OPERATING INSTRUCTIONS

BRAIN PRODUCTS
Solutions for neurophysiological research

LiveAmp

Product revision 05

Amplifier

Published by	**Brain Products GmbH**		
	Zeppelinstrasse 7	Phone:	+49 (0) 8105 733 84 - 0
	82205 Gilching	Fax:	+49 (0) 8105 733 84 - 505
	Germany	Web:	www.brainproducts.com
Published on*	February 27, 2025	Document version	021

*Valid until publication of a new version of this document.

Contents

About the document

This document describes how to use LiveAmp and how it is integrated into a measurement setup. This document forms an integral part of the product. It must be precisely adhered to in order 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 document in a safe place and ensure that it is always available to the users.

Make sure that you have the most recent version of this document for your product or product revision. You can find the most recent version on our website: http://www.brainproducts.com.

Target group of this document

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

Users must also 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 document

Typographical conventions

Bold	indicates items on the user interface (menus, buttons, switches, connectors, options) and is used for emphases in the text
Italic	indicates titles of dialog boxes/tabs, file locations and is used to indicate product names
Underscore	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 or **Tip**: This symbol draws your attention to important information relating to the current topic and to recommendations on how to use the product(s).

Cross-reference: This symbol indicates a reference to a related chapter, section or document.

Revision history

Section	Subject
Document version 021	
STE compact at a glance	Information on the STE compact LEDs updated
Appendix A	Technical data updated
Document version 020	
Combinations with other products	Combinations with other products updated
Chapter 6	New chapter added on how to add trigger signals directly to LiveAmp
Chapter 7	New chapter added on how to add trigger and sensor signals with the STE compact
Section 9.3	Screenshots updated for version 2.2.4 of the LiveAmp File Converter
Section 12.7	Troubleshooting updated to include possible STE compact issues
Appendix A	Technical data updated

Reporting errors and support

We would ask you to report without delay any error you find in this document, any fault on the products or any malfunction that you observe when using this product. To do so, please contact your local dealer, who will also assist you in general questions about the product.

About the product

LiveAmp is an ultra-lightweight, wearable amplifier that is available in four different models.

- LiveAmp 8 can record a total of 8 EEG channels, referential and/or bipolar.
- LiveAmp 16 can record a total of 16 referential EEG channels with a maximum of 8 bipolar channels.
- LiveAmp 32 can record either 32 referential EEG channels or 24 referential and 8 bipolar channels.
- LiveAmp 64 can record either 64 referential EEG channels or 56 referential and 8 bipolar channels.

As it is wireless and allows you to store the data internally on an exchangeable memory card, there are no mobility limitations. LiveAmp is easy and intuitive to use and extremely compact. Its technical specifications leave nothing to be desired and translate into outstanding signal quality. LiveAmp can be combined with all available Brain Products electrode types, passive/active or dry.

Bipolar recording is only possible with passive electrodes. Active electrodes cannot be used in combination with bipolar recording.

Product identification

Product designation	**LiveAmp wireless amplifier**
Article number	LiveAmp 32 channel: BP-200-3000 LiveAmp 16 channel: BP-200-3010 LiveAmp 8 channel: BP-200-3020
Manufacturer	Brain Products GmbH Zeppelinstrasse 7 82205 Gilching Germany Tel: +49 (0) 8105 733 84 - 0 Fax: +49 (0) 8105 733 84 - 505 Web: http://www.brainproducts.com Email: techsup@brainproducts.com We are registered as a manufacturer of electrical and/or electronic equipment with the stiftung elektro-altgeräte register, Nordostpark 72, 90411 Nürnberg, Germany, under the registration number DE89975135.
Warranty	http://www.brainproducts.com/contact.php

Combinations with other products

LiveAmp is permitted to be combined with the following products:

Product	Manufacturer
EEG caps and electrodes (actiCAP, actiCAP Xpress Twist, LiveCAP/BrainCap, R-Net)	Easy Cap GmbH
Sensor & Trigger Extension (STE) for LiveAmp[a]	Brain Products GmbH
STE compact for LiveAmp	Brain Products GmbH
LiveAmp Mobility Set	Brain Products GmbH
Push button, 2.5 mm jack	Brain Products GmbH
LabSim	Brain Products GmbH
32 GB micro memory card, class 10	Transcend®
Powerbank with >= 10,000 mAh	Should conform to all national safety and product standards or directives in the country of use. The selected powerbank should be tested (signal noise, operating time, etc.) before first use.
BrainVision Recorder (as of version 1.21)	Brain Products GmbH
BrainVision LiveAmp File Converter	Brain Products GmbH
RecView	Brain Products GmbH
Computer	The computer connected to the amplifier should comply with either IEC 62368-1, EN 62368-1, IEC 60601-1, EN 60601-1 or equivalent safety standards.

a. For more information on STE, see LiveAmp Operating Instructions, document version 019.

STE compact is permitted to be combined with the following products:

Product	**Manufacturer**
Wireless Trigger Transmitter	Brain Products GmbH
3D Acceleration Sensor	Brain Products GmbH
BIP2AUX Adapter	Brain Products GmbH
Blood Pulse Sensor	Becker Meditec
Force Sensor	Brain Products GmbH
GSR Sensor	Brain Products GmbH
LiveAmp (as of Rev. 04 and FW 4.77)	Brain Products GmbH
Pulse Oximetry Sensor set	Nonin Medical, Inc.
Photo Sensor	Brain Products GmbH
BrainVision Recorder (as of version 1.27)	Brain Products GmbH
BrainVision LiveAmp File Converter (as of version 2.2.4)	Brain Products GmbH
Respiration Belt	Brain Products GmbH
StimTrak	Brain Products GmbH
TriggerBox	Brain Products GmbH
TriggerBox Plus	Brain Products GmbH

Beside this general statement about permitted product combinations the user must check whether all stipulations of each product (e.g., regarding its MR compatibility) are fulfilled for the specific combination and purpose of application (i.e. intended use and correct use). Please observe the operating instructions of the respective products.

Markings on the products

The following markings are displayed on the product label:

Brain Products GmbH confirms the compatibility of this product according to the Directive 2014/53/EU (RED) of the European Parliament and the Council of 16 April 2014 on the harmonisation of the laws of the Member States relating to the making available on the market of radio equipment.

The Brain Products GmbH confirms the RoHS compliance of this product according to the 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).

LiveAmp: EMC tested according to EN 61326-1:2013 (IEC 61326-1:2012). Radio-tested in accordance with ETSI EN 300 328 V2.2.2.

STE compact: EMC tested according to EN IEC 61326-1:2021 (IEC 61326-1:2020). Radio-tested in accordance with ETSI EN 300 328 V2.2.2.

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

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

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.

MR Unsafe: Products with this symbol must not be used in an MR environment.*

Observe the operating instructions.

Next to this symbol, the name and address of the product manufacturer is specified.

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

LiveAmp 8, 16 and 32 BP-200-3020, BP-200-3010, BP-200-3000
Japan
MIC ID: R 204-210003
Japan Radio Equipment Compliance: Japanese Technical Regulation Conformity Certification of Specified Radio Equipment, Article 2, Paragraph 1, Item 19, '2.4 GHz band wide band low power data communication system'.

LiveAmp Wireless USB Adapter BP-210-6200
Japan
Contains MIC ID: 2011-200403
Japan Radio Equipment Compliance: Japanese Technical Regulation Conformity Certification of Specified Radio Equipment (Ordinance of MPT No. 37, 1981), Article 2, Paragraph 1, Item 19, "2.4 GHz band wide band low power data communication system".

STE compact for LiveAmp BP-210-2005
Japan
MIC ID: R 204-520022
Japan Radio Equipment Compliance: Japanese Technical Regulation Conformity Certification of Specified Radio Equipment, Article 2, Paragraph 1, Item 19, "2.4 GHz band wide band low power data communication system".

IC

LiveAmp 8, 16 and 32 BP-200-3020, BP-200-3010, BP-200-3000
Canada
Contains transmitter module IC: 5325A-0946
This device complies with Industry Canada license-exempt RSS standard(s). Operation is subject to the following two conditions: (1) this device may not cause interference, and (2) this device must accept any interference, including interference that may cause undesired operation of the device.

Le présent appareil est conforme aux CNR d'Industrie Canada applicables aux appareils radio exempts de licence. L'exploitation est autorisée aux deux conditions suivantes: (1) l'appareil ne doit pas produire de brouillage, et (2) l'utilisateur de l'appareil doit accepter tout brouillage radioélectrique subi, même si le brouillage est susceptible d'en compromettre le fonctionnement

LiveAmp Wireless USB Adapter BP-210-6200
Canada
Contains IC: 21098-ESPWROVERE
This device complies with Part 15 of the FCC Rules. Operation is subject to the following two conditions:
1. This device may not cause harmful interference, and
2. This device must accept any interference received, including interference that may cause undesired operation.
Le présent appareil est conforme aux CNR d’Industrie Canada applicables aux appareils radio exempts de licence. L’exploitation est autorisée aux deux conditions suivantes:
1. l’appareil ne doit pas produire de brouillage;
2. l’utilisateur de l’appareil doit accepter tout brouillage radioélectrique subi, même si le brouillage est susceptible d’en compromettre le fonctionnement.

STE compact for LiveAmp BP-210-2005
Canada
Contains IC 7693A-24J40MA
"This device complies with Part 15 of the FCC Rules. Operation is subject to the following two conditions:
1. This device may not cause harmful interference, and
2. This device must accept any interference received, including interference that may cause undesired operation."
"Le présent appareil est conforme aux CNR d’Industrie Canada applicables aux appareils radio exempts de licence. L’exploitation est autorisée aux deux conditions suivantes:
1. l’appareil ne doit pas produire de brouillage;
2. l’utilisateur de l’appareil doit accepter tout brouillage radioélectrique subi, même si le brouillage est susceptible d’en compromettre le fonctionnement."

LiveAmp 8, 16 and 32 BP-200-3020, BP-200-3010, BP-200-3000

USA
Contains FCC ID: PVH0946
This device complies with Part 15 of the FCC Rules. Operation is subject to the following two conditions:
(1) this device may not cause harmful interference,
and
(2) this device must accept any interference received, including interference that may cause undesired operation.

This equipment has been tested and found to comply with the limits for a Class B digital device, pursuant to part 15 of the FCC Rules. These limits are designed to provide reasonable protection against harmful interference in a residential installation. This equipment generates, uses and can radiate radio frequency energy, and if not installed and used in accordance with the instructions, may cause harmful interference to radio communications. However, there is no guarantee that interference will not occur in a particular installation. If this equipment does cause harmful interference to radio or television reception, which can be determined by turning the equipment off and on, the user is encouraged to try to correct the interference by one or more of the following measures:
• Reorient or relocate the receiving antenna
• Increase the separation between the equipment and receiver
• Consult your Brain Products dealer for help.

LiveAmp Wireless USB Adapter BP-210-6200
USA
Contains FCC ID: 2AC7Z-ESP32WROVERE

This device complies with Part 15 of the FCC Rules. Operation is subject to the following two conditions:
(1) this device may not cause harmful interference, and
(2) this device must accept any interference received, including interference that may cause undesired operation.

This equipment has been tested and found to comply with the limits for a Class B digital device, pursuant to part 15 of the FCC Rules. These limits are designed to provide reasonable protection against harmful interference in a residential installation. This equipment generates, uses and can radiate radio frequency energy, and if not installed and used in accordance with the instructions, may cause harmful interference to radio communications. However, there is no guarantee that interference will not occur in a particular installation. If this equipment does cause harmful interference to radio or television reception, which can be determined by turning the equipment off and on, the user is encouraged to try to correct the interference by one or more of the following measures:
• Reorient or relocate the receiving antenna
• Increase the separation between the equipment and receiver
• Consult your Brain Products dealer for help.

STE compact for LiveAmp BP-210-2005
USA
Contains FCC-ID: OA3MRF24J40MA
This device complies with Part 15 of the FCC Rules. Operation is subject to the following two conditions: (1) this device may not cause harmful interference, and (2) this device must accept any interference received, including interference that may cause undesired operation.
This equipment has been tested and found to comply with the limits for a Class B digital device, pursuant to part 15 of the FCC Rules. These limits are designed to provide reasonable protection against harmful interference in a residential installation. This equipment generates, uses and can radiate radio frequency energy, and if not installed and used in accordance with the instructions, may cause harmful interference to radio communications. However, there is no guarantee that interference will not occur in a particular installation. If this equipment does cause harmful interference to radio or television reception, which can be determined by turning the equipment off and on, the user is encouraged to try to correct the interference by one or more of the following measures:
• Reorient or relocate the receiving antenna
• Increase the separation between the equipment and Receiver
• Consult your Brain Products dealer for help.

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

Safety information

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 these operating instructions and, in particular, the safety instructions.

Intended use

LiveAmp is intended to be used for amplifying and digitizing electrophysiological signals (for example EEG, EMG, ECG, EOG).

LiveAmp is not a medical device. It 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 LiveAmp for diagnosis, therapy, monitoring of vital physiological processes (such as cardiovascular functions) or other medical purposes is expressly forbidden.

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

Correct use

LiveAmp is permitted to be used:

- by users in the psychological and neurophysiological research area.
- in research institutes and other non-medical environments (e.g., at home), hospitals, clinics and other medical environments, provided that all other stipulations regarding the correct use are met and that the products are used in accordance with its intended use.

LiveAmp 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) this document.
- in MR scanner environment.
- in vicinity of explosive gases, for example in operating theaters.
- in oxygen enriched atmospheres.
- under water (e.g., sea, swimming pool, bath tub) or in environments in which significant amounts of water could enter the products (e.g., under shower, in the rain).

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.

CAUTION

Risk of burns by damaged battery

If water enters LiveAmp or if LiveAmp is completely submerged in water, or is otherwise damaged, swollen, cracked, or opened, the battery may get damaged. A damaged battery can catch fire and cause burns.

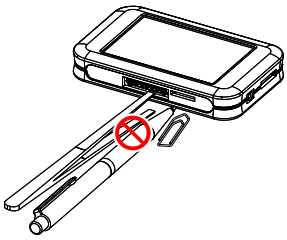
In order to protect the battery:

- do not drop LiveAmp.
- do not damage the housing of LiveAmp by impacts.
- do not open LiveAmp.
- do not modify LiveAmp.
- do not submerge in water or let water enter LiveAmp.

If you notice leakages or a swollen housing, immediately switch off LiveAmp and stop using it. Contact your local distributor. Do not ship damaged or potentially defective LiveAmps to your local distributor or Brain Products GmbH unless instructed otherwise.

NOTICE

Damage to connectors when using tools



If you use tools, for example to remove the memory card, you can accidentally touch the pins of the connectors. This can cause damage to LiveAmp.

Do not use tools when removing or inserting the memory card.

Damage by water

LiveAmp is not splash-water protected. Water or liquids, even small amounts, can damage LiveAmp. This includes internal components, like the battery. Conditions in which liquids could enter LiveAmp are, for example:

- rain
- close to or in water
- sweat
- bathroom

This list is not exhaustive. Please contact your distributor for consultation.

Do not use in conditions where liquids could enter LiveAmp.

NOTICE

Damage by mechanical force

A force applied to the housing of LiveAmp, for example strong impact, twisting, shaking, can result in damage to LiveAmp. This includes internal components, like the battery. A damaged battery can cause fire.

Do not use in conditions where a force could be applied to LiveAmp.

General precautions

- Do not open the LiveAmp and its accessories.
- Heat, direct sunlight (UV radiation), moisture, dust, liquids, conductive foreign matter and excessive radiation shorten the lifespan of the product.
- Use the supplied cables. Brain Products is not liable for damage caused by cables that are not supplied by Brain Products.
- Do not unplug connectors by pulling on their cable. Instead unplug a connector by releasing the locks (if applicable) and by pulling on the connector itself.
- Do not crush or kink the cables.

Notes on the data quality

- Only use the supplied memory card or a memory card that matches the specifications to avoid data loss.
- The user is responsible for the appropriate measurement setup and the quality of the recorded data.
- During operation, keep a minimum distance of three meters to cell phones or similar transmission equipment. Otherwise, signals may be distorted or contain artifacts.
- Do not attach the products to metallic surfaces. This will impair the wireless connection.

Storing and transporting LiveAmp

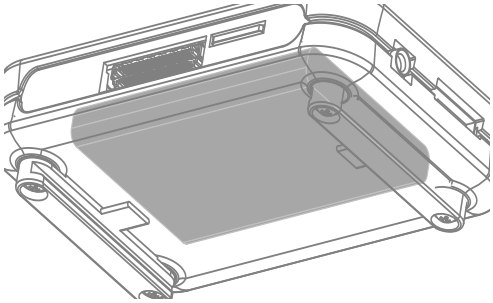
- Always store LiveAmp in the supplied case in a dark, dry place. Avoid direct sunlight (UV radiation), moisture and dust.
- Use the supplied case when you transport LiveAmp.
- The temperature must be within 0 °C (32 °F) to 40 °C (104 °F).

Note

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

Information on the Lithium-Ion cobalt battery

Location of the battery



General data of the battery

- Type: Lithium-Ion cobalt battery in shrink sleeve
- 1 cell with approx. 18 g
- Rated capacity: 1,000 mAh
- Watt-Hour rating: 3.7 Wh

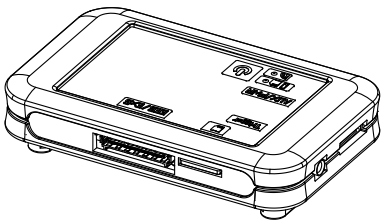
1 Scope of delivery

1.1 LiveAmp System

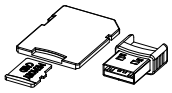
The LiveAmp System is available in three versions:

- LiveAmp 32 channel: BP-100-3000
- LiveAmp 16 channel: BP-100-3010
- LiveAmp 8 channel: BP-100-3020

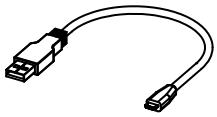
LiveAmp wireless amplifier
LiveAmp 32 channel: BP-200-3000
LiveAmp 16 channel: BP-200-3010
LiveAmp 8 channel: BP-200-3020



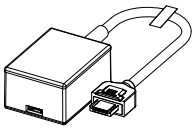
32 GB micro memory card & USB card reader
BP-350-6000 & BP-350-6010



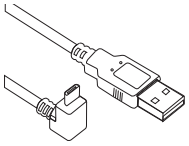
USB3 cable, Type A/C, 15 cm
BP-345-1065 (starting with Rev02)



LiveAmp USB adapter
BP-245-5020

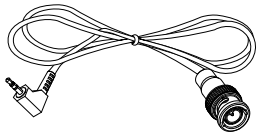


USB A – micro USB extension cable (100 cm)
BP-350-1046

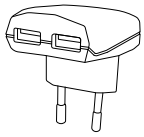


LiveAmp Wireless USB Adapter
BP-210-6200

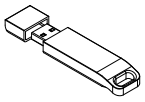
Trigger cable (80 cm / 31 in.)
BP-245-1200



USB charger with adapter
BP-315-1010



License dongle (black)
BP-00060-UR



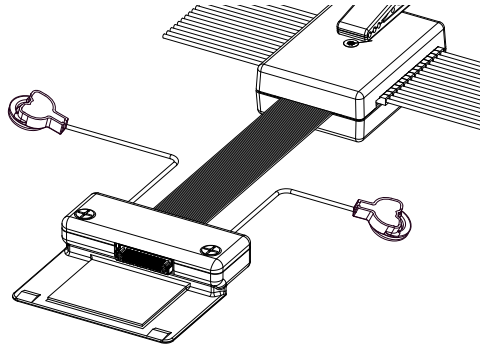
Application Suite USB (not illustrated)
BP-270-6010

LiveAmp Case (not illustrated)
BP-390-1040

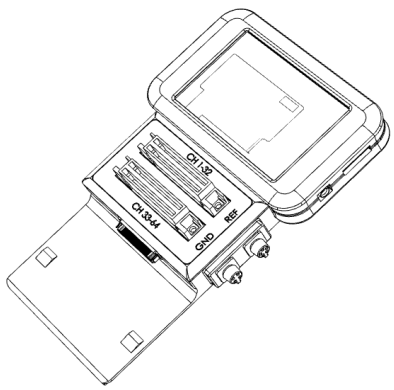
1.2 Optional accessories for LiveAmp

The following are additional items that can be purchased for use with your LiveAmp.

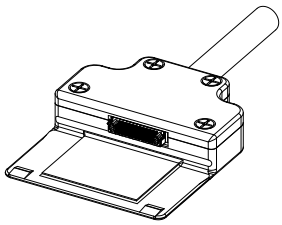
actiCAP snap 32-channel electrode system for LiveAmp
BP-130-1105
(16-channel: BP-130-1110; 8-channel: BP-130-1120)



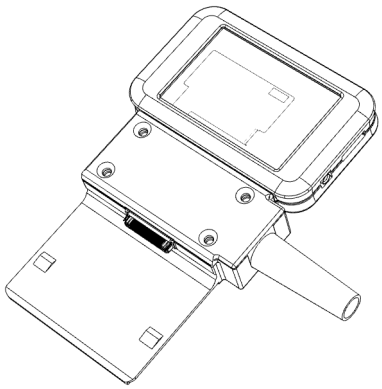
actiCap slim 64-channel electrode system for LiveAmp
BP-130-1107



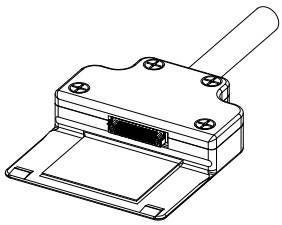
LiveCap 32-channel cap
BP-330-1300
(16-channel: BP-330-1303; 8-channel: BP-330-1306)



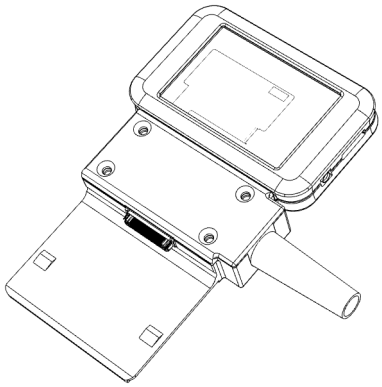
LiveCap 64-channel cap
BP-330-1310



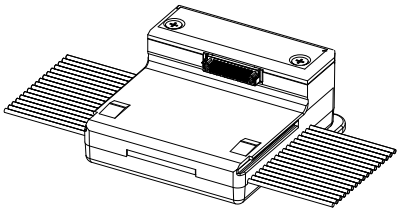
R-Net 32-channel for LiveAmp
BP-330-5300



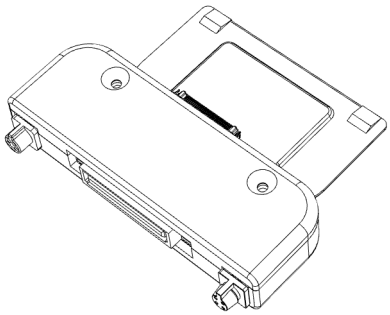
R-Net 64-channel for LiveAmp
BP-330-5310



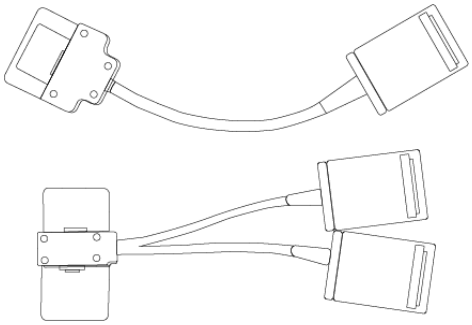
actiCAP Xpress Twist 32-channel electrode system for LiveAmp
BP-130-1200
(16-channel: BP-130-1203; 8-channel: BP-130-1206)



Adapter LiveAmp to standard actiCAP electrode set incl. Ref and GND
BP-110-2100

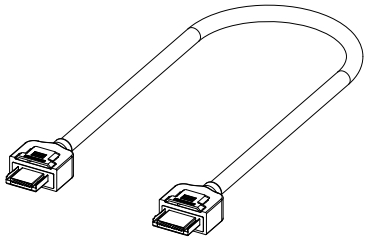


Adapter LiveAmp 32 /64 to standard BrainCap
BP-310-6110 / BP-310-6120

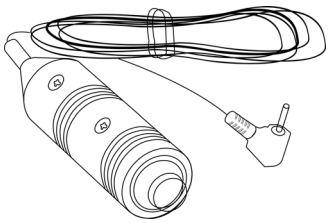


STE compact for LiveAmp
BP-210-2005

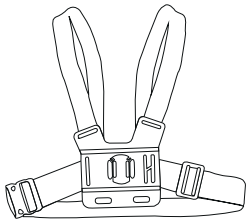
Connection cable LiveAmp - STE (80 cm / 31 in.)
BP-245-1220



Push button, 2.5 mm jack
BP-245-5042

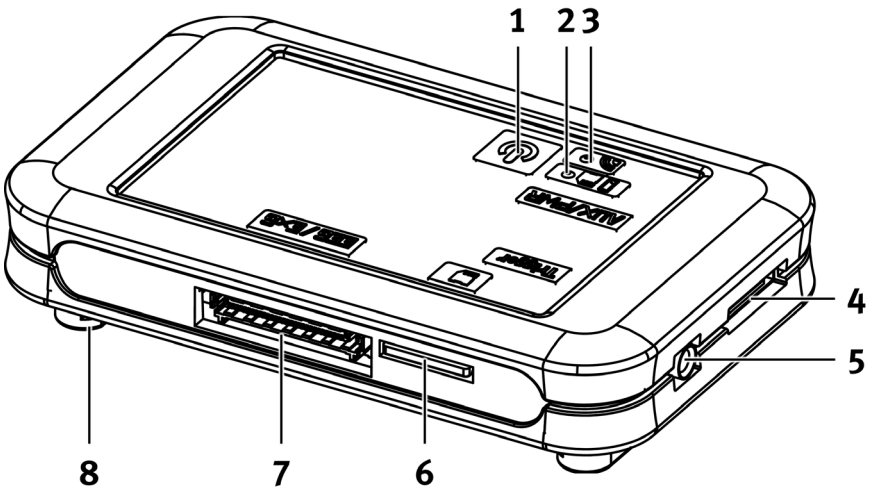


LiveAmp Mobility Set
BP-150-6500



2 Overview of the product

2.1 LiveAmp at a glance



1 ⏻ button (on/off)

2 Battery/recording LED

3 Wireless LED

4 AUX/PWR input

5 Trigger input

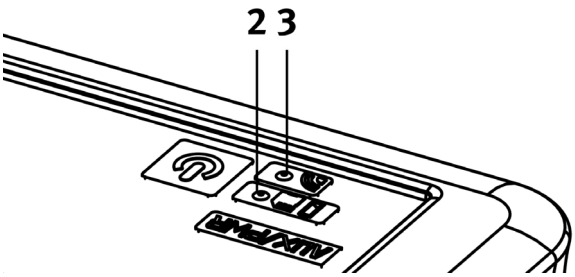
6 Memory card slot

7 Electrode connector

8 Connector rails

Understanding the LEDs

You can determine the operating status of LiveAmp by the LEDs and in the recording software.



2 Battery/recording LED

This LED has different colors that indicate the battery state.

- ▷ OFF — LiveAmp is OFF.
- ▷ ON, any color — LiveAmp is ON
- ▷ ON, green — Charging is completed (when connected to a power source)
- ▷ blinking slowly, green — LiveAmp is charging.
- ▷ blinking fast, any color — Recording to memory card
- ▷ ON, green — Battery is full
- ▷ ON, red — Battery is empty

3 Wireless LED

This LED is blue.

- ▷ OFF — Wireless module is OFF.
- ▷ ON — Wireless module is ON, but LiveAmp is not connected with BrainVision Recorder.
- ▷ blinking — LiveAmp is connected with BrainVision Recorder.

Is my LiveAmp charging? (see Chapter 12)

2.2 Identifying your LiveAmp

- Serial number:

  You can identify your LiveAmp by the serial number. It is located on the type plate at the bottom of your LiveAmp.

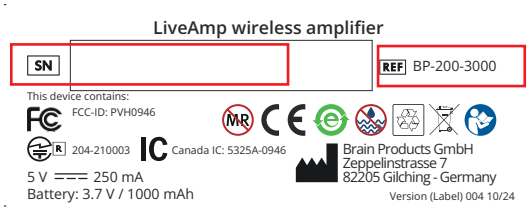
- Reference number:

  You can identify your version of LiveAmp by the reference number.

  BP-200-3000 - LiveAmp 32 Channel

  BP-200-3010 - LiveAmp 16 Channel

  BP-200-3020 - LiveAmp 8 Channel



2.3 About the license dongle

The labeling of the license dongle consists of the license type and 5-digit serial number. License types are:

- Unnnnn: Analyzer local license
- Nnnnnn: Analyzer network license
- Rnnnnn or URnnnnn: Recorder professional license
- URnnnnn: Recorder license for LiveAmp
- URnnnnn: Recorder license for actiCHamp
- URnnnnn: Recorder license for BrainAmp
- VURnnnnn: Recorder license for V-Amp
- URAnnn: Analyzer/Recorder license
- VURAnnnnn: combined Analyzer/Recorder license for V-Amp
- UCnnnnn: CapTrak license

For further information, please visit: http://www.brainproducts.com/productreg.php

3 Before you begin

3.1 Installing the software and drivers

Before the first use, install BrainVision Recorder and BrainVision LiveAmp File Converter. The installation of BrainVision Recorder includes the recording software and all relevant drivers.

The latest version of BrainVision Recorder is on the Application Suite USB and also available on our website: http://www.brainproducts.com/downloads.php.

Quick installation procedure:

1 Insert the Application Suite USB stick into your computer.
The Welcome screen opens.
2 Install BrainVision Recorder.
3 Install BrainVision LiveAmp File Converter.

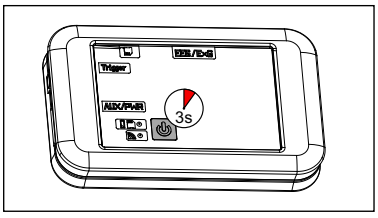
For details on installing BrainVision Recorder, please refer to the BrainVision Recorder user manual.

3.2 Inserting the memory card

The memory card allows you to record data to LiveAmp.

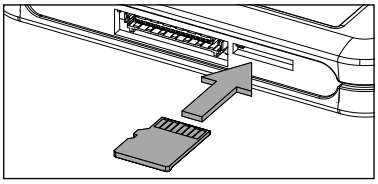
Prepare:

- Micro memory card (class 10)
- LiveAmp



1 Switch off LiveAmp.

➔ Make sure that all LEDs are OFF.
For detailed instructions see Section 4.1.



2 Insert the memory card into the card slot of LiveAmp until you hear a click.

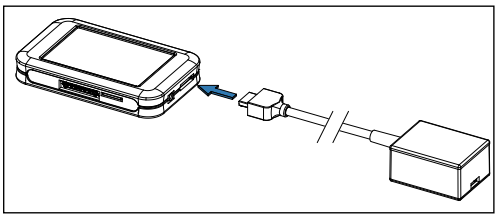
➔ You can now record data to the memory card in LiveAmp.

3.3 Charging the battery of LiveAmp

Before the first use and after each use, fully charge the battery of LiveAmp.

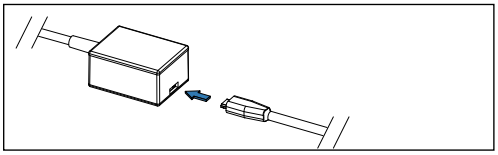
Prepare:

- LiveAmp
- USB cable (15 cm)
- USB adapter
- USB charger or computer with USB port

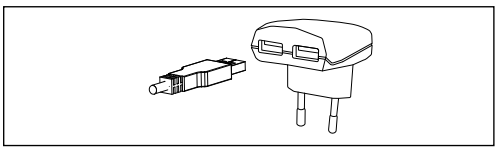


1 Connect the USB adapter to the LiveAmp.

The USB adapter has a text label on the connector that tells you the component to which you need to connect it. Make sure that the text label points upward when you connect it.



2 Connect the USB cable to the USB adapter.



3 Connect the USB cable to the USB charger, and plug the charger into the power socket.

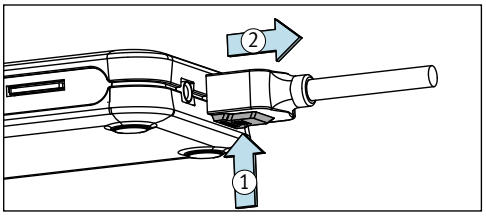
Alternatively, connect the USB cable to an USB port of your computer.

➔ When the battery of LiveAmp is charging, the battery LED is blinking green.

After charging

When the battery of LiveAmp is fully charged, the battery LED is ON continuously. It takes approximately four hours to charge a completely empty battery.

When the battery of LiveAmp is fully charged, disconnect it from the power source.



1 Push and hold the release button on the connector.

2 Pull the connector from LiveAmp.

Charging the power bank (optional)

Before the first use and after each use, fully charge the power bank.

To charge the power bank, follow the operating instructions of the manufacturer of the power bank.

3.4 Preparing the recording environment

To avoid interferences with other radio devices and to improve the operating range of LiveAmp, prepare the recording environment as follows.

1 Remove any obstacles in the signal path.

   For example, if there is a door between the recording computer and LiveAmp, then leave the door open. The same applies for movable walls, hatstands, etc.

2 Switch off any devices that could cause interferences.

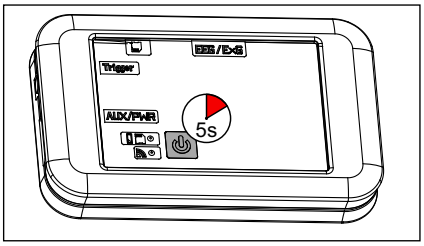
   LiveAmp uses the ISM band (2.4 GHz). Interference can be caused by equipment in the same band, for example:

   ▷ Bluetooth® (e.g., keyboard, mouse, and mobile phones)
   ▷ Wi-Fi®
   ▷ mobile phones
   ▷ microwave oven

4 Using LiveAmp

4.1 Switching LiveAmp on/off

Switching on



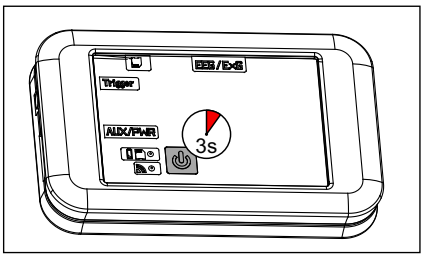
1 Press and hold the ⏻ button for five seconds.

The battery LED blinks.

2 When the battery LED is ON continuously, release the ⏻ button.

➔ The wireless LED automatically turns ON when LiveAmp is running.

Switching off



1 Press and hold the ⏻ button for three seconds.

2 When the battery LED blinks and the wireless LED turns OFF, release the ⏻ button.

➔ LiveAmp switches off after another three seconds.

➔ While charging, LiveAmp does not switch off completely.

4.2 Using a power bank

You can use a power bank during recording to charge the LiveAmp battery. This will extend the recording period.

Do not connect the power bank if you use actiCAP Xpress Twist.

4.3 Understanding the accelerometer

LiveAmp has an integrated accelerometer. It shows the acceleration in the x, y, and z direction. The directions are as follows:

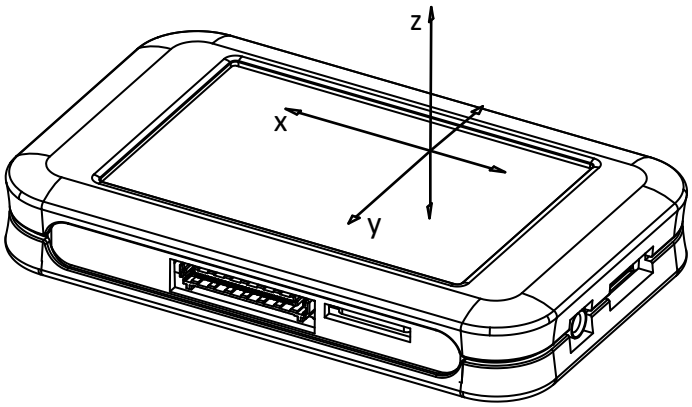


Figure 4-1. x, y, and z axes of the accelerometer

5 Setting up LiveAmp

You can connect electrode caps with passive, active or dry electrodes to LiveAmp 8, 16, 32 or LiveAmp 64.

5.1 Connecting the wireless USB adapter

To record data, LiveAmp must be connected wirelessly with BrainVision Recorder. To make the connection, use the supplied wireless USB adapter.

LiveAmp 8, 16, 32

Prepare:

- 1 x USB extension cable
- 1 x Wireless USB adapter
- LiveAmp (with memory card if required)

Connect the wireless USB adapter(s) via the USB extension cable to your computer.

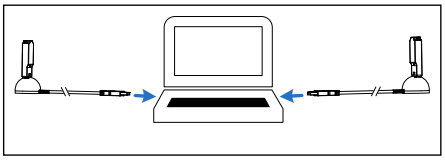
To use the internal wireless adapter of the computer, refer to the BrainVision Recorder User Manual.

LiveAmp 64

Prepare:

- 2x USB extension cable
- 2x Wireless USB adapter
- LiveAmp 64 (with memory cards if required)

Connect the wireless USB adapter(s) via the USB extension cable to your computer.



To ensure reliable data transmission, keep the wireless USB adapters at least 50 cm apart.

5.2 Connecting and disconnecting an electrode cap to LiveAmp 8, 16 or 32

Connection options for LiveAmp 8, 16 or 32:

- Electrode caps for LiveAmp with channel connector.

Electrode cap for LiveAmp	8-channel	16-channel	32-channel
actiCAP	●	●	●
actiCAP Xpress Twist	●	●	●
LiveCap	●	●	●
R-Net	N/A	N/A	●

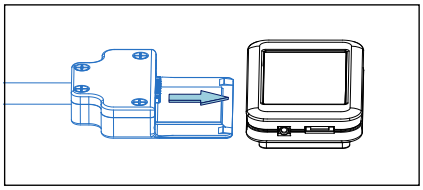
- Standard 32-channel electrode caps and 32-channel adapter (channel connector) for LiveAmp. Available adapters:
  - Adapter LiveAmp 32 to standard actiCAP (BP-210-2100)
  - Adapter LiveAmp 32 to BrainCap (BP-310-6110)

Prepare

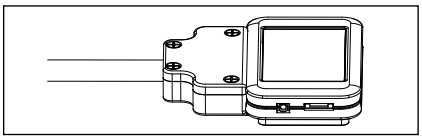
- LiveAmp (with memory card if required)
- Electrode cap for LiveAmp or standard cap with LiveAmp 32-channel adapter

Illustrated in this section are electrode caps for LiveAmp 8, 16 or 32 with LiveAmp channel connector. In case an adapter is used, the ribbon-cable of the electrode cap must be connected to the adapter. Illustration may differ depending on the connector/adapter used.

Connecting

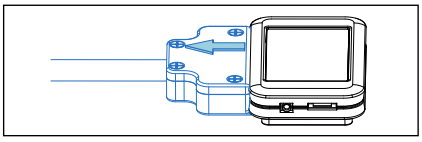


1 Switch off LiveAmp.
2 Slide the connector on the LiveAmp.



3 Push the connector as far as it will go.
4 Turn on LiveAmp.

Disconnecting



1 Switch off LiveAmp.
2 Slide the connector from LiveAmp.

5.3 Assembling LiveAmp 64

You can assemble LiveAmp 64 by connecting two LiveAmp 32 channel units. LiveAmp 64 gives you either 64 referential EEG channels or 56 referential and 8 bipolar channels.

Bipolar recording is only possible with passive electrodes. Active electrodes cannot be used in combination with bipolar recording.

To use LiveAmp 64, both of your LiveAmps must be running firmware version 4.60 or later. Refer to the BrainVision Recorder User Manual (section Show connected amplifier) to check the current firmware version. Refer to Section 11.3 for details on how to update the firmware.

Connection Options for LiveAmp 64:

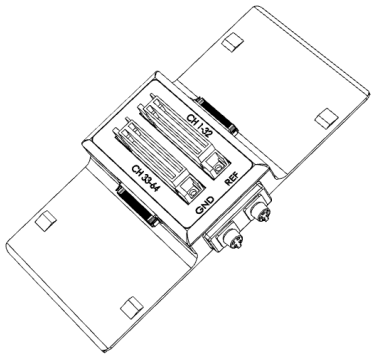
Electrode caps	for LiveAmp 64 with channel connector	Standard caps with LiveAmp 64 adapter
actiCAP	N/A	●
LiveCap/BrainCap	●	●
R-Net	●	●

The LiveAmp 64 has to be assembled before use.

Prepare

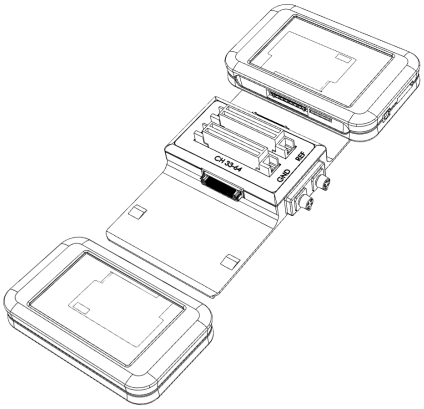
- 2 x LiveAmp 32 amplifiers (with memory cards if required)
- Electrode cap for LiveAmp 64 or standard cap with LiveAmp 64 adapter

Illustrated in this section is the actiCAP slim 64-channel active electrode system for LiveAmp 64 (LiveAmp 64 actiCAP adapter). In case an electrode cap for LiveAmp 64 is used, the electrode cap is already connected to the channel connector. Illustration may differ depending on the connector/ adapter used .



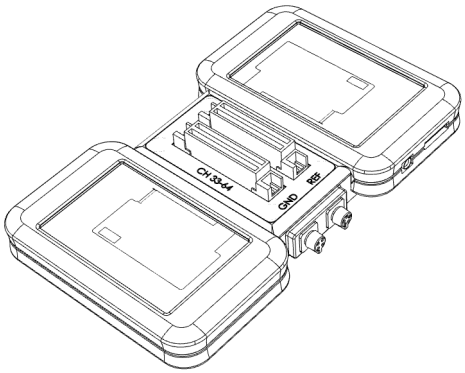
1 Identify primary and secondary LiveAmps:
CH 1-32, this LiveAmp will serve as the primary LiveAmp.
CH 33-64, this LiveAmp will serve as the secondary LiveAmp.

2 Ensure that the LiveAmps are turned off.



3 Using the mount as a guide, slide the LiveAmp on to the adapter and push to create a secure connection with the connector.

4 Repeat with the second LiveAmp on the other connector.



➔ The LiveAmp 64 is now assembled and ready for use.

5.4 Connecting/disconnecting an electrode cap to LiveAmp 64

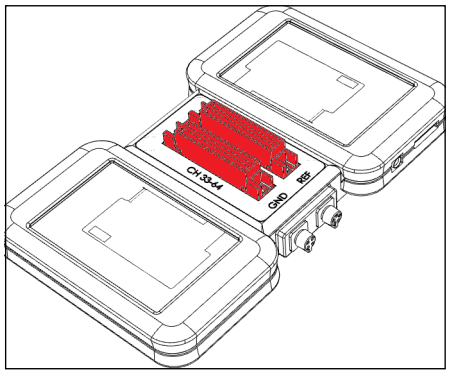
This step is necessary when you use a standard electrode cap with 2x 32-channel connectors together with a LiveAmp 64 adapter and a LiveAmp 64.

This step is not necessary when you use an electrode cap with a permanently attached LiveAmp 64 adapter together with a LiveAmp 64.

Prepare

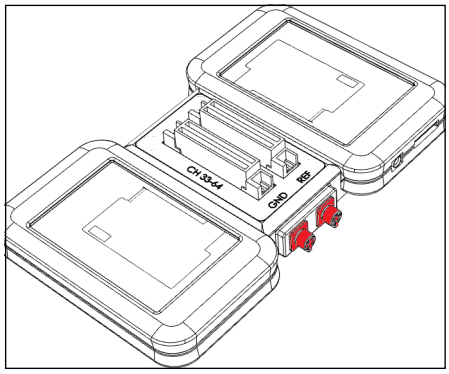
- Assembled LiveAmp 64 amplifier
- 2x 32-channel electrode caps

Connecting an electrode cap



1 Switch off the LiveAmps.

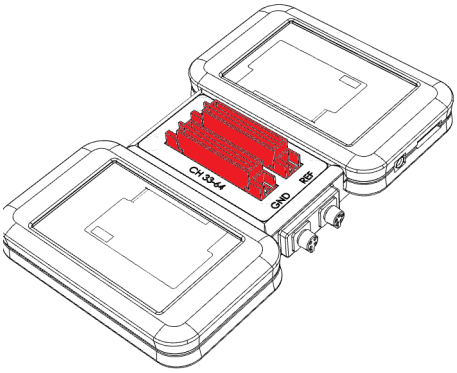
2 Connect the electrode cap to the connector on the LiveAmp 64 adapter.



3 Connect the GND and REF cable.

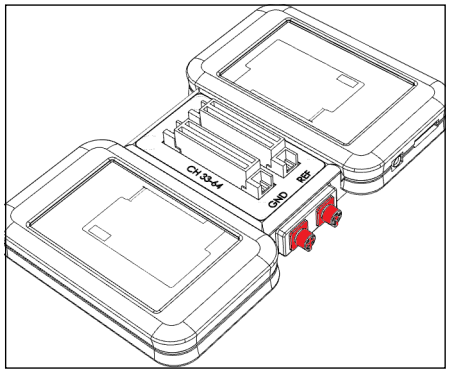
4 Switch on the LiveAmps.

Disconnecting an electrode cap



1 Switch off the LiveAmps.

2 Remove the electrode cap from the connector on the LiveAmp 64 adapter.



3 Disconnect the GND and REF cable.

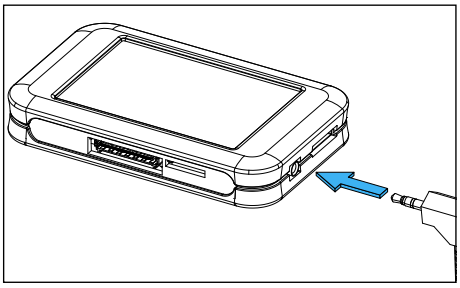
6 Adding trigger signals directly to LiveAmp

LiveAmp 8, 16 and 32 has an input for one trigger bit. When you use LiveAmp 64, you can connect two trigger bits, one to each LiveAmp. When you want to add additional triggers and/or auxiliary signal inputs, you can connect the STE compact to LiveAmp 8, 16, 32 and LiveAmp 64 setups. For further information, refer to Chapter 7.

Using a trigger with LiveAmp 8, 16, 32 (1 bit) or LiveAmp 64 (2x 1-bit)

Prepare

- LiveAmp 8, 16, 32 or LiveAmp 64
- Trigger cable or push button, 2.5 mm jack

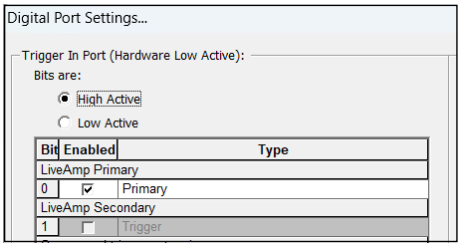


1 Connect the trigger cable or trigger push button to the trigger input of the LiveAmp.

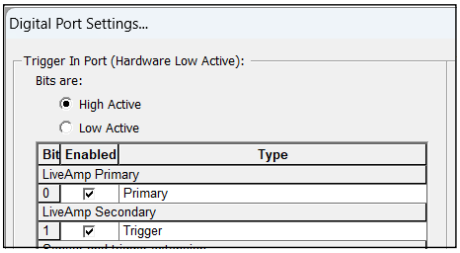
▶ LiveAmp 64:
When you use a 1-bit trigger, connect the trigger cable either to the primary LiveAmp or to the secondary LiveAmp. When you use 2x 1-bit triggers, connect one trigger cable to the primary LiveAmp and one trigger cable to the secondary LiveAmp.
  ▷ CH 1 - 32 = Primary LiveAmp
  ▷ CH 33 - 64 = Secondary LiveAmp

2 Switch on the LiveAmp and connect it with BrainVision Recorder.

3 In BrainVision Recorder, open the Digital Port Settings (**Amplifier › Digital Port Settings...**) and adjust the settings.



▶ LiveAmp 8, 16, 32:
Check the Bit 0 check-box to enable the trigger.



- LiveAmp 64:
  Check the Bit 0 and/or the Bit 1 check-box to enable/disable the trigger(s).
  - Bit 0 (Primary) is the trigger input from the primary LiveAmp
  - Bit 1 (Trigger) is the trigger input from the secondary LiveAmp

➔ Check your setup by using the Current State as a guide. The black and red bullets indicate the state of your trigger sources. Activate a trigger to check that the state of the bullet changes and that a marker will be set.

For further information on how to set up triggers in **Digital Port Settings**..., refer to the BrainVision Recorder manual.

When you use LiveAmp without a connected STE, you can ignore the **Trigger Out Port settings**.

When you use LiveAmp with the STE compact, the **Trigger Out Port settings** will not be displayed.

7 Adding trigger and sensor signals with the STE compact

7.1 The STE compact

If you want to add additional triggers and/or auxiliary signal inputs, you can connect the STE compact to LiveAmp 8, 16, 32 and LiveAmp 64 setups.

To use the STE compact, your LiveAmp must be running firmware version 4.77 or later. Refer to the BrainVision Recorder user manual (section Show connected amplifier) to check the current firmware version. Refer to Section 11.3 for details on how to update the firmware.

The STE compact provides a connector for 8-bit trigger inputs via a 9-pin D-Sub cable, an onboard Wireless Trigger Receiver that can be paired with a Wireless Trigger Tansmitter, and 6 auxiliary inputs for connecting any sensor of the Brain Products portfolio.

Additionally, the STE compact provides an input for a Pulse Oximetry Sensor set that can be attached separately in order to record oxygen saturation (SpO_2), heart rate, and photoplethysmogram (PPG).

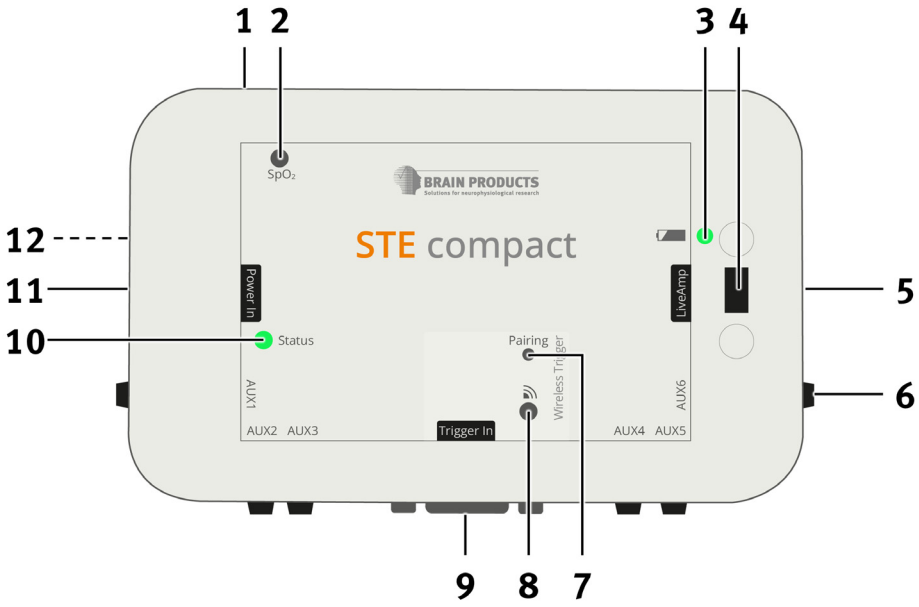
Functions of the STE compact

The STE compact can be used for one, two, or all of the following functions:

- Receiving cable-based or wireless 8-bit trigger signals and saving them together with EEG signals.
- Adding up to six sensor signals to the EEG signals or using sensor signals instead of EEG signals.
- Adding Pulse Oximetry signals to EEG signals and/or sensor signals.

You can record sensor signals instead of EEG signals. However, you cannot have Pulse Oximetry signals as the only channels.

STE compact at a glance



1 Pulse Oximetry Sensor input for connecting the Pulse Oximetry Sensor set

2 Pulse Oximetry Sensor status LED

3 Battery status LED

4 Battery switch

5 Signal output to LiveAmp (via connection cable LiveAmp-STE)

6 6 x AUX inputs for sensors

7 Pair button

8 Wireless Trigger status LED

9 Trigger input for 9-pin D-Sub

10 STE compact status LED

11 Power In connector (from power bank via USB adapter)

12 Battery compartment for 2x AA batteries (on the reverse side)

Understanding the LEDs

2 Pulse Oximetry Sensor status LED

The Pulse Oximetry Sensor status LED indicates the status of the Pulse Oximetry Sensor. The status applies to the STE compact and does not indicate whether the Pulse Oximetry Sensor is activated in Recorder or not.

▷ OFF	- The STE compact is OFF. - The Pulse Oximetry Sensor is not connected to the STE compact.
▷ ON, red	The Pulse Oximetry Sensor is connected to the STE compact but no Pulse Oximetry signal is acquired.
▷ blinking, red	A Pulse Oximetry signal with low quality is acquired. The blinking indicates the detected pulse.
▷ blinking, yellow	A Pulse Oximetry signal with marginal quality is acquired. The blinking indicates the detected pulse.
▷ blinking, green	A Pulse Oximetry signal with high quality is acquired. The blinking indicates the detected pulse.

3 Battery status LED

The Battery status LED indicates the charging status of the batteries and whether the STE compact is being powered by batteries or not.

▷ OFF	The battery switch is in the OFF position or the batteries are missing or empty.
▷ ON, green	The batteries are charged.
▷ ON, red	The batteries are almost empty.

8 Wireless Trigger status LED

For information on the Wireless Trigger status LED, refer to the Wireless Trigger manual.

10 STE compact status LED

The STE compact status LED indicates the general status of the STE compact.

▷ OFF	- STE compact is OFF or - LiveAmp and STE compact are connected with Recorder but no signal is acquired.
▷ ON, green	- A signal is acquired or - **Digital Port Settings...** is open.
▷ blinking, green	STE compact is powered but not yet connected with BrainVision Recorder

7.2 Power management for the STE compact

The STE compact can be powered in the following ways:

- By the internal AA batteries (We recommend using rechargeable 1.2-V Ni-MH or 1.5-V Li-Ion batteries)
- By connecting a power bank to the Power In connector
- By using the LiveAmp as a power source. (This feature is available as of LiveAmp Revision 05.)

Using the LiveAmp as a power source is only recommended as a temporary or short-term solution because the operating time will be shortened noticeably.

Powering the STE compact by the internal AA batteries

Prepare:

- STE compact (battery switch switched off)
- 2 x AA batteries

1 Open the battery compartment of the STE compact.
2 Insert the batteries into the battery compartment.
3 Close the battery compartment.
4 Switch on the battery switch.

➔ The STE compact is powered by the internal AA batteries.

As of LiveAmp Revision 05, you can hot-swap the batteries while the STE compact is running. Your signals and triggers from the STE compact will still be recorded.

If you use LiveAmp Revision 04 and hot-swap the batteries while the STE compact is running, your signals and triggers from the STE compact will not be recorded and a marker is set. Once you have swapped the batteries, the recording continues automatically.

If you switch on the battery switch while a LiveAmp is connected to the STE compact, the LiveAmp will be switched on, too. This does not mean that the LiveAmp is powered by the STE compact.

Powering the STE compact by a power bank

Prepare:

- STE compact
- Power bank with USB adapter

1 Connect the power bank via the USB adapter to the Power In connector.

➔ The STE compact is powered by the power bank.

If you connect a power bank to the STE compact, the power bank will power the STE compact and the LiveAmp. The STE compact itself will not power the LiveAmp.

Powering the STE compact by the LiveAmp

Prepare:

- STE compact connected to LiveAmp Revision 05 (switched on)

If you switch off the battery switch of the STE compact, if take out the batteries or if the batteries are empty, then the STE compact will automatically be powered by the LiveAmp.

If you switch off the battery switch of the STE compact while a LiveAmp is connected to the STE compact, neither the STE compact nor the LiveAmp will be switched off.

7.3 Receiving 8-bit STE compact triggers

The STE compact provides a connector for 8-bit trigger inputs via a 9-pin D-Sub cable.

Prepare:

- LiveAmp 8, 16, 32 or LiveAmp 64 (switched off)
- STE compact (battery switch switched off)
- Connection cable LiveAmp-STE
- [Optional] Power bank with USB adapter
- [Optional] Cable-based trigger source (e.g., TriggerBox Plus) with trigger cable
- [Optional] Wireless trigger source (e.g., TriggerBox Plus with Wireless Trigger Transmitter)

1 Connect the STE compact via the connection cable LiveAmp-STE to the AUX/PWR input of the LiveAmp. If you use LiveAmp 64, you can connect the STE compact either to the primary LiveAmp or to the secondary LiveAmp.

The connection cable LiveAmp-STE has a text label on the connector that tells you the component to which you need to connect it. Make sure that the text label points upward when you connect it.

2 [Optional] If you use a cable-based trigger source, connect the trigger cable to the Trigger input of the STE compact.

3 To switch on the LiveAmp, proceed as follows:

▷ If you power the STE compact by internal AA batteries, switch on the battery switch.

▷ If you power the STE compact by a power bank, connect it via the USB adapter to the Power In connector.

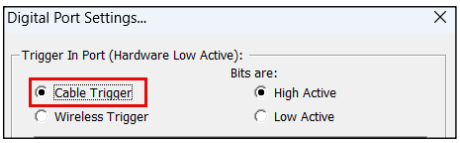
The USB adapter has a text label on the connector that tells you the component to which you need to connect it. Make sure that the text label points upward when you connect it.

▷ If you power the STE compact by the LiveAmp, switch on the LiveAmp.

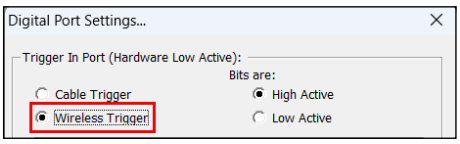
4 [Optional] If you use LiveAmp 64, switch on the second LiveAmp.

5 Connect LiveAmp with BrainVision Recorder.

6 In BrainVision Recorder, open **Amplifier › Digital Port Settings...** and adjust the settings as follows.



7 If you send triggers to the STE compact via a trigger cable (e.g., from TriggerBox Plus), select **Cable Trigger**.

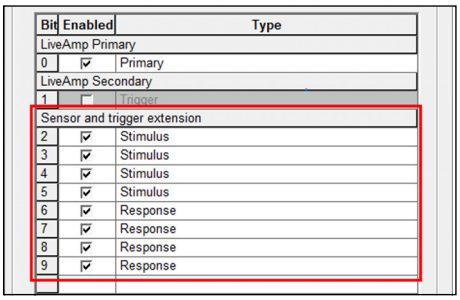


8 If you send triggers to the STE compact from a Wireless Trigger Transmitter (e.g., connected to a TriggerBox Plus), select **Wireless Trigger.**

▷ When the setting switches to **Wireless Trigger**, the STE compact can be paired with the Wireless Trigger Transmitter.

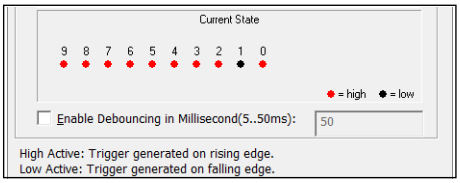
▷ When the STE compact is successfully paired with a Wireless Trigger Transmitter, the green Wireless Trigger status LED on the STE compact is ON.

For further information on how to pair with a Wireless Trigger Transmitter, refer to the Wireless Trigger manual.



9 Ensure that the boxes in the **Enable** column are checked for all **Bits** that are used and that the **Type**s are named properly.

For further information on how to set up triggers in **Digital Port Settings...**, refer to the BrainVision Recorder manual.



10 Check the setup by using the **Current State** as a guide. The black and red bullets indicate the state of the trigger sources. To check if the state of the bullet changes and that a marker will be set, activate a trigger.

Additionally, you can connect 1-bit LiveAmp triggers. For further information, refer to Section 7.4.

Additionally, you can connect up to six sensors to the AUX inputs plus a Pulse Oximetry Sensor. For further information, refer to Section 7.5.

7.4 Adding 1-bit LiveAmp triggers with 8-bit STE compact triggers

If you combine LiveAmp 8, 16, or 32 with an STE compact, you can use up to nine trigger bits.

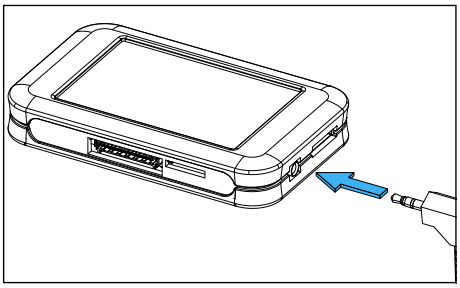
If you combine LiveAmp 64 with an STE compact, you can use up to ten trigger bits.

The 1-bit triggers can only be used individually with their very own Type and cannot have a Type that is already used for the 8-bit STE compact triggers.

Prepare:

- LiveAmp 8, 16, 32 or LiveAmp 64 (switched off)
- STE compact (battery switch switched off)
- Connection cable LiveAmp-STE
- [Optional] Power bank with USB adapter
- [Optional] Cable-based trigger source (e.g., TriggerBox Plus) with trigger cable
- [Optional] Wireless trigger source (e.g., TriggerBox Plus with Wireless Trigger Transmitter)
- Trigger cable or push button, 2.5 mm jack

Complete the instructions in Section 7.3 and proceed as follows:



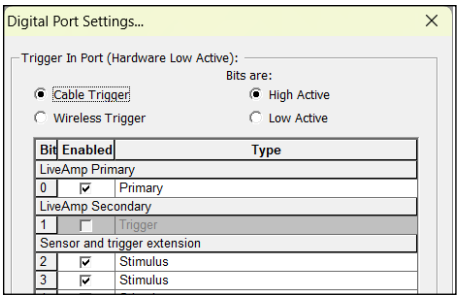
11 Connect the trigger cable or trigger push button to the trigger input of the LiveAmp.

▶ LiveAmp 64:
When you use a 1-bit trigger, connect the trigger cable either to the primary LiveAmp or to the secondary LiveAmp. When you use 2x 1-bit triggers, connect one trigger cable to the primary LiveAmp and one trigger cable to the secondary LiveAmp.

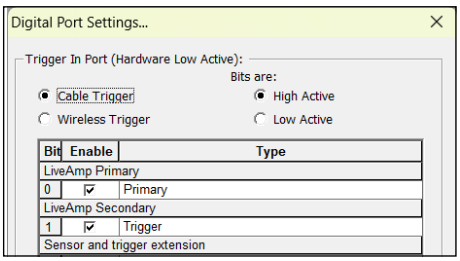
▷ CH 1 - 32 = Primary LiveAmp

▷ CH 33 - 64 = Secondary LiveAmp

12 In BrainVision Recorder, open the Digital Port Settings (**Amplifier › Digital Port Settings...**) and adjust the settings.



▶ LiveAmp 8, 16, 32:
Check the Bit 0 (Primary) check-box to enable the trigger.



- LiveAmp 64:
  Check the Bit 0 and/or the Bit 1 check-box to enable/disable the trigger(s).
  - Bit 0 (Primary) is the trigger input from the primary LiveAmp
  - Bit 1 (Trigger) is the trigger input from the secondary LiveAmp

For further information on how to set up triggers in **Digital Port Settings**..., refer to the BrainVision Recorder manual.

Additionally, you can connect up to six sensors to the auxiliary inputs plus a Pulse Oximetry Sensor. For further information, refer to Section 7.5.

7.5 Connecting up to six sensors plus a Pulse Oximetry Sensor

You can connect up to six sensors to the auxiliary inputs of the STE compact.

Instead or additionally, you can connect a Pulse Oximetry Sensor set to the Pulse Oximetry Sensor input of the STE compact. The Pulse Oximetry Sensor set provides oxygen saturation signals, heart rate signals and PPG signals.

Prepare:

- LiveAmp 8, 16, 32 or LiveAmp 64 (switched off)
- STE compact (battery switch switched off)
- Connection cable LiveAmp-STE
- [Optional] Power bank with USB adapter
- [Optional] Up to six sensors
- [Optional] Pulse Oximetry Sensor set

1 Connect the STE compact via the connection cable LiveAmp-STE to the AUX/PWR input of the LiveAmp. If you use LiveAmp 64, you can connect the STE compact either to the primary LiveAmp or to the secondary LiveAmp.

The connection cable has a text label on the connector that tells you the component to which you need to connect it. Make sure that the text label points upward when you connect it.

2 [Optional] Connect up to six sensors to the AUX inputs of the STE compact.

3 [Optional] Connect the Pulse Oximetry Sensor set to the Pulse Oximetry Sensor input of the STE compact.

4 To switch on the LiveAmp, proceed as follows:

▷ If you power the STE compact by internal AA batteries, switch on the battery switch.

▷ If you power the STE compact by a power bank, connect it via the USB adapter to the Power In connector.

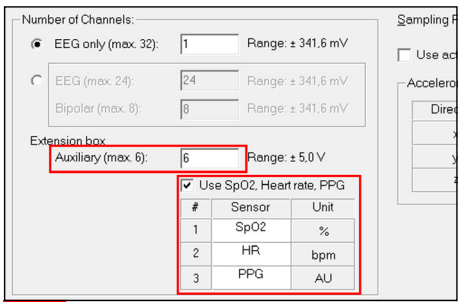
The USB adapter has a text label on the connector that tells you the component to which you need to connect it. Make sure that the text label points upward when you connect it.

▷ If you power the STE compact by the LiveAmp, switch on the LiveAmp.

5 [Optional] If you use LiveAmp 64, switch on the second LiveAmp.

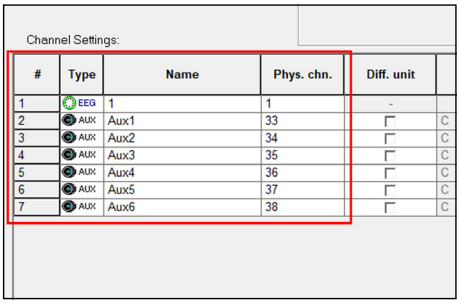
6 Connect the LiveAmp with BrainVision Recorder.

7 In BrainVision Recorder, click on **File** and open the workspace settings either by creating a **New Workspace...** or by selecting **Edit Workspace...**.



If the STE compact is connected and detected correctly, you can select up to six channels next to **Auxiliary (max. 6)**.

Additionally, you can select channels for SpO2 signals, heart rate signals and PPG signals by checking the check-box next to **Use SpO_2, Heart rate, PPG.**



➔ AUX signals will be listed in the table below, starting from the **Phys. chn.** number following the number of available EEG channels (8, 16, 32, or 64).

➔ Channels from the Pulse Oximetry Sensor will not be listed in the table.

If you select **Use SpO_2, Heart rate, PPG**, the Pulse Oximetry Sensor set needs to be connected, otherwise Monitoring cannot be started. As soon as the Pulse Oximetry Sensor set is connected and attached to the finger of a participant, the Pulse Oximetry Sensor status LED changes from glowing red to blinking green, which indicates the detected pulse.

Additionally, you can connect triggers to the STE compact. For further information, refer to Section 7.3 and Section 7.4.

8 Recording procedures

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

LiveAmp 8, 16, 32 and 64 have four operating modes:

- monitoring
- impedance measurement
- test
- recording

Via the recording software, you can switch between these four operating modes. For further information, refer to the BrainVision Recorder manual.

LiveAmp allows you to record data to different locations: the computer, the memory card inserted into LiveAmp, or both locations simultaneously.

You can try out the operating modes and recording locations even without electrodes. To do so, open the LiveAmp **Workspace** and select passive electrodes.

- LiveAmp 8 channel and LiveAmp 16 channel require BrainVision Recorder version 1.21.0202 or later.
- LiveAmp 32 BrainVision Recorder Version 1.21.0004
- LiveAmp 64 requires BrainVision Recoder version 1.21.0303 or later.

9 Accessing your data

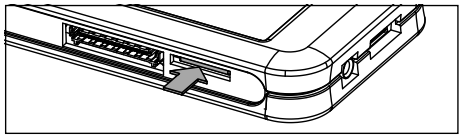
When you record to the LiveAmp memory, LiveAmp writes the EEG data and the settings for BrainVision Recorder workspace to the memory card. You can access the data as described below.

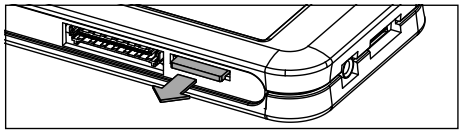
9.1 Ejecting the memory card

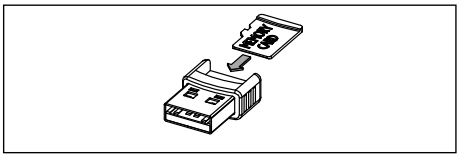
You can eject the memory card from LiveAmp, for example, to transfer the data from the memory card to your computer.

Pre-requisites

- The recording is stopped
- LiveAmp is disconnected from BrainVision Recorder







1 Switch off LiveAmp.

2 Push the memory card slightly into the slot to unlock it from the holder.

The card will pop out.

3 Pull the memory card from the slot.

➔ Insert the memory card into the USB reader and plug the unit into your computer.

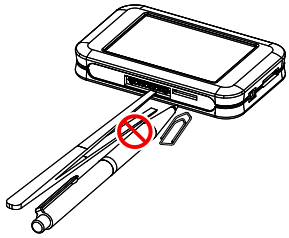
Alternatively, use the memory card adapter.

NOTICE

Damage to connectors when using tools

If you use tools, for example to remove the memory card, you can accidentally touch the pins of the connectors. This causes damage to LiveAmp.

Do not use tools to remove or insert the memory card.

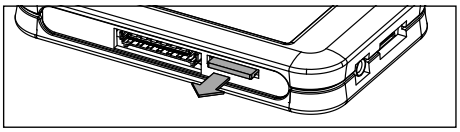


9.2 Transferring data from the memory card to a computer

Make a copy of your data on your computer for analyzing and as a back-up.

Prepare

- USB card reader or memory card adapter



1 Eject the memory card from LiveAmp. For detailed instructions see Ejecting the memory card.

2 On your computer, open the memory card.

For example, by clicking on: **Windows Explorer › Computer › Removable Disk**.

➔ You can now copy the data from the memory card to your computer.

Files on the memory card

LiveAmp 8, 16 and 32

LiveAmp 8, 16 and 32 saves the EEG data and the settings of the BrainVision Recorder workspace on the memory card. These files have following names and extensions:

- Workspace: TEMP.WSP (does not need to be copied)
- EEG, bipolar and trigger data: LA*000001*.DAT (the digit is automatically incremented)

Copy the ***.DAT** files from the memory card to a folder on your computer.

LiveAmp 64

LiveAmp 64 saves the EEG data and the settings of the BrainVision Recorder workspace on the memory cards of each LiveAmp 32. These files have the following names and extensions:

- Workspace: TEMP.WSP (does not need to be copied)
- Primary LiveAmp - EEG and trigger data: LA*000001*.DAM (the digit is automatically incremented)
- Secondary LiveAmp - EEG, bipolar and trigger data: LA*000001*.DAS (the digit is automatically incremented)

Copy the files from the memory cards of **both** LiveAmps (***.DAM** and ***.DAS**) to the same folder on your computer. Both the ***.DAM** and ***.DAS** files are required for the compilation by File Converter.

9.3 Converting the data

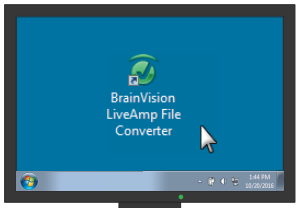
After the data acquisition, use the LiveAmp File Converter to convert the data from the memory card.

- When you use LiveAmp 64, copy the files from the memory cards of **both** LiveAmps (***.DAM** and ***.DAS**) to the same folder on your computer. Both the ***.DAM** and ***.DAS** files are required for the compilation by File Converter.
- The TEMP.WSP file does not have to be copied for any version of LiveAmp.

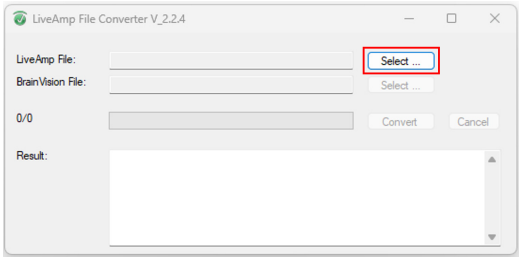
When you use an STE compact, you need to use LiveAmp File Converter version 2.2.4. or higher.

Prepare

- Computer with BrainVision LiveAmp File Converter
- Memory card inserted into the computer

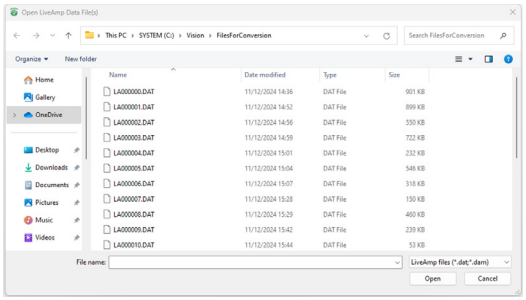


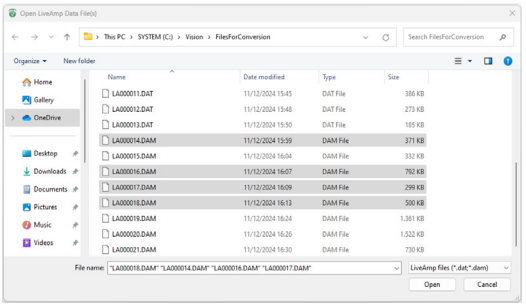
1 Open the LiveAmp File Converter as follows: **Windows start button › All Programs › BrainVision › BrainVision LiveAmp File Converter**.



2 Load the EEG files as follows:

In the line 'LiveAmp File', click on **Select** and locate the EEG data.
Search for the folder with your EEG data.

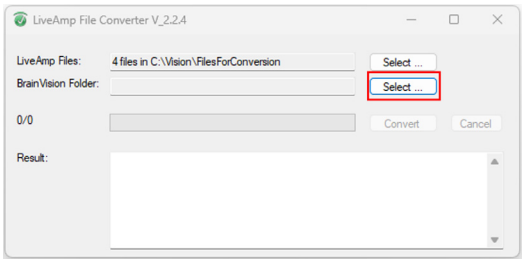




3 Select the files for conversion as follows:

Select the ***.DAT** file if you use LiveAmp 8, 16, 32 or select the ***.DAM** file if you use LiveAmp 64.

- ▷ *Select a single file*: Select the ***.DAT** or ***.DAM** file, then click **Open**.
- ▷ *Select multiple files*: Begin by selecting the first ***.DAT** or ***.DAM** file, press and hold the **Ctrl key**. While holding down the **Ctrl key,** select each of the other files you want to convert. Click **Open**.
- ▷ *Select all files*: Begin by selecting one ***.DAT** or ***.DAM** file then press and hold the **Ctrl key** and press **A**. Click **Open**.

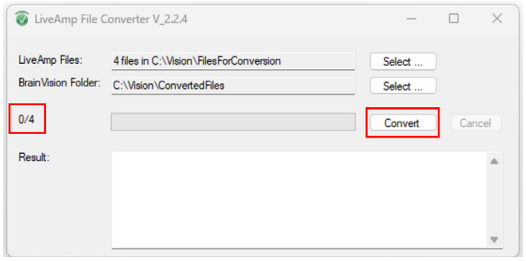


4 Specify the target file/folder as follows:

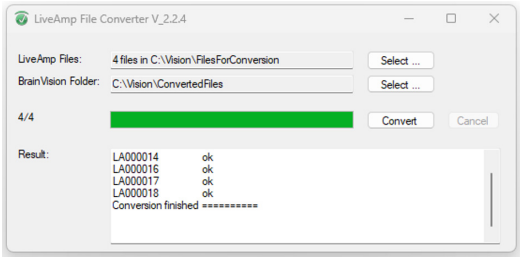
a In the line ‘BrainVision Folder’ (multiple files selected) or ‘BrainVision File’ (single file selected), click **Select**.

b Select the target folder.

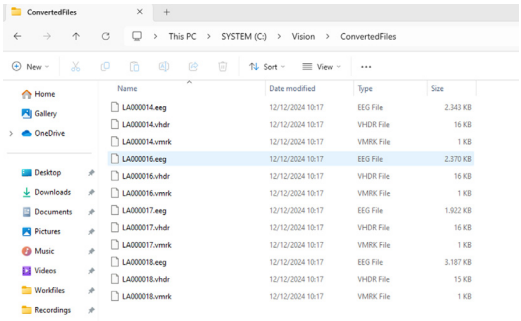
c If required, rename the folder and click **Open**.



5 The status will update to display the number of files selected for conversion.
Finally, click **Convert**.



6 The Result pane will display the status of the file conversion and alert you to any issues encountered.



7 Check the conversion as follows:

Open the target folder and ensure that there is the EEG file (***.EEG**), header file (***.VHDR**) and marker file (***.VMRK**).

➔ The converted EEG files can now be used in Analyzer.

9.4 Backing up the data of the memory card

Make a copy of the memory card to ensure that you still have the recordings in case the memory card is lost or accidentally formatted.

Prepare

- LiveAmp with memory card
- memory card adapter, or the USB adapter with USB cable

There are two options to back up the data of the memory card. We recommend to use Method 1, because it is faster.

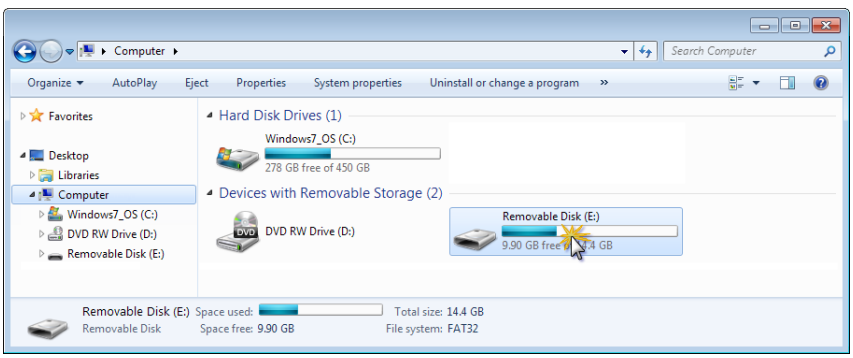
Method 1 - Copy data directly from the memory card

1 Switch off LiveAmp
2 Eject the memory card.
3 Insert the memory card into the USB card reader or adapter and plug the unit into your computer.
4 Open the Windows Explorer.
5 In the Windows Explorer, click on **Removable Disk**.
6 Copy the files to a directory of your choice.

Method 2 - Copy data from memory card in LiveAmp

1 Connect LiveAmp to your computer by using the USB adapter.
2 Open the Windows Explorer.
3 In the Windows Explorer, click on **Removable Disk**.
4 Copy the files to a directory of your choice.

➔ The memory card is shown as **Removable Disk** in the Windows Explorer. You can open, add and remove files from the memory card.



9.5 Formatting the memory card

When the memory card is full or fragmented, BrainVision Recorder prompts you to format the memory card.

For further information, please refer to the user manual of your BrainVision Recorder.

10 After using LiveAmp

10.1 Cleaning LiveAmp and the accessories

NOTICE

Risk of damage during cleaning.

- Do not clean the products and accessories under running water.
- Do not use aggressive or corrosive cleaning agents and don't sterilize the product.
- Do not use hot liquids. The temperature of liquids must not exceed 40 °C (104 °F).

Before you clean LiveAmp, disconnect all cables. Connectors must not come into contact with moisture. Moisture causes corrosion.

Clean the products with a slightly damp cloth.

Using a disinfectant

For disinfecting the surfaces of products (amplifiers, batteries, adapter boxes, etc.), we recommend wiping them down with a tissue drenched in a 70% concentration of isopropyl alcohol (commonly called isopropanol or 2-propanol) for at least 30 seconds.

If you are unable to purchase the products mentioned above in your region, a disinfecting product with similar proportions and active ingredients would be recommended.

10.2 Cleaning the electrode cap

Detailed instructions for cleaning the electrode cap are described in the following manuals, which are all available on the Application Suite USB:

- active electrodes: *actiCAP Operating Instructions* and *actiCAP slim electrode Operating Instructions* or setup poster *How to clean the actiCAP slim*
- passive electrodes: *BrainAmp Operating and Reference Manual*
- sponge-based: *R-Net electrode systems Operating Instructions*

10.3 Charging the battery of LiveAmp

After each use, fully charge the battery of LiveAmp. For detailed instructions see Chapter 3.3.

10.4 Charging the batteries of STE compact

After each use, fully charge the AA batteries of STE compact.

10.5 Charging the power bank (optional)

After each use, fully charge the power bank.

To charge the power bank follow the operating instructions of the manufacturer of the power bank.

11 Maintenance, disposal and updates

11.1 Maintenance information

LiveAmp requires no maintenance. Repairs may only be carried out by Brain Products. Regularly inspect the products and accessories for damage and check that the connections are clean. In the event of any defects, please contact your local dealer.

11.2 Disposal information

CAUTION

Risk of burns by disassembling LiveAmp

By opening LiveAmp the battery can be damaged. When a Lithium-Ion battery is damaged, it can catch fire and cause burns. Only trained personnel may open and disassemble LiveAmp.

Do not open or disassemble LiveAmp and its accessories.

Do not dispose of products, accessories and cables with the household waste. Dispose of them in accordance with national regulations or return the product and its accessories to the manufacturer.

For example, in the EU and EFTA, the Directive on Batteries and Accumulators and Waste Batteries and Accumulators (Battery Directive) 2006/66/EC resp. 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.

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

REACH SVHC notification: In accordance with Regulation (EC) No. 1907/2006 of the European Parliament and of the Council of 18 December 2006 concerning the Registration, Evaluation, Authorization and Restriction of Chemicals (REACH) as defined in article 57 Brain Products herewith notifies that products of this product family contain a concentration of a substance of very high concern (SVHC) above 0.1 % weight.

Lithium-ion battery:

Substance	CAS No.
1,3-propanesultone	214-317-9

Battery in the license dongle:

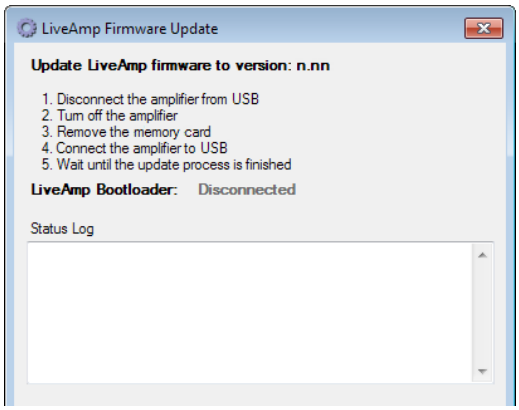
Substance	CAS No.
1, 2-dimethoxyethane; ethylene glycol dimethyl ether (EGDME)	110-71-4

11.3 Updating the firmware of LiveAmp

If there is a firmware update for LiveAmp you will be notified by e-mail, through a newsletter or by your distributor. Firmware updates can enhance the performance of LiveAmp. Therefore, install an update whenever it is available.

Prepare

- LiveAmp
- USB adapter with USB cable
- computer with Internet connection



1 Download the firmware update from the Brain Products website or contact your local distributor.

2 Start the updater.

3 Follow the instructions on the screen.

➔ During the update, the battery LED of LiveAmp blinks green.

12 Troubleshooting

12.1 LiveAmp issues

Note

Before you begin troubleshooting, check the log files for LiveAmp. You can find the log files on your local drive. By default they are stored under:
`C:\Vision\Recorder\Log`.

Symptom	Possible cause	Remedy
Cannot switch on LiveAmp	The battery is empty.	Charge the battery of LiveAmp.
Cannot attach cap to LiveAmp	The cap has the wrong connector.	Make sure that you have the correct cap or adapter (see 1 Scope of delivery).
BrainVision Recorder does not find my LiveAmp	The wireless adapter is not connected.	Connect the wireless adapter.
	LiveAmp is out of wireless range.	Get LiveAmp closer to the wireless adapter.
	LiveAmp is not switched on.	Switch on LiveAmp. The battery/recording LED is ON and glows green and the wireless LED is ON and glows blue.
	LiveAmp is connected with another computer (wireless LED is blinking blue).	Disconnect LiveAmp on the other computer and search again.
Wireless LED switches off during recording	The wireless module turns off one minute after LiveAmp is out of range or was disconnected from the recording computer.	Press the ⏻ button for 1 second to switch on the wireless module.

Symptom	Possible cause	Remedy
LiveAmp switches off during recording	The battery is empty.	Charge the battery. When the battery LED is red, the remaining recording time is approximately three minutes.
	The ⏻ button was pressed for 5 seconds or longer.	The EEG data that was recorded until LiveAmp was switched off is still usable.
Cannot find LiveAmp in Windows®	LiveAmp is connected to the computer via the wireless module AND via the USB adapter.	Press and hold the ⏻ button for at least 5 seconds to switch off the wireless adapter.

12.2 LiveAmp 64 issues

Symptom	Possible cause	Remedy
LiveAmp 64 not recognized	Only one wireless adapter is connected.	Connect a second wireless adapter.
LiveAmp 64 not discovered by BrainVision Recorder	Incompatible firmware versions are used on one or both of the LiveAmps.	Ensure that both LiveAmps are running firmware version 4.59 or later.
Lost samples when recording	The wireless adapters are too close to each other	Separate the wireless adapters by at least 50cm.
BrainVision Recorder does not recognize the STE compact when connected to LiveAmp 64	The STE compact was plugged in after LiveAmp was connected to BrainVision Recorder.	Disconnect and reconnect LiveAmp to BrainVision Recorder.
LiveAmp 64 is not discovered by BrainVision Recorder	Both LiveAmps are switched on but not connected.	Connect the LiveAmps to connector for active electrodes or to cap with passive electrodes.

12.3 Battery / Charging issues

Symptom	Possible cause	Remedy
Battery LED is blinking amber while charging	The power source is too weak.	Connect LiveAmp to the provided USB charger or a power bank. The provided charging current must be 500 mA.
Battery discharges too quickly	Battery was not fully charged.	Fully charge the battery. It takes around 4 hours to charge an empty battery. If the charging time seems to be too short, fully discharge LiveAmp and charge it again.
	Too long in impedance mode with active electrodes. **Note**: Impedance measurement of active electrodes consumes a lot of battery power.	▶ In order to save battery power, connect LiveAmp with the USB adapter to a power source during impedance measurement. ▶ Start the impedance measurement after preparing the cap.
Battery does not charge OR Battery does not charge fully	The USB adapter is not plugged in correctly.	Ensure that the USB adapter is plugged in correctly on both ends (LiveAmp and power socket). If the issue remains, contact your local distributor.

12.4 Lost samples

Symptom	Possible cause	Remedy
Lost samples on memory card	The memory card is the wrong card type.	Only use the micro memory card as specified by Brain Products GmbH.
	The memory card is not formatted with BrainVision Recorder.	Use BrainVision Recorder to format the memory card.

Lost samples during recording (lost sample markers)	The wireless adapter is not used.	Use the wireless adapter provided with the system.
	Other wireless devices are in range.	Ensure that there are no interferences with other wireless devices. For example, switch off Bluetooth® of your mobile phone.
	Too far away from recording computer.	In order to improve the signal strength, get closer to the wireless adapter.
	Too many channels for selected sampling rate.	If you selected more than 24 channels at a sampling rate of 1,000 Hz, lost samples might appear on the recording computer. Do one of the following: ▶ get closer to the recording computer. ▶ record to the memory card (no samples are lost when recording to the memory card). ▶ reduce the number of channels. ▶ reduce the sampling rate.

12.5 Issues related to the physiological signals

Symptom	Possible cause	Remedy
No signals in BrainVision Recorder	The electrode connector is not connected correctly.	Check if the electrode connector snaps into the LiveAmp.
	LiveAmp is out of range.	Move closer to the wireless adapter.
	The electrode input is broken.	Contact your local distributor.
Noise on all channels	actiCAP Xpress Twist is used and a power bank connected.	LiveAmp with the STE compact and a power bank should not be used with actiCAP Xpress Twist. The noise of dry electrodes will increase significantly under these operating conditions.
Flat lines for Auxiliary channels and marker	STE compact is not connected.	Connect the STE compact.

12.6 Analyzer issues

Symptom	Possible cause	Remedy
Cannot open data in Analyzer	The EEG data was not converted.	Refer to Section 9.3 for converting data.

12.7 STE compact issues

Symptom	Possible cause	Remedy
BrainVision Recorder does not recognize the STE compact. Flat lines are displayed for AUX channels and a marker is set that the STE compact is disconnected.	The cable between the power bank and the STE compact is disconnected on the side of the power bank.	Reconnect the cable to the power bank and disconnect the cable on the STE compact side instead.

12.8 Frequently asked questions

Is my LiveAmp charging?

When LiveAmp is connected to a power source you can determine the status by the LED or in the recording software:

Your LiveAmp is charging:

- when the Battery LED is blinking slowly

  OR

- when the LiveAmp is connected with BrainVision Recorder and the battery icon in the status bar of BrainVision Recorder is blinking.

Note

You cannot determine on the LiveAmp if it is charging when it is acquiring data, in this modus the battery/memory LED is not indicating the charge status but other states.

Where is my EEG data?

- If you record to the memory card, then your data is stored on the memory card. To access the data, see Chapter 9.
- When simultaneously recording to the memory card and computer, approximately the first ten seconds on the memory card will be missing. This is due to LiveAmp preparing the memory card when a recording is started.

LiveAmp was switched off during the recording. Is my EEG data lost?

No. The EEG-files on the recording computer and memory card contain the data until LiveAmp was switched off.

Can I use the Bluetooth® adapter of my computer?

We recommend to use the wireless adapters provided with the system to ensure reliable data transmission. The internal wireless adapter of the computer can be used with LiveAmp 8, 16 and 32. For more details refer to the BrainVision Recorder Operating Instructions.

I lost my memory card. Can I record data?

Yes, but only to the recording computer. If you want to record data to LiveAmp you must insert the supplied memory card into LiveAmp.

Only use memory cards, that match the specifications:

Card type: micro memory card, class 10

Size: 32 GB

Is the LiveAmp powering the STE compact or is the STE compact powering the LiveAmp?

The STE compact does not provide power for the LiveAmp. If the batteries of the STE compact are discharged, it draws power from the LiveAmp.

Appendix A Technical data

Ambient conditions

Charging (LiveAmp)	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: 25 % to 85 %, non-condensing Atmospheric pressure: 700 hPa to 1,050 hPa
Storage and transport	Temperature: 0 °C to 40 °C (32 °F to 104 °F) Relative humidity: 45 % to 85 %, non-condensing Atmospheric pressure: 700 hPa to 1,050 hPa
To prevent mechanical damage during transport, please pack the product in such a way that it is not subject to vibration.	

Technical data of LiveAmp

EEG/ExG channels

Number/type of channels	**LiveAmp 8 channel** LiveAmp 8 can record a total of 8 referential EEG channels, referential and/or bipolar. **LiveAmp 16 channel** LiveAmp 16 can record a total of 16 referential EEG channels with a maximum of 8 bipolar channels or 8 referential and 8 bipolar channels. **LiveAmp 32 channel** LiveAmp 32 can record either 32 referential EEG channels or 24 referential and 8 bipolar channels. **LiveAmp 64 channel** LiveAmp 64 can record either 64 referential EEG channels or 56 referential and 8 bipolar channels.
Measurement range	±341.6 mV
Input noise	‹ 2 μV_{pp} (0.01 Hz to 65 Hz at 250 Hz sampling rate) measured with internal battery and shorted inputs
Input impedance	› 200 MOhm (at DC) impedance of EEG/ExG channels to GND
Differential input impedance	› 400 MOhm (at DC) impedance between two EEG/ExG channels or bipolar EEG/ExG channels
Common-mode rejection (CMR)	› 80 dB (at 50/60 Hz)
Signal coupling	DC (there is no high pass filter in amplifier hardware)
Low pass filter in amplifier	Third order sinc filter with -3 dB frequency depending on the sample rate: ▶ 1,000 Hz: 262 Hz ▶ 500 Hz: 131 Hz ▶ 250 Hz: 65 Hz
A/D conversion	24 bit
Resolution	Approx. 40.7 nV / bit (= 2*341.6 mV / 2^{24} bit)
Acceleration sensor	Built-in 3-axis acceleration sensor Three separate channels (x, y, z) Measurement range: ±2 g Resolution: 1 mg/bit, 12 bit Error: ±0.2 g (±10 % of full scale)

Sampling rates

<table>
<tr><td rowspan="4">Hardware Sampling Rates</td><td colspan="2">Select between 250 Hz, 500 Hz and 1,000 Hz.
Note: Maximum wireless bandwidth cannot always be guaranteed due to external interference.</td></tr>
<tr><td>Sampling Rate</td><td>EEG/ExG channels</td></tr>
<tr><td>1000Hz</td><td>Up to 32 channels
(this incl. AUX and acceleration)</td></tr>
<tr><td>500Hz</td><td>32 channels or more
(this incl. AUX and acceleration)</td></tr>
</table>

Data Storage

Data storage	▶ On recording computer via wireless transmission ▶ On micro memory card ▶ On recording computer and on micro memory card
Card type	micro SD® card, class 10
Size of memory card	32 GB
Maximum file size on memory card	4 GB
Data format on internal memory card	Proprietary format; can be converted to generic Brain Products data format with converter software provided by Brain Products

Wireless transmission

Wireless data transmission	In 2.402-2.480 GHz ISM band worldwide no restrictions for using this ISM range
Radio frequency output power	Max. 13 dBm (approx. 20 mW)
Wireless transmission range	Indoor: Up to 10 m (depending on environment) Outdoor: Up to 30 m

Electrodes

Compatible electrodes	▶ Passive Ag/AgCl based electrodes ▶ Passive Ag/AgCl sponge-based electrodes ▶ Active actiCAP electrodes
Impedance measurement	Available for passive and active electrodes and integrated in amplifier.
Impedance measurement range	Up to 500 kOhm

Battery and power supply

Power supply	Built-in rechargeable battery Capacity: 1,000 mAh.
Current consumption	Max. 250 mA
Charging time	Approx. 4 hours at 500 mA (for example, USB port of a computer)
Uninterrupted recording time with built-in battery (when fully charged)	› 3 hours (wireless data transfer only and passive electrodes) › 4.5 hours (storage on memory card only and passive electrodes)
Battery Type	Lithium ion cobalt battery

Dimensions and weight

LiveAmp 8, 16, 32	
Dimensions (W x D x H)	83 mm x 51 mm x 14 mm
Weight	Approx. 60 g (incl. built-in battery)
LiveAmp 64	
Dimensions (W x D x H)	140 mm x 83 mm x 18 mm (incl. connectors: 25 mm)
Weight	Approx. 120 g (incl. built-in battery)

Further data

Built-in trigger/marker input	Yes, 3-pin 2.5 mm phone jack; TTL (LVTTL) signals, 0 to +5 V (+ 3.3 V); active low
LED indicators	Battery/status LED: green, yellow, red Wireless LED: blue

LiveAmp USB adapter

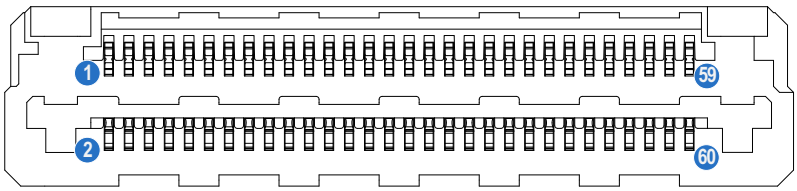
USB communication	Data rate: 12 MBit/s USB 2.0 compatible
Input and output voltage	5 V
Maximum power transfer	5 W
Galvanic isolation	2,500 VDC
Dimensions (W x D x H)	40 mm x 30 mm x 20 mm
Weight	Approx. 30 g
Cable length	Approx. 50 cm, not detachable

System requirements for LiveAmp

Operating system	Windows® 10 Windows® 11
USB port	USB 2.0 or higher
LiveAmp Firmware	**LiveAmp 64** Both LiveAmps should be running firmware version 4.60 or later.
Software requirements	**LiveAmp 32 channel** BrainVision Recorder version 1.21.0004 or later **LiveAmp 8 channel and LiveAmp 16 channel** BrainVision Recorder version 1.21.0202 or later **LiveAmp 64** BrainVision Recorder version 1.21.0303 or later

Pin assignment of LiveAmp

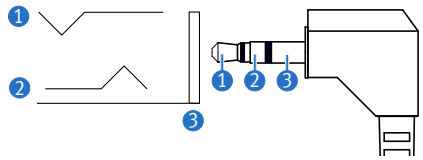
Electrode connector



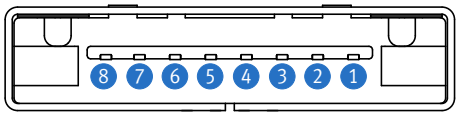
Pin	Function	Pin	Function	Pin	Function	Pin	Function
1	GND	**16**	In 27+	**31**	In 23	**46**	In 16
2	MP1	**17**	VGND	**32**	In 24	**47**	In 13
3	MP2	**18**	In 27-	**33**	In 21	**48**	In 14
4	5 V	**19**	N	**34**	In 22	**49**	In 11
5	MP3	**20**	In 28+	**35**	In 19	**50**	In 12
6	3 V	**21**	VGND	**36**	In 20	**51**	In 9
7	In 29+	**22**	In 28-	**37**	In 17	**52**	In 10
8	In 29-	**23**	REF	**38**	In 18	**53**	In 7
9	In 30+	**24**	NC	**39**	NC	**54**	In 8
10	In 30-	**25**	VGND	**40**	NC	**55**	In 5
11	In 31+	**26**	NC	**41**	NC	**56**	In 6
12	In 31-	**27**	In 26+	**42**	NC	**57**	In 3
13	In 32+	**28**	In 26-	**43**	NC	**58**	In 4
14	In 32-	**29**	In 25+	**44**	NC	**59**	In 1
15	NC	**30**	In 25-	**45**	In 15	**60**	In 2

GND = Ground
VGND = Virtual Ground
REF = Reference
IN = Input signal
MP = Multi-purpose
NC = Not Connected

Trigger connector (2.5 mm jack)

	Pin	Function
	1 (tip)	Not used
	2 (ring)	Trigger in
	3 (sleeve)	Ground (GND)

AUX connector

	Pin	Function
	1	USB D+
	2	USB D-
	3	NC
	4	I2C-SDA
	5	I2C-SCL
	6	5V in
	7	5V in
	8	GND
	Shield	Shield

Technical data of STE compact

Number of AUX channels	6 AUX channels are not intended to measure EEG/ExG signals directly.
Input range of AUX channels	± 4.8 V
Sampling rate of AUX inputs	The sampling rate is the same for all LiveAmp and STE compact channels. Regarding channel numbers and sampling rates the same restrictions as mentioned for LiveAmp apply (see above).
Power supply at AUX inputs	Voltage: ± 5 V Current: Max. total current of 60 mA (that is, either 1 x 60 mA or 6x 10 mA etc.)
Galvanic isolation of AUX inputs	AUX channels are galvanically isolated from the EEG/ExG channels of LiveAmp (isolation voltage 1,500 VAC, 50 Hz).
Pulse Oximetry Sensor input	1, compatible with Nonin Xpod: Mini-12 receptacle
Number of Trigger In bits	8
Trigger In	**Cable** ▶ Connector: 9-pin female D-Sub; pin assignment: see below ▶ Low active (internal pull up resistor (10 kOhm) to Vcc) ▶ TTL (LVTTL) signals, 0 to +5 V (+ 3.3 V) ▶ Can be used alternatively to Wireless Trigger In **Wireless** Wireless module built-in. Can be used alternatively to cable Trigger In.
Galvanic isolation of trigger inputs	Trigger channels are galvanically isolated from the EEG/ExG channels of LiveAmp (isolation voltage 1,500 VAC, 50 Hz).
Power consumption	Max. 0.9 W
Dimensions (W x D x H)	12.3 cm x 7.6 cm x 2.6 cm
Weight	‹ 130 g
Power supply	▶ Usually: via two removable AA batteries (in the STE compact battery compartment) ▶ If batteries in the STE compact are discharged and no power bank is connected: via LiveAmp ▶ If power bank is connected: via power bank
Length of cable to LiveAmp	80 cm
Required LiveAmp revision	LiveAmp Rev. 04 or higher and LiveAmp FW Version 4.77 (can be installed as of LiveAmp Rev. 04) or higher.

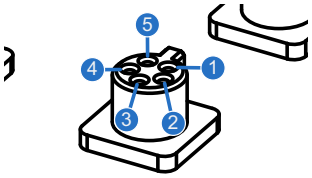
Batteries in the scope of delivery

Battery Type	Rechargeable Nickel-Metal Hydride battery, AA

Pin assignment of STE compact

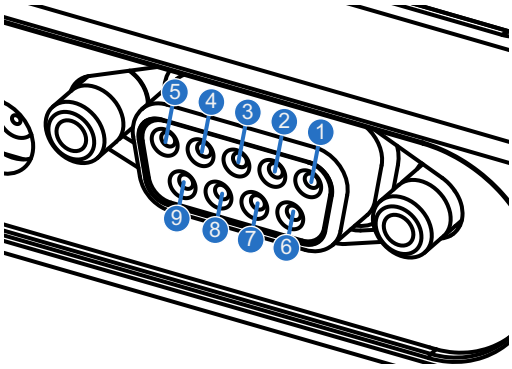
AUX sockets

Connector type: Binder 719/709, 5 pin, female

	Pin	Function
	1	+5 V
	2	In+
	3	Ground
	4	In-
	5	-5 V

Trigger In

Connector type: D-Sub, 9-pin, female

	Pin	Function
	1	Bit 0
	2	Bit 1
	3	Bit 2
	4	Bit 3
	5	Bit 4
	6	Bit 5
	7	Bit 6
	8	Bit 7
	9	Ground