performing physiological data acquisition.

Users must know how to work safely and reliably with all the products in a given setup, such as EEG caps, amplifiers, accessories, sensors, and recording software.

Conventions in this manual

Typographical conventions

Bold	indicates items on the user interface such as menus, menu commands, dialog boxes, buttons, options, or checkboxes.
<i>Italic</i>	indicates file locations and folders and is used to highlight portions of running text.
<u>Underscore</u>	indicates cross-references and web addresses.
Monospaced	indicates text or characters to be entered at the keyboard.

Symbols



Caution: This symbol indicates that incorrect use of the product(s) may result in a personal injury to the participant, the user and/or a third-party. Failure to observe the information in this document constitutes incorrect use.



Notice: This symbol indicates that the incorrect use of the product(s) may bring about a risk of damage to property. Failure to observe the information in this document constitutes incorrect use.



Note: This symbol draws your attention to important information relating to the current topic and to recommendations on how to use the product(s).

Revision history

Section	Subject
Section 6.3	Disposal information updated
Appendix C	Regulatory information added in German

Reporting errors and getting support

Please report without delay any error you find in this manual, any fault on the products or any malfunction that you observe when using this product. To do so, please contact your [local distributor](#), who will also assist you in general questions about the product, or our Technical Support team (techsup@brainproducts.com).



About actiCHamp and actiCHamp Plus

actiCHamp and actiCHamp Plus are scalable amplifier systems for laboratory EEG and ExG recording applications. With up to five modules of 32 channels each, actiCHamp and actiCHamp Plus can record up to 160 EEG channels. Additionally, actiCHamp and actiCHamp Plus have eight auxiliary inputs for recording signals via sensors.

The signals acquired via the electrodes and sensors are amplified, digitized and then transferred to a computer via USB for display and storage. To do so, actiCHamp and actiCHamp Plus are compatible with BrainVision Recorder (hereafter referred to as Recorder).

actiCHamp can be used in combination with actiCAP active electrodes.

actiCHamp Plus can be used both with actiCAP active electrodes and with the passive electrode systems R-Net and BrainCap. actiCHamp Plus also supports additional trigger and Sync Out options.



Identify the product revision

The product revision is stated on the label at the bottom of actiCHamp and actiCHamp Plus by the indication 'Prod.-Rev.'

Product identification

Product designation: **actiCHamp Plus**
actiCHamp Plus 32 System BP-100-2500
actiCHamp Plus 64 System BP-100-2510
actiCHamp Plus 96 System BP-100-2520
actiCHamp Plus 128 System BP-100-2530
actiCHamp Plus 160 System BP-100-2540

actiCHamp
actiCHamp 32 System BP-100-2107
actiCHamp 64 System BP-100-2115
actiCHamp 96 System BP-100-2125
actiCHamp 128 System BP-100-2135
actiCHamp 160 System BP-100-2145

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Brain Products GmbH is registered as a manufacturer of batteries with the stiftung elektroaltgeräte register, Nordostpark 72, 90411 Nürnberg under the following battery registration numbers:
DE28818587 (portable batteries)
DE28818587 (industrial batteries)

Warranty <http://www.brainproducts.com/contact.php>

Combination with other products

actiCHamp and actiCHamp Plus are permitted to be combined with the following products:

Category	Product name	actiCHamp	actiCHamp Plus
Caps	actiCAP	•	•
	actiCAP slim/actiCAP snap	•	•
	actiCAP Xpress Twist	•	•
	BrainCap (via 40-50 pin Adapter)		•
	BrainCap MR (via 40-50 pin Adapter; not in MR environment)		•
	R-Net		•
	R-Net MR (via 40-50 pin Adapter, not in MR environment)		•
Software	BrainVision CapTrak software	•	•
	BrainVision Recorder	•	•
	BrainVision RecView	•	•
Hardware	40-50 pin Adapter Kit		
	CapTrak handheld scanner	•	•
	EIB32 40 pin		•
	EIB-DUO		•
	EP-PreAmp	•	•
	LabSim	•	•
	MOVE (Receiver and Transmitter) (via MOVE2actiCHamp adapter)	•	•
	PowerUnit	•	•
	StimTrak	•	•
	TriggerBox (Plus) & TriggerBox Extension	•	•
	TurboLink	•	•

Category	Product name	actiCHamp	actiCHamp Plus
Sensors	3D Acceleration Sensor	•	•
	3D Acceleration Sensor MR (not in MR environment)	•	•
	BIP2AUX adapter	•	•
	Blood Pulse Sensor	•	•
	Force Sensor	•	•
	GSR Sensor	•	•
	GSR MR Sensor (not in MR environment)	•	•
	Photo Sensor	•	•
	Respiration Belt	•	•
	Respiration Belt MR (not in MR environment)	•	•
	Temperature Sensor	•	•
Computer	The computer connected to the amplifier must comply with either IEC 62368-1, EN 62368-1, IEC 60601-1, EN 60601-1, or equivalent safety standards.		

Markings on the products



Observe the manual.



MR Unsafe: An item which poses unacceptable risks to the patient, participant, medical staff or other persons within the MR environment.



This symbol indicates that defective products must not be disposed of with household waste. Dispose of in accordance with national regulations or return the products and its accessories to the manufacturer.



Brain Products GmbH confirms the electromagnetic compatibility (EMC) of this product according to the Directive 2014/30/ EU of the European Parliament and of the Council of 26 February 2014 on the harmonisation of the laws of the Member States relating to electromagnetic compatibility.

Brain Products GmbH confirms the RoHS compliance of this product according to Directive 2011/65/EU of the European Parliament and the Council of 8 June 2011 on the restriction of the use of certain hazardous substances in electrical and electronic equipment (recast published in the Official Journal of the European Union on 1 July 2011) as well as all its amendments up to and including the Commission delegated directive (EU) 2015/863 of 31 March 2015 (published in the Official Journal of the European Union on 4 June 2015).



This symbol confirms compliance with the environmental requirements for electronic products (only applies to China).



No contact with liquids: Make sure that liquids do not enter the enclosure.



The name and address of the manufacturer are specified next to this symbol.



Li-ion

Contains lithium-ion batteries. Do not dispose with household waste. Dispose of in accordance with national regulations or return the device and its accessories to the manufacturer.

* Definitions from ASTM international standard F2503-20 (IEC 62570:2014)

Safety

Please read the following safety information carefully since it helps to prevent personal injury and damage to property. It is assumed that you have the required specialist knowledge in handling the product and accessories.

Brain Products will not accept any liability for loss or damage resulting from a failure to follow this manual and, in particular, the safety information.

Intended use

actiCHamp and actiCHamp Plus are intended to be used for amplifying and digitizing electrophysiological signals (e.g. EEG, EMG, ECG, EOG).

actiCHamp and actiCHamp Plus are not medical devices. They may be used in the context of non-medical applications in order to carry out fundamental or applied research on the basis of neurophysiological methodology and data.

Use of actiCHamp or actiCHamp Plus for diagnosis, therapy, monitoring of vital physiological processes (such as cardiovascular functions etc.), or other medical purposes is expressly forbidden.

Only for the intents and purposes of electrical safety testing according to IEC 60601-1, the equipment can be treated as class II equipment.

Correct use

actiCHamp and actiCHamp Plus are permitted to be used by users in the psychological and neurophysiological research area.

They must not be used by unqualified persons (e.g. laypeople), and persons who cannot read (e.g. due to visual impairment) or understand (e.g. due to a lack of language skills) the manual.

actiCHamp and actiCHamp Plus can be used to record neuro-/electrophysiological signals from single participants.

Provided that all stipulations regarding the correct use are met and that the product is used in accordance with its intended use, the use of actiCHamp and actiCHamp Plus is permitted in the following environments:

- research institutes and other non-medical environments

- ▶ hospitals, clinics and other medical environments

actiCHamp or actiCHamp Plus must not be used in the following environments:

- ▶ MR scanner environment
- ▶ in vicinity of explosive gases as may be the case in operating theaters, for example
- ▶ oxygen enriched atmospheres
- ▶ underwater (e.g. sea, swimming pool, bath tub) or in environments in which significant amounts of water could enter components of the actiCHamp or actiCHamp Plus (e.g. under shower, under water-tap)

The user is solely liable for any risks to participants associated with the investigation if the product is not used in accordance with the correct use.

Safe use

General precautions

- ▶ Handle the product and its accessories with care.
- ▶ Do not drop the product or allow it to fall. Avoid impacts.
- ▶ Do not unplug connectors by pulling on their cable. Instead, unplug a connector by releasing the hooks (if applicable) and pulling on the connector itself.
- ▶ Do not crush or kink the cables.
- ▶ Use the products only in the environments for which they have been designed.
- ▶ Heat, direct sunlight (UV radiation), moisture, dust, liquids, conductive foreign matter, and excessive radiation can shorten the lifetime of the product.
- ▶ Only use the supplied cables.

actiCHamp and actiCHamp Plus

The simultaneous use of a defibrillator while the amplifier and its accessories are applied or are in operation is prohibited.



Caution

Risk of electric shock when using AUX inputs

The AUX inputs are not galvanically isolated from each other.

An incorrect combination of equipment connected to the AUX inputs may result in the participant receiving an electric current that exceeds the patient auxiliary or leakage current according to EN 60601-1.

If you connect equipment that is galvanically connected to the participant to an AUX input of the amplifier, do not connect equipment that can inject dangerous electric currents (EN 60601-1, 3rd edition) to the other AUX inputs of the amplifier.



Notice

Damage to actiCHamp or actiCHamp Plus

To prevent unwanted pulses of the trigger output from damaging the hardware, check the following points before you connect equipment to the trigger output of actiCHamp or actiCHamp Plus:

- ▶ The amplifier is connected to the computer.
- ▶ The amplifier is connected to the power supply.
- ▶ The recording program has been started.

For information on ambient conditions, refer to [Appendix A](#).

PowerUnit



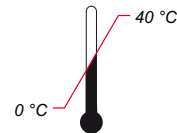
Caution

- ▶ To avoid injury or burns, never allow metal objects to touch the battery contacts and never short-circuit the battery contacts.
- ▶ To avoid damage to equipment or people, only use original chargers and accessories from Brain Products.



Notice

- ▶ After use, immediately disconnect PowerUnit from the actiCHamp or actiCHamp Plus and recharge it. Otherwise you risk deep discharging the batteries, which leads to a permanent damage of the battery.
- ▶ Do not expose PowerUnit to temperatures below 0 °C or above 40 °C or to direct sunlight. If PowerUnit is exposed to temperatures above 40 °C, allow it to cool down slowly to its normal operating temperature. At temperatures below 0 °C, the electrolyte freezes, which destroys the battery.
- ▶ PowerUnit and the charger heat up during charging. Always make sure that as much free space as possible is available around both components so that the heat can dissipate freely.
- ▶ To prevent overheating, do not stack several PowerUnits on top of one another if you are charging them at the same time.





Chapter 1 Overview

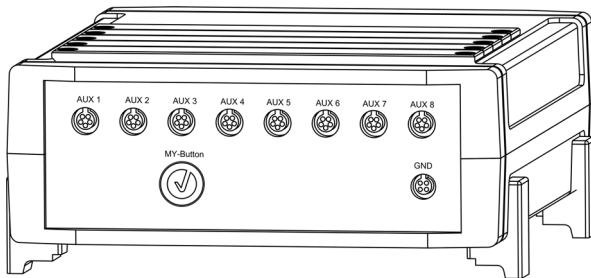
1.1 Scope of delivery

The components listed below are included in the scope of delivery.

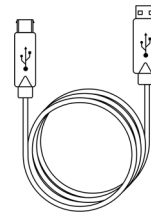
Upon receipt of the delivery, ensure that the product and package do not show any signs of damage, and that the delivery is complete.

actiCHamp Plus

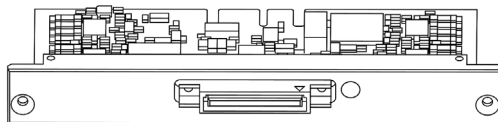
actiCHamp Plus base module
BP-200-1520



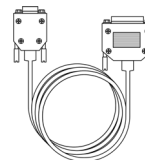
USB cable (A/B)
BP-09140



actiCHamp Plus 32-channel module
(installed upon delivery)
BP-200-1530

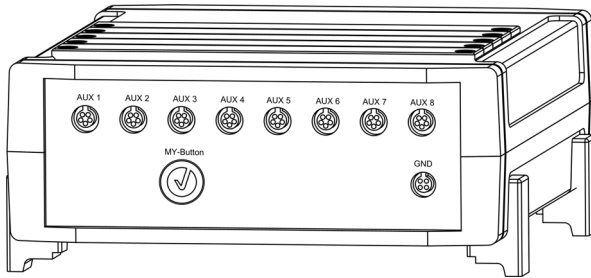


Trigger cable 3m (9/25 pin)
BP-245-1550

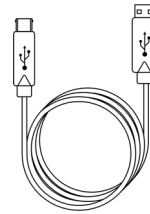


actiCHamp**actiCHamp base module**

BP-09100

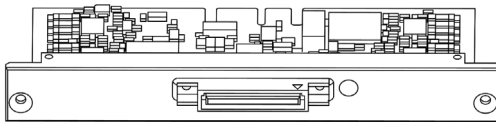
**USB cable (A/B)**

BP-09140

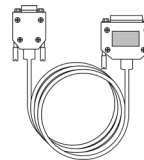
**actiCHamp 32-channel module**

(installed upon delivery)

BP-09110

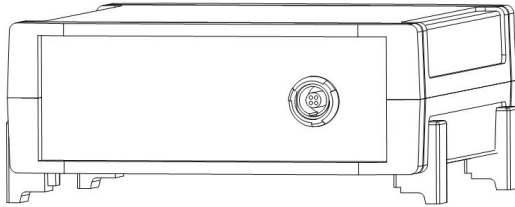
**Trigger in cable (9/25 pin)**

BP-01975

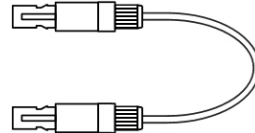


PowerUnit

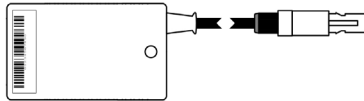
PowerUnit
BP-215-2010



PowerUnit cable
BP-215-2015



PowerUnit charger (including manual and country specific adapters)
BP-215-1021



Software and starter kit

Application Suite (USB)
BP-270-6010



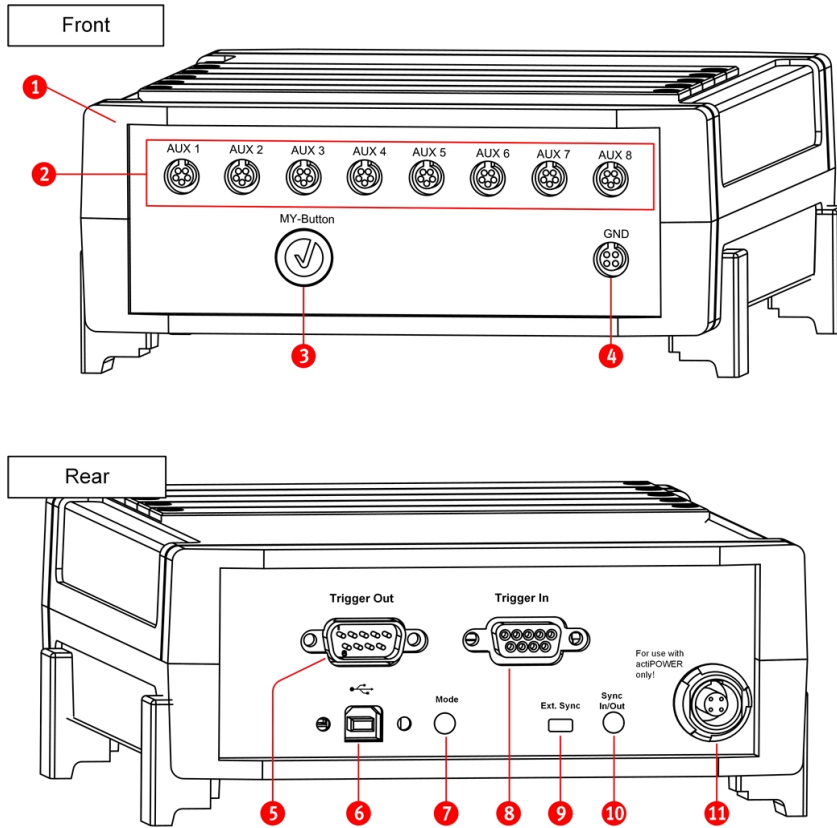
Dongle



Starter kit (actiCHamp only)
BP-09150

- ▶ Pre-filled syringes with electrode gel
- ▶ Blunt needles
- ▶ Self-adhesive rings
- ▶ Measuring tape

1.2 actiCHamp and actiCHamp Plus at a glance



No.	Description
1	Base module
2	AUX inputs
3	MY-Button (Soft key that is set in the recording software. For more information, refer to the Recorder Manual.)
4	GND socket (for the ground electrode)
5	Trigger Out (TTL signals)
6	USB connector (type B)
7	Mode LED (blinks green when base module is connected to a computer)
8	Trigger In (TTL signals)
9	Ext. Sync LED (indicates external synchronization)
10	Sync. In/Out stereo jack (outputs the synchronization signal)
11	Power supply socket (4 pin, for use with PowerUnit only)



Notes on the AUX channels

The base module has eight AUX sockets (**AUX 1** to **AUX 8**) for sensors to record additional peripheral signals (for example Acceleration Sensor, Respiration Belt). They are galvanically isolated from the EEG electrodes.

The resolution of the AUX channels is different from that of the EEG channels. If, for example, you want to connect passive electrodes at the AUX inputs, you must use an additional pre-amplifier module to adapt the input voltage of the EEG channels to the input voltage required for the AUX inputs. For this purpose, the BIP2AUX adapter is available from Brain Products (ordering code BP-200-9020).

1.3 32-channel module at a glance

Installing a 32-channel module

If you have an additional 32-channel module, install it before you use actiCHamp or actiCHamp Plus.



Electrostatic Sensitive Device (ESD)



- ▶ Keep the 32-channel module in the anti-static bag until you are ready to install.
- ▶ While the device is still in its anti-static bag, touch it to an unpainted metal surface for at least 2 seconds. This drains static electricity from the package and from your body. Alternatively, wear a protective device such as an anti-static wrist strap.
- ▶ Handle the 32-channel module carefully, holding it by its edges.
- ▶ Do not touch solder joints, pins, or exposed printed circuitry.

To install a 32-channel module (refer to [Figure 1-1](#)):

- 1 Remove the two screws of the blind cover and then remove the blind cover.
- 2 Carefully slide in the 32-channel module. Ensure that it is aligned correctly.
- 3 Insert the two screws into the 32-channel module and tighten them.

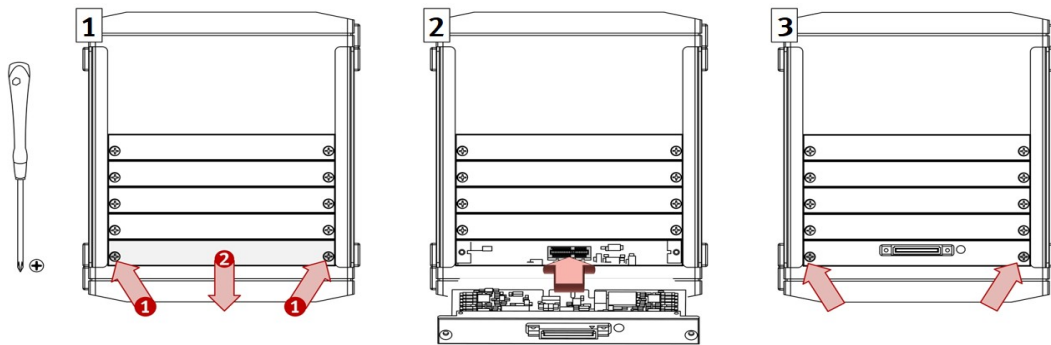


Figure 1-1. Installing a 32-channel module



Note

The 32-channel modules must be positioned correctly and in the correct sequence:

The slot closest to the front panel is intended for the channels 1 to 32. The subsequent slot for the second module (channels 33 to 64), etc.

If you do not observe the correct sequence, the 32-channel modules are not recognized.

32-channel module in operation

The status of a 32-channel module is indicated by the **Mode** LED located on each module. The LED illuminates in the following colors:

- ▶ green = correctly functioning modules
- ▶ short red flash = a charged battery is connected
- ▶ red = at start-up or if an internal error has occurred. In this case, check the communication path between the recording program and the amplifier (USB cable) as well as the supply voltage to the amplifier.
- ▶ solid red = malfunction (refer to [Chapter 7](#)).

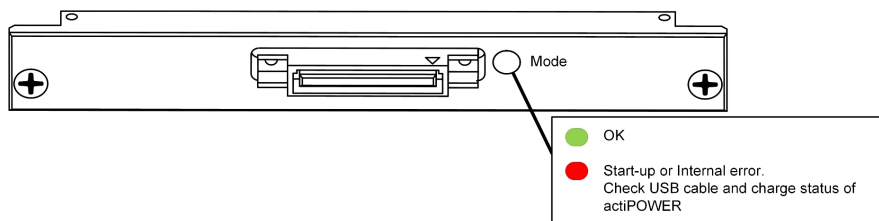
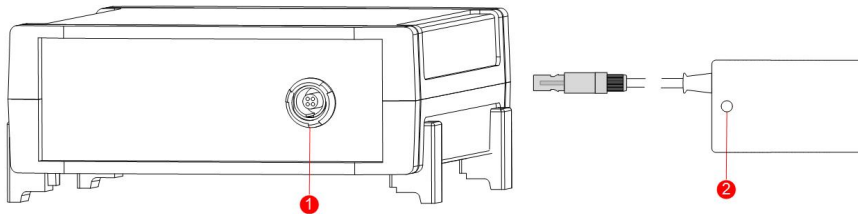


Figure 1-2. Status indicator of a 32-channel module

1.4 PowerUnit at a glance

For this information in German, refer to [Appendix C](#).



=	Description
1	Power socket (4 pin)
2	PowerUnit charger Mascot (BP-215-1021) LED solid (orange) = Charging LED solid (yellow) = Almost ready LED solid (green) = Ready FRIWO (BP-215-1020) LED solid (yellow) = Standby LED slow flashing (yellow) = Pre-charge LED fast flashing (green) = Rapid Charge LED slow flashing (green) = Maintain LED solid (green) = Ready LED fast flashing (yellow) = Error LED alternate flashing (yellow and green) = outside valid temperature (wait)

The power plug on PowerUnit is used to charge PowerUnit and to supply actiCHamp Plus with power.



Note

- ▶ When PowerUnit is completely charged (solid green LED) and the charger is disconnected and then reconnected, PowerUnit will enter a balancing charge mode where the LED will flash green for an extended period of time. This is expected behavior and the PowerUnit can still be used without having to wait for a solid green LED.
- ▶ When PowerUnit is completely charged, the charger disconnects automatically to avoid overcharging. To initiate a new charge cycle, the charger must be disconnected from PowerUnit or mains and reconnected.
- ▶ Occasionally, you may hear a high-pitched whine which changes in frequency coming from the power supply. This is expected and normal behavior.

1.4.1 Correct handling of PowerUnit

Take note of the following to avoid damages to the battery:

- ▶ Before the first use, charge PowerUnit. Refer to [Section 1.4.2](#).
- ▶ Between scheduled recordings (within hours or days), the charger can stay connected to the battery even when its fully charged (solid green LED).
- ▶ If PowerUnit is not used for an extended period of time (weeks and months), disconnect the charger when the battery is fully charged (solid green LED). PowerUnit loses its charge over long periods of time. To avoid deep discharge, fully recharge PowerUnit every four months.



Note

Rechargeable batteries are subject to gradual wear, resulting in longer charging times.



Notice

After use, disconnect PowerUnit from actiCHamp or actiCHamp Plus.

During charging, operation, and storage, keep the PowerUnit within the recommended temperature range of 10 °C to 30 °C (50 °F to 86 °F).

Do not expose the PowerUnit to direct sunlight when the heat could exceed the recommended temperature range.

Do not place the PowerUnit on or near a heater.

1.4.2 Charging the PowerUnit

Charge PowerUnit ideally at room temperature. Connection order of the charger depends on the charger type:

Charger type	First to the mains then to PowerUnit	First to PowerUnit then to the mains
Mascot (BP-215-1021)	●	
FRIWO (BP-215-1020)		●

It typically takes 10 hours to charge an empty battery at room temperature.

**Notice**

PowerUnit and the charger heat up during charging. Always make sure that as much free space as possible is available around both components so that the heat can dissipate freely.

Do not stack several PowerUnits on top of one another if you are charging them at the same time.

Only use the charger provided by Brain Products.





Chapter 2 Using actiCHamp and actiCHamp Plus

2.1 Before use

1 Charge PowerUnit

Before each use, ensure that the battery is sufficiently charged. If you are unsure, fully charge PowerUnit.

Do the following:

- ▷ Connect the charger to PowerUnit as described in [Section 1.4.2](#).
- ▷ The LED on the charger illuminates. For information on the PowerUnit LED status, refer to [Section 1.4](#).

For this information in German, refer to [Appendix C](#).

2 Install the recording software

The installation of the recording software includes the drivers for actiCHamp and actiCHamp Plus. For more information, refer to the manual of your recording software.



Note

- ▶ Recorder version 1.21.0202 or later is required for actiCHamp.
- ▶ Recorder version 1.22.0001 or later is required for actiCHamp Plus.

2.2 Using actiCHamp or actiCHamp Plus

1 Set up the power supply

- ▷ Unplug the charger from the mains and then from PowerUnit.
- ▷ Place actiCHamp or actiCHamp Plus on top of PowerUnit.
- ▷ Connect PowerUnit to actiCHamp or actiCHamp Plus with the power cable.

2 Connect to a computer

- ▷ Connect actiCHamp or actiCHamp Plus to the computer with the USB cable.
- ▷ When the connection is established, the **Mode** LED blinks.

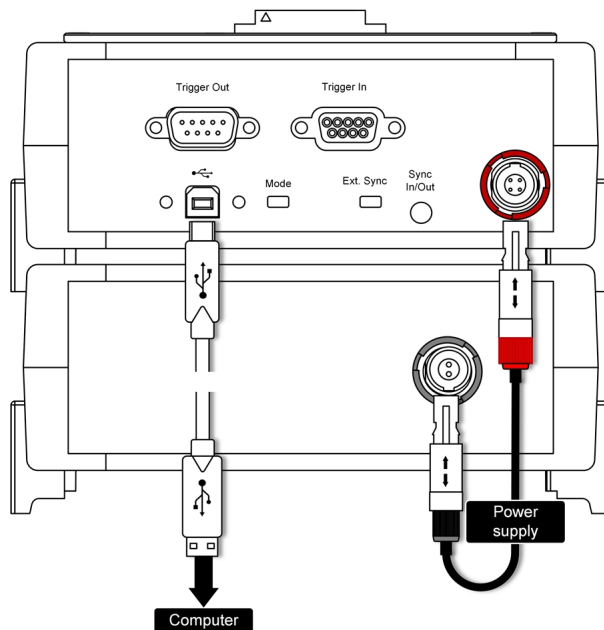


Figure 2-1. Setting up the power supply and connecting to a computer

3 Install the drivers

When you connect actiCHamp or actiCHamp Plus to your computer for the first time, Windows® initializes the drivers on the corresponding USB port.

4 Connect the ground electrode

Connect the corresponding ground electrode to the **GND** socket at the front of the amplifier.



Note on use of the ground electrode

- ▶ With actiCHamp Plus, you **must** use BP-235-2112.
- ▶ With actiCHamp, you can use either BP-235-2110 (recommended) or BP-235-2112.

5 Connect the electrode cap

The flat-ribbon cable of the electrode cap is connected to the sockets on top of the amplifier. The plug on the flat-ribbon cable and sockets on the amplifier have an arrow. Align the arrows when you connect the splitter box.

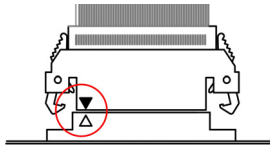


Figure 2-2. Correctly align the flat-ribbon cable

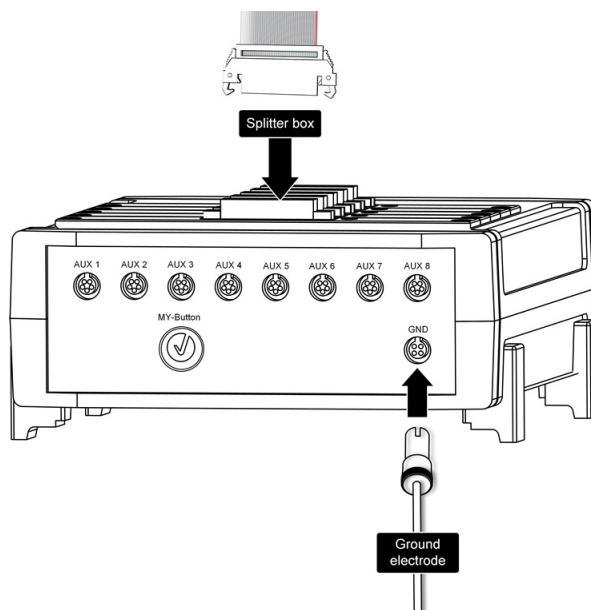


Figure 2-3. Connecting the ground electrode and electrode cap

The electrode cap connector boxes must be connected in the correct sequence: The front-most slot in the base module is intended for the first 32-channel module (channels 1 to 32); the subsequent slot for the second (channels 33 to 64), etc.

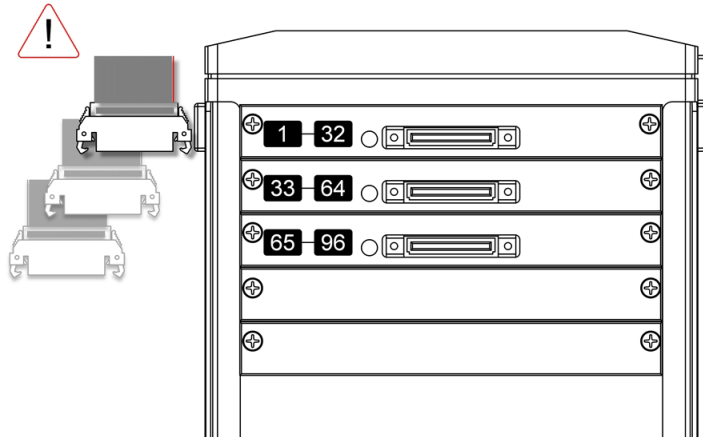


Figure 2-4. Correct sequence when connecting the electrode cap connector boxes

Connecting the trigger lines (optional)

► Trigger In

In the scope of delivery there is a trigger cable with a 9- and 26-pin connector. Connect this cable to the **Trigger In** port of the amplifier and the LTP port of your computer, simulation computer or TriggerBox.

► Trigger Out

The trigger output is used to control external equipment. For the specifications of the trigger pulse, refer to [Appendix A](#).

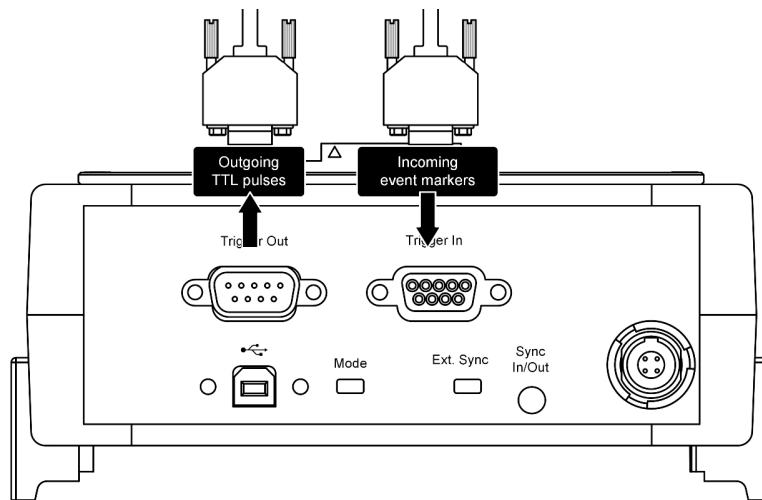


Figure 2-5. Connecting the trigger lines



Notice

Damage to actiCHamp or actiCHamp Plus

To prevent unwanted pulses of the trigger output from damaging the hardware, check the following points before you connect equipment to the trigger output of actiCHamp or actiCHamp Plus.

- The amplifier is connected to the computer.
- The amplifier is connected to the power supply.
- The recording program has been started.

Using the synchronization output (optional)

The signal on the synchronization output is a TTL signal that corresponds to one of the three basic sampling rates of actiCHamp or actiCHamp Plus. The table below maps the basic sampling rates of actiCHamp and actiCHamp Plus to the selectable sampling rates in Recorder.

Sampling rate selected in Recorder	Output signal on Sync Out
≤ 10 kHz	10 kHz
25 kHz to 50 kHz	50 kHz
100 kHz	100 kHz

The synchronization signal allows you to synchronize an external equipment, for example tDC/tAC stimulators, with actiCHamp or actiCHamp Plus. You can use it to start the stimulation precisely with a sample and to subtract the stimulation artifact optimally in the data analysis.

With the actiCHamp Plus, you can use the synchronization signal to re-synchronize two different types of data streams off-line. You can select a sync frequency of 0.1Hz, 1Hz, 5Hz, 10Hz or 25Hz.

The output is designed as a 3.5-mm stereo jack. For more information, refer to [Appendix A](#).

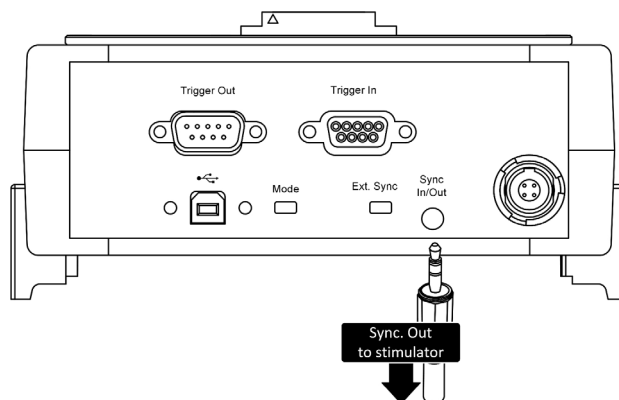


Figure 2-6. Connecting to the synchronization output



Note on the Sync In/Out jack

The synchronization input is not yet implemented.

Using the recording software

When you have completed the installation of the hardware components and the drivers, you can start to view and/or record data.

actiCHamp and actiCHamp Plus have four operating modes:

- ▶ monitoring
- ▶ test
- ▶ impedance measurement
- ▶ recording

You can switch between the modes in the recording software. For more information, refer to the manual of your recording software.



Note

- ▶ Recorder version 1.21.0202 or later is required for actiCHamp.
- ▶ Recorder version 1.22.0001 or later is required for actiCHamp Plus.

2.3 After use

2.3.1 Charging the battery

After use, disconnect PowerUnit from actiCHamp and actiCHamp Plus. Otherwise you risk deep discharging the batteries, which leads to a permanent damage.

If PowerUnit needs to be charged, connect the charger first to PowerUnit and then to the mains.

For more information, refer to [Section 2.1](#).

2.3.2 *Cleaning*



Notice

Damage to actiCHamp or actiCHamp Plus

To prevent damage due to incorrect cleaning, observe the following points:

- ▶ Do not let connectors come into contact with moisture. Moisture causes corrosion.
- ▶ Do not use aggressive or corrosive cleaning agents.
- ▶ Do not clean the products when the participant is connected to them or when the products are connected to the power supply.

Before cleaning, disconnect all cables.

Clean the products with a slightly damp cloth.

2.3.3 *Disinfecting*

For disinfecting electrodes and surfaces, refer to our [disinfection guidelines](#).





Chapter 3 Using the actiCAP slim electrode system with actiChamp and actiChamp Plus

The actiCAP slim electrode system consists of gel-based active Ag/AgCl electrodes. There are two available options:

- ▶ The actiCAP slim is a fabric cap with embedded electrodes.
- ▶ The actiCAP snap is a fabric cap with actiCAP snap holders into which you can insert the electrodes.

For more information, refer to the actiCAP Manual and to the [Brain Products website](#).



Note

Take note of channel 1 in module 1 ([Section 3.1](#)).



Figure 3-1. actiCAP slim



Figure 3-2. actiCAP snap

3.1 The role of channel 1 in module 1

The channel 1 in module 1 has two important functions:

1 Impedance measurement

During the impedance measurement, the impedance of the ground electrode is determined with the help of channel 1 in module 1. In order to measure the impedances correctly, channel 1 in module 1 must be present.

2 Active shielding mode ([page 52](#))

The active shielding mode uses channel 1 in module 1 as a signal source for determining the environmental noise. Therefore, the channel 1 electrode should be placed in an area with low physiological activity. This will avoid EEG/EMG artifacts in all electrodes due to overcompensation of the artifact.





Chapter 4 Using the BrainCap electrode system with actiCHamp Plus

The BrainCap electrode system consists of passive, gel-based Ag/AgCl electrodes fixed to a fabric cap.

To use BrainCap with actiCHamp Plus, you need a 40-50pin adapter.

For more information on the BrainCap electrode system, refer to the [Brain Products website](#).



Figure 4-1. BrainCap



Chapter 5

Using the R-Net electrode system with actiCHamp Plus

The R-Net electrode system consists of sponge-based passive Ag/AgCl electrodes fixed to a flexible net.

For more information, refer to the R-Net Manual and to the [Brain Products website](#).



Figure 5-1. R-Net



Chapter 6

Maintenance, repair, and disposal

6.1 Maintenance

Regularly inspect the product and accessories for damage. Ensure that all connectors are clean and intact.

It is recommended to apply the test signal at regular intervals (for example, once per month) in order to ensure that the amplifier is functioning correctly. For more information, refer to [Section 7.4](#).

6.2 Repair

Repairs of actiCHamp, actiCHamp Plus, PowerUnit, and accessories may only be carried out by Brain Products or authorized partners. If the product or accessories are damaged, please contact your [local distributor](#) or our Technical Support team at techsup@brainproducts.com. If you ship the product to Brain Products for repair, observe the information on transport in [Appendix A](#).

If there is reason to assume that the damage is due to the battery, do not ship the product. Dispose of the battery as described in [Section 6.3](#).

Examples:

- ▶ Visible mechanical damage to the battery.
- ▶ Signs of excessive heating, scorching, or fire.
- ▶ Leaking battery.
- ▶ The battery is fully charged, but the product does not switch on.



Note

A shortened battery life is considered normal aging, not a battery defect.

For this information in German, refer to [Appendix C](#).

6.3 Disposal



Do not dispose of products, accessories, cables, and batteries with the household waste. Dispose of them in accordance with national regulations, for example in Germany via the collection boxes in stores or at municipal collection points.

Batteries that are not permanently integrated into electronic devices and can be safely removed must be removed and disposed of separately prior to disposal of the device.

For example, in the EU and EFTA, the Regulation Concerning Batteries and Waste Batteries (Battery Regulation) (EU) 2023/1542 as well as the Directive on Waste Electrical and Electronic Equipment (WEEE) 2012/19/EU apply.

On request, Brain Products will take back your old devices, provided that they are original Brain Products parts.

Data protection

We would like to point out to all end users that you are responsible for deleting personal data on the products to be disposed of.

Risks associated with handling lithium batteries



Note: To check whether your product contains lithium batteries, refer to [Appendix A](#).

Lithium batteries are safe when handled properly.

If handled improperly, lithium batteries can cause fires.

- ▶ Avoid mechanical damage (for example, from impacts or dropping), thermal effects (for example, from strong sunlight), and short circuits.
- ▶ Observe the rules described in the manual of the product regarding charging, use, storage, and transport to avoid damage and to extend battery life.
- ▶ Do not use defective, damaged, deformed, swollen, or leaking batteries.

Registration numbers

Brain Products GmbH is registered as a manufacturer of electrical and/or electronic equipment with the stiftung elektro-altgeräte register, Nordostpark 72, 90411 Nürnberg under the WEEE registration number DE89975135.

Brain Products GmbH is registered as a manufacturer of batteries with the stiftung elektroaltgeräte register, Nordostpark 72, 90411 Nürnberg under the following battery registration numbers:

DE28818587 (portable batteries)

DE28818587 (industrial batteries)

For this information in German, refer to [Appendix C](#).





Chapter 7

Troubleshooting

This chapter contains test scenarios and recommendations that assist you when conducting tests and localizing faults.

7.1 Troubleshooting for actiCHamp, actiCHamp Plus, and Recorder

Errors that occur when actiCHamp or actiCHamp Plus are connected and Recorder is running are displayed in the Recorder interface. These type of errors can indicate an issue with the hardware being used, for example, the actiCHamp or actiCHamp Plus, USB cables, USB ports, or the PC and operating system.

Use the following as a checklist if you are experiencing any issues:

- ▶ Is the green LED on the rear of the actiCHamp or actiCHamp Plus blinking after it is connected to the PC? (PowerUnit does not have to be connected).
- ▶ Is the actiCHamp or actiCHamp Plus visible in the Windows device manager? (PowerUnit does not have to be connected).
- ▶ Connect the actiCHamp or actiCHamp Plus to a different USB port on the PC or try using an alternative PC to ensure any problems are not PC dependent.
- ▶ Remove any USB extensions or hubs and swap USB cables to see if the problems persist.
- ▶ Is the PowerUnit fully charged? Always make sure the battery is completely charged.
- ▶ Does Recorder recognize the actiCHamp or actiCHamp Plus and channel modules? (PowerUnit has to be charged and connected). Within Recorder select **Amplifier** > **Connected Amplifier**.
- ▶ Are the green LEDs lit on the channel modules during impedance and monitoring mode?

7.2 Troubleshooting for PowerUnit

As with any rechargeable battery, over time the charge capacity will naturally reduce. However, if the usable capacity suddenly drops this is often the result of inadequate battery management caused by incomplete charging and discharging cycles.

Symptom	Possible cause	Possible solution
Recording has been terminated by low voltage.	PowerUnit has not been completely charged.	1 Completely charge PowerUnit for at least ten hours. 2 Connect PowerUnit to the amplifier. 3 Time the amplifier operating duration on monitoring mode with a 32 channel electrode set and 1 kHz sampling rate. With PowerUnit, an operating time of 10 h can be expected in monitoring mode.
	Battery has reached the end of its serviceable life.	Contact your certified distributor.
Charger LED no longer lights up.	Fuse or internal circuitry defect.	Contact your certified distributor.
LED on the channel module/s does not flash red after the PowerUnit has been connected.	Battery has been deeply discharged.	1 Completely charge PowerUnit for at least ten hours. 2 Connect PowerUnit to the amplifier. 3 Time the amplifier operating duration on monitoring mode with a 32 channel electrode set and 1 kHz sampling rate. With PowerUnit, an operating time of 10 h can be expected in monitoring mode.
	Fuse or internal circuitry defect.	Contact your certified distributor.

7.3 Saline test

The saline test is a simple and often indispensable method to track impedance mode problems and signal measurement problems. The saline solution serves as a low impedance reference state to test the impedance mode or to inject a test signal in all channels simultaneously.

To perform a saline test:

- 1 Mix approximately three tablespoons of salt with one liter of water in a plastic bowl.

**Notice**

Do not use a metal bowl or sink, as this will damage the electrodes.

**Notice**

If you know that your tap water contains significant amounts of iron ions, better use distilled water to avoid damage to the Ag/AgCl electrode pellets.

- 2 Place all electrodes including the ground electrode in the saline solution.

7.4 Applying a test signal

You can use the amplifier internal test signal generator to check the integrity of the signal pipeline

- 1 Place the electrodes in a saline solution. For more information, refer to [Section 7.3](#).
- 2 Deactivate all software filters in your recording program.
- 3 Set the sampling rate to 500Hz.
- 4 Click the signal test button in your recording program.
- 5 Wait until the saline solution has stopped moving and signals are stable in monitoring mode.
- 6 Record 30 sec, zip .eeg, .vhdr, .vmrk and send it to techsup@brainproducts.com.

If all channels are working properly a square-wave signal (Figure 7-1) is output. If this is not the case, the corresponding electrode is faulty.

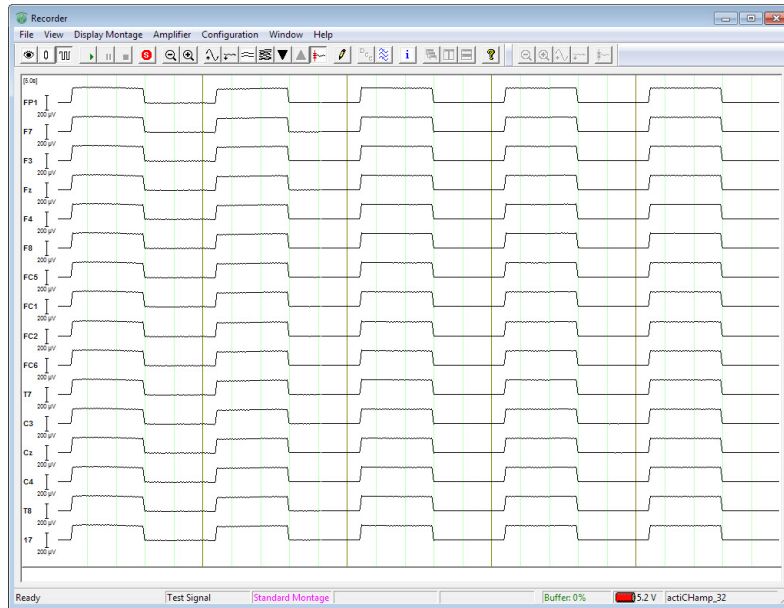


Figure 7-1. Square-wave signal in Recorder

Test signal details:

Symptom	Possible cause	Possible solution
Square-wave signal on all channels	Expected function.	None.
No signal on one or more electrodes	Electrode (pin worn, broken or corroded) or electrode cable broken.	Replace the faulty electrode (see Section I).
	Splitter or ribbon cable broken.	Contact your certified distributor.
No signal on all electrodes	GND electrode defective.	Replace the GND electrode (see Section I).

In case the problem which was seen during recording or the impedance check is not reproducible in the saline solution move the electrode cable in question to determine if there is a loose contact issue.



Appendix A Technical data

actiCHamp

Specification	Value
Maximum sampling rate:	100 000 Hz*
Maximum number of channels:	160 EEG + 8 AUX
Maximum bandwidth of the EEG channels:	DC up to 7500 Hz
Digitization:	24-bit, one converter/channel
Input noise:	2 μV_{pp} (DC – 35 Hz)
Input voltage range:	+/- 400 mV (EEG), +/- 4.8 V (AUX)
Resolution	EEG channels: $0.819.2 \text{ V}/(2^{24} \text{ Bit}) \approx 0.04883 \mu\text{V/Bit}$ AUX channels: As of Rev. 02: $10 \text{ V}/(2^{24} \text{ Bit}) \approx 0.596 \mu\text{V/Bit}$
Common-mode rejection (CMR):	100 dB
Trigger input:	8 bit TTL (LVTTTL) signals, 0 to +5 V (+ 3.3 V), max. 10 mA
Trigger output:	8 bit TTL signals, 0 to +5 V, max. 10 mA
Use with active electrodes:	Yes
Use with passive electrodes:	No
Impedance measurement:	Yes, three colors, displayed via LEDs
Easy replacement of faulty electrodes:	Yes, by removal from splitter box
Recording software:	BrainVision Recorder (version 1.21.0202 or later)
Integrated AUX/bipolar channels (base module):	Yes, 8 AUX channels
Synchronization output:	3.5 mm stereo jack TTL signal, always ON Clock signal of A/D converter, based on the three basic sampling rates of the amplifier (10 kHz, 50 kHz, 100 kHz).
Dimensions (H x W x D):	Approx. 68 mm x 160 mm x 187 mm
Weight:	Approx. 1.1 kg

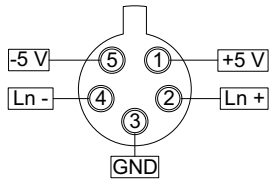
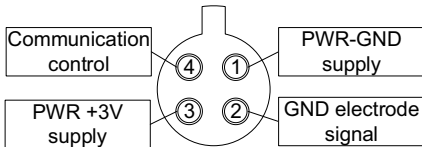
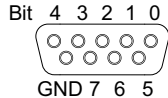
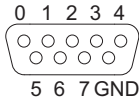
Specification	Value
Medical device:	No
CE marking:	Yes
EMC-tested in accordance with EN 61326-1:2013 (IEC 61326-1:2012)	Yes

*Please note that the maximum sampling rate depends on the number of channels used. The employed recording program and the computer used to record the data also have a significant impact on the maximum transmission speed.

The following table contains the recommended values based on the optimum configuration of the computer used for data recording:

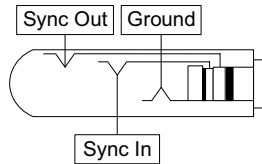
Maximum number of channels:	Recorder as of version 1.20
160 EEG channels + 8 AUX channels	25 kHz
128 EEG channels + 8 AUX channels	25 kHz
96 EEG channels + 8 AUX channels	25 kHz
64 EEG channels + 8 AUX channels	50 kHz
32 EEG channels + 8 AUX channels	100 kHz

Ambient conditions	
Operation	Temperature: 10 °C to 40 °C (50 °F to 104 °F) Relative humidity: 25 % to 75 %, non-condensing Atmospheric pressure: 700 hPa to 1050 hPa
Storage and transport	Temperature: 0 °C to 60 °C (32 °F to 140 °F) Relative humidity: 25 % to 85 %, non-condensing Atmospheric pressure: 700 hPa to 1050 hPa

Pinout of the connectors (view from top)	
Auxiliary (AUX) (5 pin, female) 	Ground (GND) (4 pin, female) 
Trigger In (D-Sub 9, female) 	Trigger Out (D-Sub 9, male) 

Pinout of the connectors (view from top)

Sync In/out (stereo plug, female)

**actiCHamp Plus**

Specification	Value
Maximum sampling rate:	100 000 Hz*
Maximum number of channels:	160 EEG + 8 AUX
Maximum bandwidth of the EEG channels:	DC up to 7500 Hz
Digitization:	24-bit, one converter/channel
Input Impedance (for DC)	EEG channels: > 1000 MOhm AUX channels: As of Rev. 01: 40 MOhm Note: Irrelevant for use with active electrodes connected to actiCHamp or actiCHamp Plus, i.e. only relevant for passive electrodes connected to actiCHamp Plus.
Input noise:	2 μV_{pp} (DC – 35 Hz)
Input voltage range:	+/- 400 mV (EEG), +/- 4.8 V (AUX)
Common-mode rejection (CMR):	100 dB
Trigger input:	8 bit TTL (LVTTTL) signals, 0 to +5 V (+ 3.3 V), max. 10 mA
Trigger output:	8 bit TTL signals, 0 to +5 V, max. 10 mA
Use with active electrodes:	Yes
Use with passive electrodes	Yes
Impedance measurement:	Yes, three colors, displayed via LEDs
Easy replacement of faulty active electrodes:	Yes, by removal from splitter box
Recording software:	BrainVision Recorder (version 1.22.0001 or later)
Integrated AUX/bipolar channels (base module):	Yes, 8 AUX channels

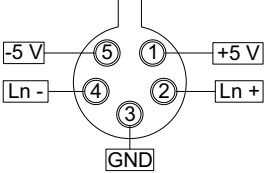
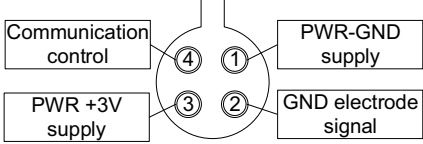
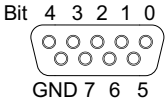
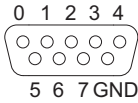
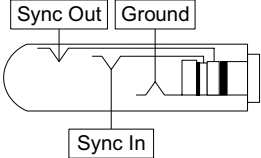
Specification	Value
Synchronization output:	3.5 mm stereo jack TTL signal, always ON Clock signal of A/D converter, based on the three basic sampling rates of the amplifier (10 kHz, 50 kHz, 100 kHz).
Dimensions (H x W x D):	Approx. 68 mm x 160 mm x 187 mm
Weight:	Approx. 1.1 kg
Medical device:	No
CE marking:	Yes
EMC-tested in accordance with EN 61326-1:2013 (IEC 61326-1:2012)	Yes

*Please note that the maximum sampling rate depends on the number of channels used. The employed recording program and the computer used to record the data also have a significant impact on the maximum transmission speed.

The following table contains the recommended values based on the optimum configuration of the computer used for data recording:

Maximum number of channels:	Recorder as of version 1.22
160 EEG channels + 8 AUX channels	25 kHz
128 EEG channels + 8 AUX channels	25 kHz
96 EEG channels + 8 AUX channels	25 kHz
64 EEG channels + 8 AUX channels	50 kHz
32 EEG channels + 8 AUX channels	100 kHz

Ambient conditions	
Operation	Temperature: 10 °C to 40 °C (50 °F to 104 °F) Relative humidity: 25 % to 75 %, non-condensing Atmospheric pressure: 700 hPa to 1050 hPa
Storage and transport	Temperature: 0 °C to 60 °C (32 °F to 140 °F) Relative humidity: 25 % to 85 %, non-condensing Atmospheric pressure: 700 hPa to 1050 hPa

Pinout of the connectors	
Auxiliary (AUX) (5 pin, female) 	Ground (GND) (4 pin, female) 
Trigger In (D-Sub 9, female) 	Trigger Out (D-Sub 9, male) 
Sync In/out (stereo plug, female) 	

PowerUnit

Specification	Value
Max. number of amplifiers:	1
Rated voltage:	6.6 V DC
Rated capacity:	13 Ah
Rated energy:	85.8 Wh
Output current:	Max. 3 A
Rechargeable battery type:	Lithium-ion (lithium iron phosphate (LiFe-PO ₄))
Operating time for one amplifier:	22 h at 10 kHz and 32 channels 7 h at 25 kHz and 160 channels
Charging time:	Typically 12 hours with FRIWO charger (BP-215-1020) (at room temperature with empty battery); Typically 5 hours with Mascot charger (BP-215-1021) (at room temperature with empty battery)
Dimensions (H x W x D):	Approx. 68 mm x 160 mm x 187 mm
Weight:	Approx. 1.2 kg
State of charge (SOC) for transport	<30% of full capacity
State of charge (SOC) for storage	30% up to 80% of full capacity For longer storage periods: Start with 80% SOC for extending the time period until SOC falls short of 30% by self-discharge
Medical Device	no
CE marking	yes
EMC-tested in accordance with EN 61326-1:2013 (IEC 61326-1:2012)	

Ambient conditions	
Charging	Temperature: 10 °C to 30 °C (50 °F to 86 °F)
Operation	Temperature: 10 °C to 40 °C (50 °F to 104 °F) Relative humidity: 30 % to 80 %, non-condensing Atmospheric pressure: 700 hPa to 1050 hPa
Storage	Temperature: 0 °C to 40 °C (32 °F to 104 °F) Relative humidity: 30 % to 80 %, non-condensing Atmospheric pressure: 700 hPa to 1050 hPa
Transport	Temperature: 0 °C to 60 °C (32 °F to 140 °F) Relative humidity: 30 % to 80 %, non-condensing Atmospheric pressure: 700 hPa to 1050 hPa

Ambient conditions	
To prevent mechanical damage during transport, please pack the product in such a way that it is not subject to vibration.	

Transport	
UN number	UN3480 (PowerUnit as a single product) UN3481 (PowerUnit shipped with an amplifier)
UN proper shipping name	ADR/RID/IMDG-Code: LITHIUM-ION BATTERIES ICAO-TI/IATA-DGR: LITHIUM-ION BATTERIES
Transport hazard class	9
Packing group	II

For transportation, PowerUnit fulfills requirements of UN-test 38.3 according to the UN Manual of Tests and Criteria.

PowerUnit falls under the transportation regulations of dangerous goods. It may only be shipped by a qualified person or service partner depending on local regulations.





Appendix B Active electrodes

This appendix explains the technical background of active electrodes, impedance conversion, the active shielding mode, and reference-free acquisition. For more information on the impedance check with active electrodes, refer to the actiCAP Manual.

How the active electrodes work

The actiCAP electrodes possess high-quality Ag/Ag-Cl pellets as well as “active” circuits that are integrated in the electrodes. These features make it possible to perform recording at high electrode impedances (e.g. 60 kOhm).

Alongside the integrated impedance converter, the electrodes also possess special electronic components, which enable the amplifier system to measure the impedances between the electrode and the scalp. Multi-color LEDs in the electrodes indicate the impedance ranges. The default ranges are as follows:

- ▶ green = less than 25 kOhm
- ▶ yellow = between 25 and 60 kOhm
- ▶ red = greater than 60 kOhm.

For information on identifying and correcting defective electrodes, refer to [Chapter 7](#).

The principle of impedance conversion

The term “impedance conversion” refers to the transformation of an input resistance R_I into an output resistance R_O . The input voltage U_I at the input resistance R_I is identical to the output voltage U_O at the output resistance R_O .

In practice, it can be assumed that the impedance converter possesses a very high input resistance R_I and a low output resistance R_O . This reflects the fact that most signal sources have a high internal resistance R_S which cannot be modified. In the field of electroencephalography, this is due to the

physiological characteristics, i.e. the electrical properties of tissue and bone, interposed between the signal source (nerves) and the receivers (electrodes).

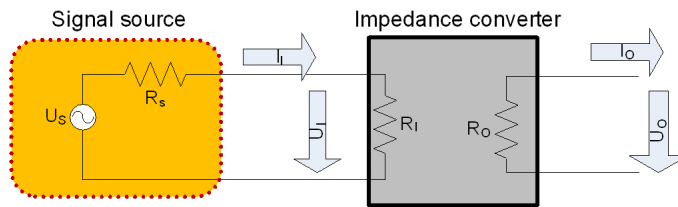


Figure B-1. Impedance conversion

In combination with the internal resistance R_s of the signal source U_s , the input resistance R_i of the impedance converter acts as a voltage divider. If, as assumed, the input resistance R_i has a very high value compared to the internal resistance R_s then the attenuation due to the acquisition system can be ignored. Because the impedance converter does not allow any feedback from its output, the signal source is not distorted. At the impedance converter output, the small output resistance R_o acts as a power amplifier (drive). At the low-impedance side of the impedance converter, the parasitic characteristics of the electrode lines and any external sources of interference have a far smaller impact on subsequent transmission quality.

It is therefore vital to use impedance conversion to prepare the signal as close as possible to the electrode. The actiCHamp system meets this requirement through the use of active electrodes.

Active shielding

actiCHamp and actiCHamp Plus support two modes of recording: The default mode and the active shielding mode. Channel 1 is used as the source for the shielding signal (refer to [Section 3.1 as of page 34](#)).

Environmental noise can have different characteristics depending on their source (AC power lines, computers, displays, wireless equipment). The critical distinctive features are the mode (normal mode and common mode) and the distribution across the EEG channels. AC line noise usually is common mode noise but shows a large variation regarding the topographical distribution: The frontal positions are often more affected than occipital channels (when facing a computer screen, for example).

As a rule of thumb, the better the noise fulfills the common mode characteristics and the more uniform the distribution is, the better shielding mode works.

In contrast, for channels that are less affected by common mode noise, shielding mode can cause an over-compensation, which results in more noisy signals, since the assumptions of the noise characteristics are not fulfilled.

In any case the data are modified: Either reversible (referencing) or irreversible (active shielding).

Thus, for using a reference channel (i.e. referencing) together with the active shielding mode, the characteristics of the noise and the environment have to be considered. The best way of selecting the appropriate strategy is to carefully evaluate the recorded pilot data in both time and frequency domain.

Even though actiCHamp and actiCHamp Plus are highly immune to environmental electrical noise due to the flexible handling of referencing and shielding mode, the best way is to eliminate electrical noise at the source.

The principle of reference-free acquisition

The signals are acquired without a physical reference electrode. Internally, the amplifier uses the GND electrode signal as the reference.

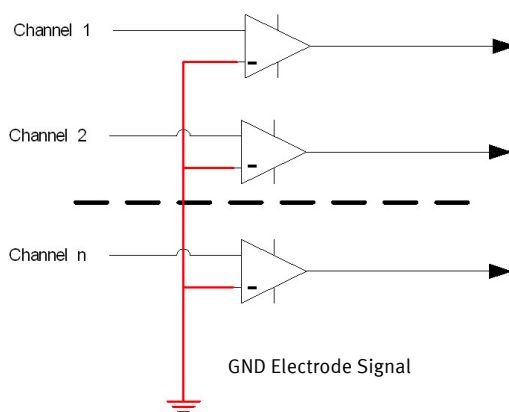


Figure B-2. Representation of the GND electrode signal

The recording program allows you to define any electrode of your choice as the software reference. The system calculates the difference between software reference and the other acquired channels for each data point.



Note on role of the ground electrode

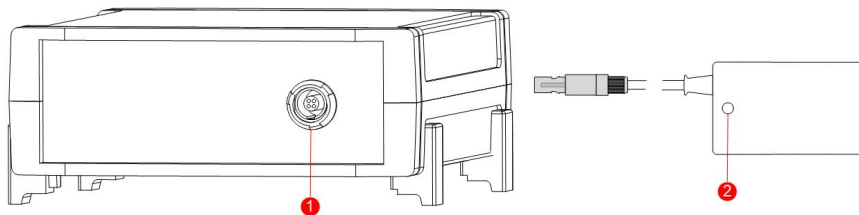
The physically present ground electrode prevents the DC drift of the amplifier system. If you use the actiCHamp's or actiCHamp Plus's default recording mode without active shielding then the positioning of the ground electrode is crucial in determining the signal quality for recording. Position the ground electrode in a location that is particularly exposed to external interferences.



Appendix C Regulatory information (German) – Regulatorische Informationen (Deutsch)

In diesem Anhang sind auszugsweise die batterierelevanten Abschnitte sowie die Hinweise zur Entsorgung von Batterien und von Elektro- und Elektronik-Altgeräten auf Deutsch gesammelt.

1.4 PowerUnit



Nr.	Beschreibung
1	Ladebuchse (4 pin)
2	PowerUnit charger Mascot (BP-215-1021) LED dauerhaft (orange) = Laden LED dauerhaft (gelb) = Fast vollständig geladen LED dauerhaft (grün) = Vollständig geladen FRIWO (BP-215-1020) LED dauerhaft (gelb) = Standby LED langsam blinkend (gelb) = Vorladen LED schnell blinkend (grün) = Schnelles Laden LED langsam blinkend (grün) = Erhaltungsladen LED dauerhaft (grün) = Vollständig geladen LED schnell blinkend (gelb) = Fehler LED abwechselnd blinkend (gelb und grün) = außerhalb der zulässigen Temperatur (abwarten)

Der Ladestecker der PowerUnit dient dazu, die PowerUnit zu laden und den actiCHamp Plus mit Strom zu versorgen.

**Anmerkung**

- ▶ Wenn die PowerUnit vollständig geladen ist und das Ladegerät ab- und wieder angesteckt wird, geht die PowerUnit in einen Ausgleichzustand über, in dem die LED für eine längere Zeit grün blinkt. Dies ist ein erwartetes Verhalten, und die PowerUnit kann verwendet werden, ohne auf eine durchgehend grüne LED zu warten.
- ▶ Wenn die PowerUnit vollständig geladen ist, trennt das Ladegerät die Stromversorgung automatisch, um ein Überladen zu verhindern. Um einen neuen Ladevorgang zu starten, muss das Ladegerät von der PowerUnit oder dem Netz ab- und wieder angesteckt werden.
- ▶ Gelegentlich kann es vorkommen, dass ein hohes Pfeifen mit wechselnder Frequenz zu hören ist, das vom Netzteil ausgeht. Dies ist ein erwartetes und normales Verhalten.

1.4.1 Korrekte Handhabung der PowerUnit

Beachten Sie Folgendes, um Schäden an der Batterie zu vermeiden:

- ▶ Vor der ersten Verwendung die PowerUnit aufladen. Siehe Abschnitt 1.4.2.
- ▶ Zwischen geplanten Messungen (innerhalb von Stunden oder Tagen) kann das Ladegerät mit der Batterie verbunden bleiben, selbst wenn sie vollständig geladen ist.
- ▶ Wenn die PowerUnit für längere Zeit nicht verwendet wird (Wochen oder Monate), das Ladegerät abstecken, sobald die Batterie vollständig geladen ist. Die PowerUnit verliert ihre Ladung über lange Zeiträume hinweg. Um eine Tiefenentladung zu verhindern, die PowerUnit alle vier Monate wieder vollständig aufladen.

**Anmerkung**

Wiederaufladbare Batterien unterliegen einem allmählichen Verschleiß, was zu längeren Ladezeiten führt.

**Hinweis**

Nach der Verwendung die PowerUnit von actiCHamp oder actiCHamp Plus abstecken.

Während des Ladevorgangs, des Betriebs und der Lagerung der PowerUnit den empfohlenen Temperaturbereich von 10 °C bis 30 °C (50 °F to 86 °F) einhalten.

Die PowerUnit nicht direkter Sonneneinstrahlung aussetzen, wenn die Hitze den empfohlenen Temperaturbereich überschreiten könnte.

Die PowerUnit nicht auf oder in der Nähe eines Heizkörpers platzieren.

1.4.2 Laden der PowerUnit

Die PowerUnit idealerweise bei Raumtemperatur laden.

Die Reihenfolge, in der das Ladegerät verbunden werden sollte, hängt vom Typ des Ladegeräts ab:

Typ des Ladegeräts	Zuerst mit dem Netz, dann mit der PowerUnit verbinden	Zuerst mit der PowerUnit, dann mit dem Netz verbinden
Mascot (BP-215-1021)	●	
FRIWO (BP-215-1020)		●

Das Aufladen einer leeren Batterie dauert bei Raumtemperatur in der Regel 10 Stunden.

**Hinweis**

Die PowerUnit und das Ladegerät erwärmen sich während des Ladens. Immer sicherstellen, dass um beide Komponenten herum möglichst viel Freiraum vorhanden ist, damit die Wärme ungehindert abgeführt werden kann.

Nicht mehrere PowerUnits aufeinander stapeln, wenn sie zur gleichen Zeit geladen werden.

Nur das von Brain Products bereitgestellte Ladegerät verwenden.

2.1 Vor der Verwendung

1 PowerUnit laden

Vor jeder Verwendung sicherstellen, dass die Batterie ausreichend geladen ist. Im Zweifelsfall die PowerUnit vollständig aufladen.

- ▶ Das Ladegerät mit PowerUnit verbinden wie in [Section 1.4.2](#) beschrieben.
- ▶ Die LED des Ladegerät leuchtet auf. Für Informationen zum LED-Status der PowerUnit siehe [Section 1.4](#).

2.3 Nach der Verwendung

Unmittelbar nach der Verwendung die PowerUnit vom actiCHamp oder actiCHamp Plus abstecken. Andernfalls droht eine Tiefenentladung, die zu bleibenden Schäden an der Batterie führt.

6.2 Reparatur

Reparaturen an actiCHamp, actiCHamp Plus, PowerUnit und Zubehör dürfen nur von Brain Products oder autorisierten Partnern durchgeführt werden. Wenn das Produkt oder sein Zubehör beschädigt sind, kontaktieren Sie bitte unser Technical Support Team unter techsup@brainproducts.com. Wenn Sie das Produkt zur Reparatur an Brain Products schicken, beachten Sie die Informationen zum Transport in [Appendix A](#).

Wenn es Grund zur Annahme gibt, dass die Beschädigung mit der Batterie zusammenhängt, transportieren Sie die Batterie nicht, sondern entsorgen sie wie in Abschnitt 6.3 beschrieben.

Beispiele:

- ▶ Sichtbare mechanische Schäden an der Batterie.
- ▶ Anzeichen von übermäßiger Erwärmung, Verschmörung oder Feuer.
- ▶ Ausgelaufene Batterie.
- ▶ Die Batterie wurde vollständig geladen, aber das Produkt lässt sich nicht anschalten.



Anmerkung

Eine verkürzte Batterielaufzeit ist normale Alterung, kein Batteriedefekt.

6.3 Entsorgung



Die Produkte, Zubehör, Kabel und Batterien nicht über den Hausmüll entsorgen. Stets gemäß den nationalen Vorschriften entsorgen, in Deutschland beispielsweise über die Sammelboxen im Handel oder bei kommunalen Sammelstellen.

Batterien, die nicht fest in Elektrogeräte eingebaut sind und gefahrlos entnehmbar sind, müssen vor der Entsorgung des Elektrogeräts entnommen und separat entsorgt werden.

In der EU und EFTA gelten beispielsweise die Verordnung (EU) 2023/1542 über Batterien und Altbatterien (Batterieverordnung) sowie die Richtlinie 2012/19/EU über Elektro- und Elektronik-Altgeräte (WEEE-Richtlinie).

Auf Anfrage nimmt Brain Products Ihre alten Geräte zurück, sofern es sich um Originalteile von Brain Products handelt.

Datenschutz

Wir möchten unsere Endnutzer darauf hinweisen, dass sie verantwortlich dafür sind, personenbezogene Daten auf den Produkten vor der Entsorgung zu löschen.

Risiken beim Umgang mit lithiumhaltigen Batterien



Anmerkung: Um zu prüfen, ob Ihr Produkt lithiumhaltige Batterien enthält, siehe [Appendix A](#).

Lithiumhaltige Batterien sind bei sachgemäßem Umgang sicher.

Bei unsachgemäßem Umgang können lithiumhaltige Batterien Brände verursachen.

- ▶ Vermeiden Sie mechanische Beschädigungen (zum Beispiel durch Stöße, Herunterfallen), thermische Einwirkungen (zum Beispiel starke Sonneneinstrahlung) sowie Kurzschlüsse.
- ▶ Berücksichtigen Sie die im Manual des Produktes beschriebenen Regeln bezüglich Laden, Verwendung, Lagerung und Transport, um Schäden zu vermeiden und die Lebensdauer der Batterien zu verlängern.
- ▶ Verwenden Sie keine defekten, beschädigten, verformten, aufgeblähten oder ausgelaufenen Batterien.

Registrierungsnummern

Brain Products GmbH ist als Hersteller von Elektro- und/oder Elektronikgeräten bei der stiftung elektro-altgeräte register, Nordostpark 72, 90411 Nürnberg unter der WEEE-Registrierungsnummer DE89975135 registriert.

Brain Products GmbH ist als Hersteller von Batterien bei der stiftung elektro-altgeräte register, Nordostpark 72, 90411 Nürnberg unter folgenden Batterie-Registrierungsnummern registriert:

DE28818587 (Gerätebatterien)

DE28818587 (Industriebatterien)

Appendix A Technische Daten – PowerUnit

Angabe	Wert
Max. Anzahl von Verstärkern:	1
Nennspannung:	6.6 V DC
Nennkapazität:	13 Ah
Nennenergie	85.8 Wh
Ausgangsstrom:	Max. 3 A
Typ der wiederaufladbaren Batterie:	Lithium-Ionen (Lithium-Eisenphosphat (LiFe-PO ₄))
Laufzeit bei einem Verstärker:	22 h bei 10 kHz und 32 Kanälen 7 h bei 25 kHz und 160 channels
Ladedauer:	Üblicherweise 12 Stunden mit FRIWO-Ladegerät (BP-215-1020) (bei leerer Batterie auf Raumtemperatur); Üblicherweise 5 Stunden mit Mascot-Ladegerät (BP-215-1021) (bei leerer Batterie auf Raumtemperatur)
Maße (H x W x D):	Ca. 68 mm x 160 mm x 187 mm
Gewicht:	Ca. 1.2 kg
Ladezustand/State of Charge (SOC) für den Transport	<30% der vollen Kapazität
Ladezustand/State of Charge (SOC) für die Lagerung	30% bis 80% der vollen Kapazität Für längere Lagerung: Start bei 80% SOC, um die Zeitspanne zu verlängern, bis SOC durch Selbstentladung unter 30% fällt.
Medizinprodukt	Nein
CE-Kennzeichnung	Ja
EMC-geprüft gemäß EN 61326-1:2013 (IEC 61326-1:2012)	

Umgebungsbedingungen	
Laden	Temperatur: 10 °C bis 30 °C (50 °F bis 86 °F)
Betrieb	Temperatur: 10 °C bis 40 °C (50 °F bis 104 °F) Relative Luftfeuchtigkeit: 30 % bis 80 %, nicht kondensierend Luftdruck: 700 hPa bis 1050 hPa
Lagerung	Temperatur: 0 °C bis 40 °C (32 °F bis 104 °F) Relative Luftfeuchtigkeit: 30 % bis 80 %, nicht kondensierend Luftdruck: 700 hPa bis 1050 hPa
Transport	Temperatur: 0 °C bis 60 °C (32 °F bis 140 °F) Relative Luftfeuchtigkeit: 30 % bis 80 %, nicht kondensierend Luftdruck: 700 hPa bis 1050 hPa
Um mechanische Beschädigung während des Transports zu vermeiden, bitte das Produkt so verpacken, dass es keinen Vibrationen ausgesetzt ist.	

Transport	
UN-Nummer	UN3480 (PowerUnit als separates Produkt) UN3481 (PowerUnit gemeinsam mit einem Verstärker)
Ordnungsgemäße UN-Versandbezeichnung	ADR/RID/IMDG-Code: LITHIUM-IONEN-BATTERIEN ICAO-TI/IATA-DGR: LITHIUM-ION BATTERIES
Transportgefahrenklassen	9
Verpackungsgruppe	II

Für den Transport erfüllt PowerUnit die Anforderungen des UN-Handbuchs über Prüfungen und Kriterien, Unterabschnitt 38.3 für den Transport.

PowerUnit unterliegt den Transportvorschriften für Gefahrgut. PowerUnit darf nur von einer qualifizierten Person oder einem Servicepartner gemäß den örtlichen Vorschriften versandt werden.

