

At a glance:
Brain Products Amplifiers in Comparison (page 1 of 4)

BrainAmp series

	BrainAmp Standard	BrainAmp DC	BrainAmp ExG
Number of channels per unit	32	32	8/16
Max. number of channels	256 (using 8 x BrainAmp Standard, 2 x USB 2 Adapter (BUA) and dualBUA)	256 (using 8 x BrainAmp DC, 2 x USB 2 Adapter (BUA) and dualBUA)	-
Channel type / reference	Referential channels / acquisition of a reference using a single electrode ("unipolar")	Referential channels / acquisition of a reference using a single electrode ("unipolar")	» BrainAmp ExG 8: 8 bipolar (sensors cannot be connected!) » BrainAmp ExG 16: 16 bipolar OR 8 bipolar + 8 AUX (to connect sensors)
Integrated impedance measurement	available, measurement incl. ground and reference electrode at 15 Hz	available, measurement incl. ground and reference electrode at 15 Hz	yes
Input impedance (for DC)	10 MΩ	switchable: 10 MΩ / > 10,000 MΩ	switchable: 10 MΩ / > 10,000 MΩ
Input noise	≤ 2 μVpp (0.016 Hz – 1,000 Hz)	≤ 1 μVpp (0.016 Hz – 250 Hz)	≤ 2 μVpp (0.016 Hz – 250 Hz)
Common-mode rejection (CMR)	≥ 90 dB (at 50/60 Hz)	≥ 110 dB (at 50/60 Hz)	≥ 100 dB (at 50/60 Hz)
Lower cutoff frequency (high pass) / time constant	0.016 Hz / (10 s)	0 Hz in DC mode, 0.016 Hz / 10s in AC mode. Switchable between AC and DC mode (in software)	0 Hz in DC mode, 0.016 Hz / 10s in AC mode Switchable between AC and DC mode
Upper cutoff frequency (low pass)	1,000 Hz	1,000 / 250 Hz (switchable for resolutions 0.1 μV / 0.5 μV per bit)	1,000 / 250 Hz (switchable for resolutions 0.1 μV / 0.5 μV per bit)
Measurement range	± 3.28 mV	switchable: ±3.28 mV / ±16.384 mV / ±327.68 mV	switchable: ±3.28 mV / ±16.384 mV / ±327.68 mV
Resolution	0.1 μV per bit	switchable: 0.1 μV; 0.5 μV; 10.0 μV per bit	switchable: 0.1 μV; 0.5 μV; 10.0 μV per bit
Sampling rate	5 kHz per channel	5 kHz per channel	5 kHz per channel
Bit width of A/D converter	16 bit	16 bit	16 bit
DC offset tolerance	± 300 mV	± 300 mV	± 300 mV
Signal transmission	Through duplex fiber-optic cables, optically coupled	Through duplex fiber-optic cables, optically coupled	Through duplex fiber-optic cables, optically coupled
Deblocking function	present	present	present
Blocking of unused channels	present	present	present
Power supply	rechargeable battery (PowerPack)	rechargeable battery (PowerPack)	rechargeable battery (PowerPack)
Current consumption	max. 110 mA	max. 130 mA	max. 110 mA / max. 120 mA
Computer interface	USB 2 Adapter (BUA, dualBUA) or PCI Adapter Card	USB 2 Adapter (BUA, dualBUA) or PCI Adapter Card	USB 2 Adapter (BUA, dualBUA) or PCI Adapter Card
TTL trigger input	16 bit	16 bit	16 bit
Suitable for use in MR scanner room	no, MR unsafe	no, MR unsafe	no, MR unsafe
Medical product	no	no	no
CE marking	CE according to EMC directive	CE according to EMC directive	CE according to EMC directive
Applied part (amplifier)	Type BF (according to IEC 60601-1)	Type BF (according to IEC 60601-1)	Type BF (according to IEC 60601-1)
Dimensions (H x D x W)	68 mm x 160 mm x 187 mm	68 mm x 160 mm x 187 mm	68 mm x 160 mm x 187 mm
Weight (approx.)	1.1 kg	1.1 kg	1.1 kg

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At a glance:
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actiCHamp (compared to BrainAmp Standard and DC)

	actiCHamp	BrainAmp Standard	BrainAmp DC
Number of channels per unit	32	32	32
Max. number of channels	160 EEG + 8 AUX	256 (using 8 x BrainAmp Standard, 2 x USB 2 Adapter (BUA) and dualBUA)	256 (using 8 x BrainAmp DC, 2 x USB 2 Adapter (BUA) and dualBUA)
Channel type / reference	EEG channels: referential channels / internal Reference AUX channels: bipolar, -4.8 V - 4.8 V	Referential channels / acquisition of a reference using a single electrode ("unipolar")	Referential channels / acquisition of a reference using a single electrode ("unipolar")
Measurement range	0 to 100 k Ω	available, measurement incl. ground and reference electrode at 15 Hz	available, measurement incl. ground and reference electrode at 15 Hz
Input impedance (for DC)	EEG channels: > 1,000 M Ω AUX channels: Rev. 01: > 2,000 M Ω ; as of Rev. 02: > 40 M Ω	10 M Ω	switchable: 10 M Ω / > 10,000 M Ω
Input noise for EEG channels	\approx 2 μ Vpp (0.1 Hz - 30 Hz)	\leq 2 μ Vpp (0.016 Hz - 1,000 Hz)	\leq 1 μ Vpp (0.016 Hz - 250 Hz)
Common-mode rejection (CMR)	> 100 dB	\geq 90 dB (at 50/60 Hz)	\geq 110 dB (at 50/60 Hz)
Lower cutoff frequency (high pass) / time constant	DC for EEG and AUX signals 0 Hz (DC)	0.016 Hz / 10s	0 Hz in DC mode, 0.016 Hz / 10s in AC mode. Switchable between AC and DC mode (in software)
Upper cutoff frequency (low pass)	EEG channels: 20 kHz (without label) or 8 kHz (with 8 kHz label or imprint on EEG module) AUX channels: Rev 01: 0.3 V to 4 V, Rev 02: Bipolar -4.8 V to +4.8 V	1,000 Hz	1,000 / 250 Hz (switchable for resolutions 0.1 μ V / 0.5 μ V per bit)
Resolution	\approx 0.048 μ V / bit	0.1 μ V per bit	switchable: 0.1 μ V; 0.5 μ V; 10.0 μ V per bit
Sampling rate in combination with BrainVision PyCorder (Python-based open source recording software)	16ch + 8 AUX: 100 kHz 32ch + 8 AUX: 50 kHz 64ch + 8 AUX: 25 kHz 96ch + 8 AUX: 10 kHz 128ch + 8 AUX: 10 kHz 160ch + 8 AUX: 10 kHz	combination not possible	combination not possible
Sampling Rate in combination with BrainVision Recorder 1.20 and higher (commercial license)	16ch + 8 AUX: 100 kHz 32ch + 8 AUX: 100 kHz 64ch + 8 AUX: 50 kHz 96ch + 8 AUX: 25 kHz 128ch + 8 AUX: 25 kHz 160ch + 8 AUX: 25 kHz	5 kHz per channel	5 kHz per channel
Bit width of A/D converter	24 bit for EEG and AUX channels	16 bit	16 bit
Deblocking function	no	present	present
Power supply	rechargeable battery („actiPOWER“)	rechargeable battery (PowerPack)	rechargeable battery (PowerPack)
Computer interface	direct via USB 2.0	USB 2 Adapter (BUA, dualBUA) or PCI Adapter Card	USB 2 Adapter (BUA, dualBUA) or PCI Adapter Card
Trigger input	8 bit, D-Sub, 9 pin, female	16 bit	16 bit
Trigger output	8 bit, D-Sub, 9 pin, male		
Suitable for use in MR scanner room	no, MR unsafe	no, MR unsafe	no, MR unsafe
Medical product	no	no	no
CE marking	Yes, according to EMC directive	CE according to EMC directive	CE
Dimensions (H x W x D)	68 mm x 160 mm x 187 mm	68 mm x 160 mm x 187 mm	68 mm x 160 mm x 187 mm
Weight (approx.)	1.1 kg	1.1 kg	1.1 kg

The actiCHamp is intended to be used for research applications only and is not sold, designed or intended to be used as medical devices as defined in EU Directive 93/42/EEC, nor is it intended to be used for other medical applications such as diagnosis or treatment of disease. The hardware is freely configurable. Brain Products shall not be liable for any use other than pure scientific and research applications. The actiCHamp hardware has been tested and certified as per the relevant EMC and electrical safety standards. A non-medical CE certificate is available on request.

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BrainAmp MR series

	BrainAmp MR	BrainAmp MR plus	BrainAmp ExG MR
Number of channels per unit	32	32	8 or 16
Max. number of channels	for use in fMRI: 128 for use in other fields of application: 256 (using 8 x BrainAmp MR, 2 x USB 2 Adapter (BUA) and dualBUA)	for use in fMRI: 128 for use in other fields of application: 256 (using 8 x BrainAmp MR plus, 2 x USB 2 Adapter (BUA) and dualBUA)	-
Channel type / reference	Referential channels / acquisition of a reference using a single electrode ("unipolar")	Referential channels / acquisition of a reference using a single electrode ("unipolar")	» BrainAmp ExG MR 8: 8 bipolar (sensors cannot be connected!) » BrainAmp ExG MR 16: 16 bipolar OR 8 bipolar + 8 AUX (to connect sensors)
Integrated impedance measurement	available, measurement incl. ground and reference electrode at 15 Hz	available, measurement incl. ground and reference electrode at 15 Hz	yes
Input impedance (for DC)	10 MΩ	switchable: 10 MΩ / > 10,000 MΩ	switchable: 10 MΩ / > 10,000 MΩ
Input noise	≤ 1 μVpp (0.016 Hz – 250 Hz)	≤ 1 μVpp (0.016 Hz – 250 Hz)	≤ 2 μVpp (0.016 Hz – 250 Hz)
Common-mode rejection (CMR)	≥ 90 dB (at 50/60 Hz)	≥ 110 dB (at 50/60 Hz)	≥ 100 (at 50/60 Hz)
Lower cutoff frequency (high pass) / time constant	0.016 Hz / 10s	0 Hz in DC mode or 0.016 Hz / 10s in AC mode; switchable between AC and DC mode	0 Hz in DC mode or 0.016 Hz / 10s in AC mode; switchable between AC and DC mode
Upper cutoff frequency (low pass)	250 Hz	1,000 Hz / 250 Hz (switchable for resolution 0.1 μV / 0.5 μV per bit)	1,000 Hz / 250 Hz (switchable for resolution 0.1 μV / 0.5 μV per bit)
Measurement range	± 16.384 mV	switchable: ±3.28 mV; ±16,384 mV; ±327.68 mV	switchable: ±3.28 mV; ±16.384 mV; ±327.68 mV
Resolution	0.5 μV per bit	switchable: 0.1 μV; 0.5 μV; 10.0 μV per bit	switchable: 0.1 μV; 0.5 μV; 10.0 μV per bit
Sampling rate	5 kHz per channel	5 kHz per channel	5 kHz per channel
Bit width of A/D converter	16 bit	16 bit	16 bit
DC offset tolerance	± 300 mV	± 300 mV	± 300 mV
Signal transmission	Through duplex fiber-optic cables, optically coupled	Through duplex fiber-optic cables, optically coupled	Through duplex fiber-optic cables, optically coupled
Deblocking function	present	present	present
Blocking of unused channels	present	present	present
Power supply	External battery pack (PowerPack)	External battery pack (PowerPack)	External battery pack (PowerPack)
Current consumption	max. 110 mA	max. 130 mA	max. 120 mA
Computer interface	USB 2 Adapter (BUA, dualBUA) or PCI Adapter Card	USB 2 Adapter (BUA, dualBUA) or PCI Adapter Card	USB 2 Adapter (BUA, dualBUA) or PCI Adapter Card
TTL trigger input	16 bit	16 bit	16 bit
Suitable for use in MR scanner room	yes, MR safe SIEMENS/PHILIPS: 1.5 - 7 T GE: 1.5 - 7 T Bruker: 4 T	yes, MR safe SIEMENS/PHILIPS: 1.5 - 7 T GE: 1.5 - 7 T Bruker: 4 T	yes, MR safe SIEMENS/PHILIPS: 1.5 - 7 T GE: 1.5 - 7 T Bruker: 4 T
Medical product	no	no	no
CE marking	CE according to EMC directive	CE according to EMC directive	CE according to EMC directive
Applied part (amplifier)	Type BF (according to IEC 60601-1)	Type BF (according to IEC 60601-1)	Type BF (according to IEC 60601-1)
Dimensions (H x D x W)	68 mm x 160 mm x 187 mm	68 mm x 160 mm x 187 mm	68 mm x 160 mm x 187 mm
Weight (approx.)	1.1 kg	1.1 kg	1.1 kg

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At a glance:
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V-Amp

V-Amp 8 channel

V-Amp 16 channel

EEG Channels

Number of channels	8 (plus ground and reference electrode)	16 (plus ground and reference electrode)
Channel type / reference	Referential channels / recording with one electrode as reference („unipolar“)	Referential channels / recording with one electrode as reference („unipolar“)
Bit width of A/D converter	24 bit	24 bit
Input range	± 410 mV	± 410 mV
Input noise	< 1 µVpp (0.5 - 30 Hz)	< 1 µVpp (0.5 - 30 Hz)
Input impedance (to ground) (for DC)	> 100 MΩ	> 100 MΩ
Common Mode Rejection (CMR)	> 100 dB at 50 Hz	> 100 dB at 50 Hz
Sampling rate	2 kHz	2 kHz
Sampling rate in high-speed mode (4 ch)	20 kHz	20 kHz
Resolution	≈ 0.0489 µV / bit	≈ 0.0489 µV / bit
Bandwidth	0 Hz (DC) - 500 Hz (- 3 dB)	0 Hz (DC) - 500 Hz (- 3 dB)
Bandwidth in high-speed mode (4 ch)	0 Hz (DC) - 4,000 Hz (- 3 dB)	0 Hz (DC) - 4,000 Hz (- 3 dB)

Auxiliary channels

Number of AUX channels	2	2
Channel type	bipolar	bipolar
Input range	± 5 V	± 5 V
Input impedance (to ground)	> 10 MΩ	> 10 MΩ
Differential input impedance	> 20 MΩ	> 20 MΩ
Sampling rate	2 kHz	2 kHz
Resolution	≈ 1.19 µV / bit	≈ 1.19 µV / bit
Bandwidth	0 - 150 Hz (- 3 dB)	0 - 150 Hz (- 3 dB)

On-Board-display	TFT LCD 320 x 240 pixels; diagonal size of 3,5 inch	TFT LCD 320 x 240 pixels; diagonal size of 3,5 inch
Number of trigger inputs	9 bit; TTL level	9 bit; TTL level
Power Supply	USB	USB
Max. current in active mode during recording [mA]	Stand-by < 0,5 mA in USB suspend mode Min. in active mode (recording off, LCD off)*: typically 140 mA Max. in active mode during recording*: < 450 mA (typically 370 mA) *Power data are stated for the 16-channel models.	Stand-by < 0,5 mA in USB suspend mode Min. in active mode (recording off, LCD off)*: typically 140 mA Max. in active mode during recording*: < 450 mA (typically 370 mA) *Power data are stated for the 16-channel models.
Computer interface	USB 1.1 full speed mode with plug-and-play support	USB 1.1 full speed mode with plug-and-play support
Suitable for use in MR scanner room	no, MR unsafe	no, MR unsafe
Medical product	no	no
CE marking	CE according to EMC directive	CE according to EMC directive
Applied part (amplifier)	Type BF (according to IEC 60601-1)	Type BF (according to IEC 60601-1)
Dimensions W x D x H	170 mm x 125 mm x 30 mm	170 mm x 125 mm x 30 mm
Weight (approx.)	0.40 kg	0.43 kg

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