BRAIN PRODUCTS
Solutions for neurophysiological research

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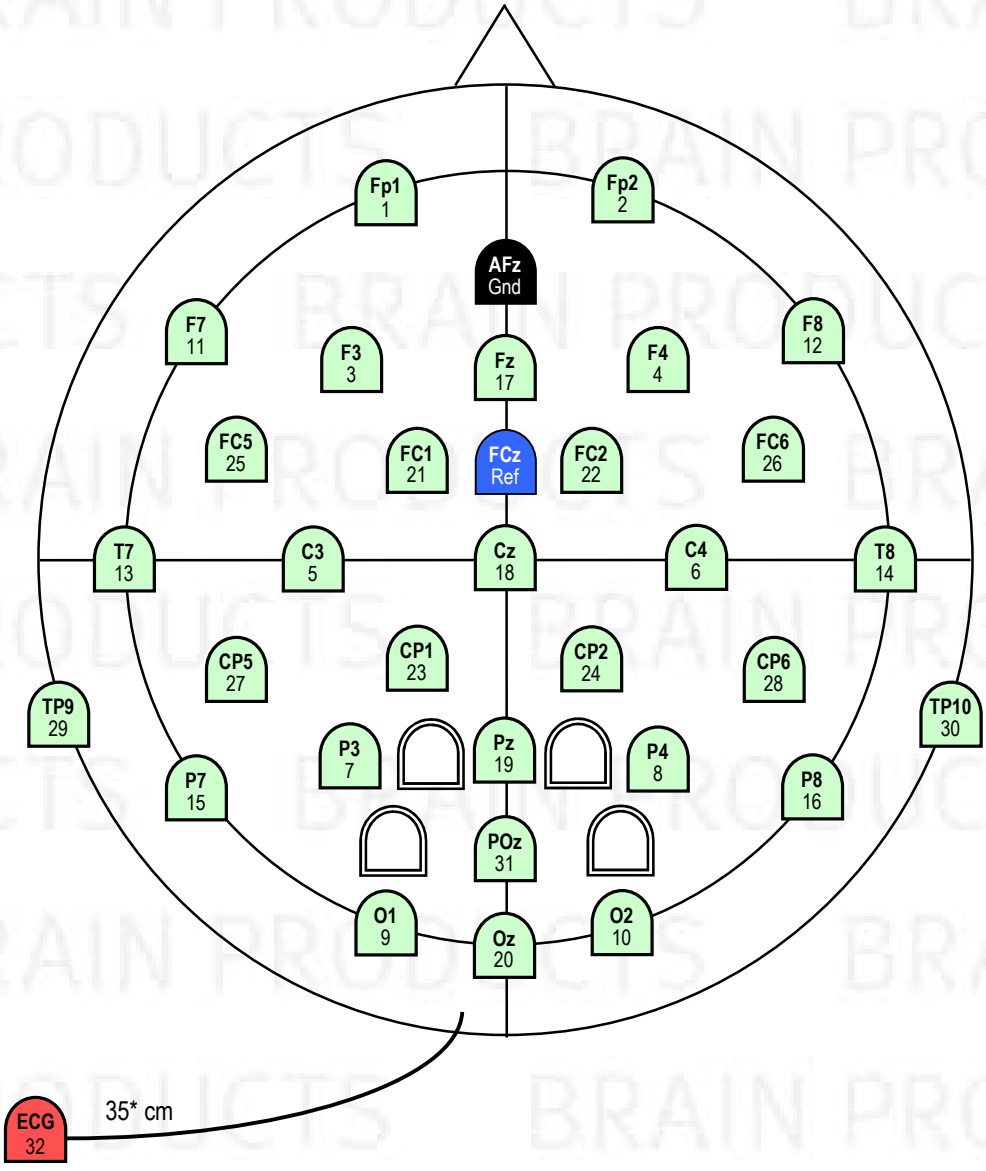
32Ch Standard BrainCap-MR with Multitrodes

Electrode Layout and Channel Assignment:

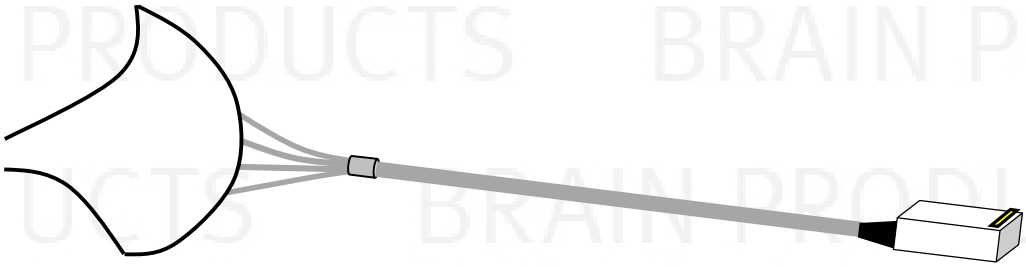


More Details for Users

Exit Point of Cable Tree

In BrainCap-MR the exit point of the cable tree can be either fronto-central

or centro-parietal.



Upon ordering one of these options needs to be chosen. The decision depends upon the headcoil used.
(All BrainCap-MR built before October 2019 have the centro-parietal exit point.)

Ordering Information

For ordering please give **Article Number, Cap Cut, Exit Point, and Size**
(e.g. *BC-MR-32, Caucasian, Exit FFCz, 56*):

- Article Number: ***BC-MR-32***
- Cap Cut: ***Caucasian*** or ***Asian***
- Exit Point: ***Cable Tree Exiting at FFCz*** or ***Cable Tree Exiting at CPz***
- Size (given in cm head circumference):
  Adult caps: ***54, 56, 58, 60, 62, 64*** (average male: 58, average female: 56)
  Children caps: ***50*** (3-4 years), ***52*** (5-10 years), ***54*** (11-14 years)
  Infant caps: ***34, 36*** *(newborn),* ***38, 40*** *(3 months),* ***42***, ***44*** (7 month), ***46***, ***48*** (2 years)

The catalogue-number comprises the cap as described, serial number, and this document; all packed in a labelled cardboard box. For further information about accessories or consumables, please visit our website or contact our local distributor.

Cap

Standard: Subtemporal Cap with integrated chin belt, white
Sizes 52 – 64 made from High Precision Fabric, Sizes 50 and smaller made from High Comfort Fabric
Options: Caucasian or Asian, Exit Point, Size

Electrodes

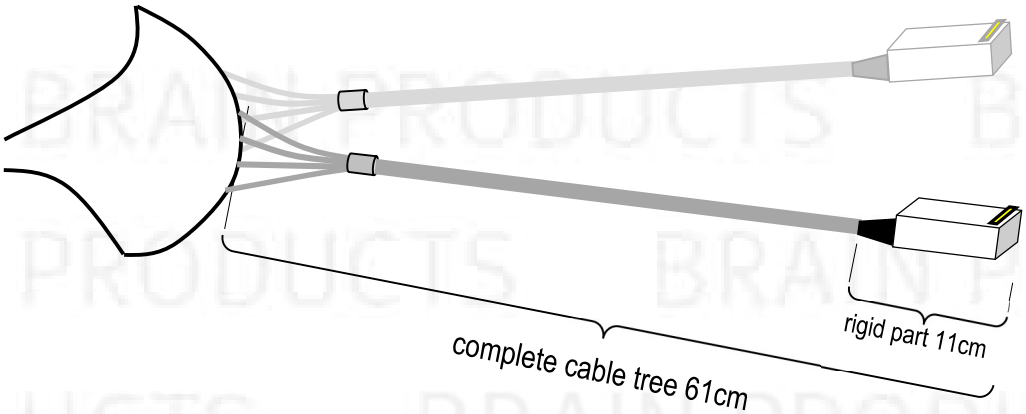
All electrodes are Multitrodes for MR with sintered Ag/AgCl sensors. They are buttoned directly into the cap (total height less than 3,5 mm) or can be attached to the skin with washers (= double-sided adhesive rings). In the parieto-occipital area, empty electrode housings (double border lines in the layout) provide more comfort.

All electrodes in the cap come with 5 kOhm-resistors directly after the sensor, the ECG-electrode with 15 kOhm resistor.

The electrode housing colours are according to the above figure. All cables are white, except Ch32 = red cable, Ref = blue cable, and Gnd = black cable. All electrodes are name-labelled (Fp1, Fp2, …) near sensor.

The ECG electrode cable part outside the cap is covered waterproof wherever possible in silicone - or if more suitable in spiral tube - to avoid direct contact to skin.
* ECG cable length dependent on cap size, will be reduced for children caps

All cables are led on the outside of the cap directly to the exit point of the cable tree. Cables are fixed with double-T-nylon threads. The cables part from the cap in branches of approx. 8 cables. These branches leave radially from the area around FFCz or CPz and straight/tight to a uniting point after approx. 5 cm. After the uniting point, one cable tree continues to the BrainCap-connector-box. The overall length of the cable tree is approx. 61 cm.



Termination

The cable tree is led into a Connector box. From here the caps are connected to BrainAmp-MR with 30 cm-flat-ribbon-cables. These flat ribbon cables come with the BrainAmps. They can be re-ordered from BrainProducts (Cat-No. BP-02400-NN) or from Easycap (Cat.-No. E80).
Inside the connector box there is another 5 kOhm-resistor on each channel, Ref, Gnd.

The top side of the connector box is labelled “BrainCap-MR”. The bottom side label states

- 10kΩ in cap electrodes (5kΩ: tip + 5kΩ: box)
- 20kΩ at ECG (15kΩ: tip + 5kΩ: box)

Theta / Phi Coordinates for BC-MR-32

Channel-Number	Name	Theta	Phi
1	Fp1	-90	-72
2	Fp2	90	72
3	F3	-60	-51
4	F4	60	51
5	C3	-45	0
6	C4	45	0
7	P3	-60	51
8	P4	60	-51
9	O1	-90	72
10	O2	90	-72
11	F7	-90	-36
12	F8	90	36
13	T7	-90	0
14	T8	90	0
15	P7	-90	36
16	P8	90	-36
17	Fz	45	90
18	Cz	0	0
19	Pz	45	-90
20	Oz	90	-90
21	FC1	-31	-46
22	FC2	31	46
23	CP1	-31	46
24	CP2	31	-46
25	FC5	-69	-21
26	FC6	69	21
27	CP5	-69	21
28	CP6	69	-21
29	TP9	-113	18
30	TP10	113	-18
31	POz	67	-90
32	ECG		
Ref	FCz	23	90
Gnd	AFz	67	90

These values are standardized to a Theta of 90° for the plane through Fpz, T7, T8, Oz.

The signs follow this convention:

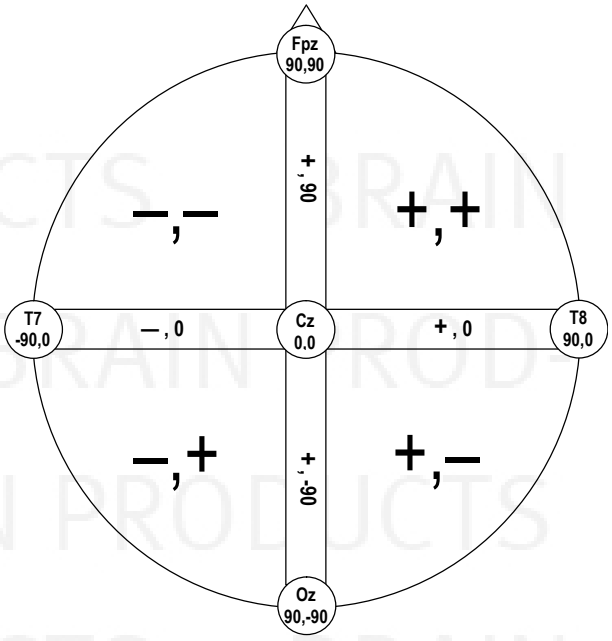


Table of ECG cable lengths

head circumference	length of ECG cable
64-52	35
50	30
48	28
46	26
44	24
42	22
40	20
38	18
36	16
34	14
32	12
30	10
29	9
28	8
26	7
24	6
22	5

Summary of Safety Rules for BrainCap-MR for 3T before April 2020

Together, the BrainCap MR and the BrainAmp MR / MR plus form a MR-conditional system according ASTM 2503-05.

In this context, the term MR-conditional means that restrictions from the manufacturer regarding field strength and imaging sequences apply to the product. A detailed explanation of the conditions for use can be found in the document *'Performing simultaneous EEG-fMRI measurements - Conditions for the safe use of BrainAmp MR amplifiers and accessories in the MR environment'*. A hard copy can be ordered from Brain Products (BP-265-4000) or it can be downloaded from the Brain Products website.

A summary of the main safety related points can be found below.

Any safety rules stipulated by the manufacturer of the MRI-Scanner and the local scanning facility must also be followed.

Scanner field strength and MR-sequences:

The BrainCap MR is designed and approved for field strengths up to 3T.

For MRI sequences used with the BrainCap MR there is a maximum allowed RF power; at 3 T B1+rms must not exceed 1µT.

All other conditions specified in the BrainAmp MR user manual must also be met.

Cable Routing:

No loops in connection cables or electrode leads are allowed. When recording in the MR environment all cables between the BrainCap MR and the BrainAmp MR / MR plus must be routed as straight as possible and must never form loops or similar (e.g. meander).

Amplifier protection:

To protect amplifiers from RF overload it is important that all connected electrodes have low impedance values during measurements in the MR scanner. Impedance values can be verified by means of the impedance mode in BrainVision Recorder.

This also applies if the BrainCap MR is used for measurements on imaging phantoms; all electrodes must be connected and have a low impedance. This can be achieved by covering the entire phantom surface with electrode gel and filling all electrodes with gel. Never perform phantom measurements with the BrainCap MR connected to the amplifier with unterminated electrodes.

Repair:

The cap may not be altered by the customer. For any repair the cap must be sent to Brain Products via the local Brain Products distributor.