

# Description of the BrainVision Core Data Format 1.0

## 1 BRAINVISION HEADER FILE IN TEXT FORMAT (.VHDR)

### 1.1 File Version of header file

The first line must be as follows:

**Brain Vision Data Exchange Header File Version 1.0**

Note: Neither white spaces nor comments must be before this line!

### 1.2 "Common Infos" section

Keyword	Meaning	Mandatory/Optional	Comment
<b>Codepage</b>	Character encoding defined by Codepage. Possible value: <b>UTF-8</b> Character encoding is done according to UTF-8.	Mandatory	In fact, the encoding needs to be known before the file is read.
<b>DataFile</b>	Name of the EEG data file. The placeholder \$b can be used in the file name. It is replaced by the base name of the header file when the file is read in.  <i>Example</i> If the name of the header file is Test.vhdr, the entry DataFile=\$b-EEG.eeg is interpreted as DataFile=Test-EEG.eeg.	Mandatory	It is assumed that the header file, the EEG data file and the optional marker file are in the same folder.

<b>MarkerFile</b>	Name of optional marker file. If it exists the marker file contains a list of markers assigned to the EEG data. For the format of the marker file refer to the section "Marker file" below. The placeholder \$b can be used in the file name (see example for keyword <b>DataFile</b> ).	Optional	It is assumed that the marker file is in the same folder as the header file.
<b>DataFormat</b>	Encoding of EEG data. Possible value: <b>BINARY</b>	Mandatory	
<b>DataOrientation</b>	Arrangement of data in EEG file. Possible value: <b>MULTIPLEXED</b>	Mandatory	In case of <b>MULTIPLEXED</b> all channel data are written sequentially in one line for one sampling point in time. The next line contains the data for the next sampling point in time.
<b>DataType</b>	Data domain. Possible value: <b>TIMEDOMAIN</b> The data is in the time domain.	Optional	This is an optional entry, i.e. if missing the default value <b>TIMEDOMAIN</b> is assumed by BrainVision Analyzer 2.
<b>NumberOfChannels</b>	Number of channels in the EEG file.	Mandatory	Value is of type integer.
<b>SamplingInterval</b>	Sampling interval. The interval is specified in $\mu$ s in the time domain.	Mandatory	Value is of type float.
<b>Averaged</b>	This indicates whether the data set to be read in has been averaged across segments. Possible values are: <b>YES</b> The data set represents data that has been averaged. <b>NO</b> The data set represents data that has not been averaged.	Optional	This is an optional entry, i.e. if missing the default value <b>NO</b> is assumed by BrainVision Recorder 1 and BrainVision Analyzer 2.
• <b>AveragedSegments</b>	This value is only evaluated if <b>AVERAGED=YES</b> . In this case the value states the number of segments included in the average.	Mandatory if <b>AVERAGED=YES</b> otherwise optional	Value is of type integer. The value <b>0</b> corresponds to the case <b>AVERAGED=NO</b> .
• <b>SegmentDataPoints</b>	This value is only evaluated if <b>AVERAGED=YES</b> . In this case the value states the number of data points in the averaged segment.	Mandatory if <b>AVERAGED=YES</b> otherwise optional	Value is of type integer. In BrainVision Recorder 1 the value <b>0</b> corresponds to the case <b>AVERAGED=NO</b> .

			The same is true in BrainVision Analyzer 2 for <b>SegmentationType=MARKERBASED</b> .
<ul style="list-style-type: none"> <li>• <b>SegmentationType</b></li> </ul>	Possible values are: <b>NOTSEGMENTED</b> The data set has not been segmented. <b>MARKERBASED</b> The data set has been segmented on the basis of one or more marker positions.	Mandatory if <b>AVERAGED=YES</b> otherwise optional	In BrainVision Recorder 1 this value is only evaluated if <b>AVERAGED=YES</b> .  In BrainVision Analyzer 2 this value is always used and requires individual segments of same length. If missing the default value <b>NOTSEGMENTED</b> is assumed.

### 1.3 "Channel Infos" section

Keyword	Meaning	Mandatory/Optional	Comment
<b>Ch&lt;x&gt;</b>  <x> stands for the channel number. In other words, the keyword for the first channel is Ch1, for the second channel Ch2, etc.	Individual properties for the channel are specified separated by commas: <channel name>,[<reference channel name>], [<resolution in "unit">],[<unit>]  <i>Example 1</i> Ch1=Fp1,,0.1,µV The first channel has the channel name "Fp1". The common reference channel is used as the reference channel because no entry has been made. The resolution in "unit" is 0.1 (the resolution is the value by which the value of the data point has to be multiplied to convert it to the channel unit). The unit is µV.  <i>Example 2</i> Ch1=Fp1,,,	Mandatory structure <channel name>,,,	<ul style="list-style-type: none"> <li>• &lt;channel name&gt; is of type string</li> <li>• &lt;reference channel name&gt; is of type string (may be empty as in the two examples; then the common reference channel is used as the reference)</li> <li>• &lt;resolution in "unit"&gt; is of type float (may be empty as in <i>Example 2</i>).</li> <li>• &lt;unit&gt; is of type string (may be empty as in <i>Example 2</i>)</li> <li>• BrainVision Analyzer 2 interprets empty units as µV.</li> </ul>

## 1.4 "Binary Infos" section

Keyword	Meaning	Mandatory/Optional	Comment
<b>BinaryFormat</b>	Encoding of EEG data. Possible values: <b>IEEE_FLOAT_32</b> IEEE floating-point format, single precision, 4 bytes per value <b>INT_16</b> 16-bit signed integer	Mandatory	

## 1.5 "Coordinates" section

Keyword	Meaning	Mandatory/Optional	Comment
<b>Ch&lt;x&gt;</b>  <x> stands for the channel number. In other words, the keyword for the first channel is Ch1, for the second channel Ch2, etc.	Coordinates of an individual channel in the form: <Radius>, <Theta>, <Phi>  <i>Example</i> Ch1=1,-92,-72	Optional	<ul style="list-style-type: none"> <li>• &lt;Radius&gt; is of type float</li> <li>• &lt;Theta&gt; is of type float</li> <li>• &lt;Phi&gt; is of type float</li> </ul>

## 1.6 "Comment" section

Keyword	Meaning	Mandatory/Optional	Comment
---	Arbitrary content	Optional	<ul style="list-style-type: none"> <li>To be used for additional information only.</li> <li>Data readers cannot interpret this information unambiguously.</li> </ul>

Note: Lines starting with a “;” are interpreted as comments and are ignored, however, in the “Comment” section “;” has no special meaning.

## 2 BRAINVISION MARKER FILE IN TEXT FORMAT (.VMRK)

The marker file is based on the same principle of sections and keywords as the header file.

### 2.1 File Version

The first line must be as follows:

#### Brain Vision Data Exchange Marker File Version 1.0

Note: Neither white spaces nor comments must be before this line!

### 2.2 "Common Infos" section of the marker file

Keyword	Meaning	Mandatory/Optional	Comment
<b>Codepage</b>	Character encoding defined by Codepage. Possible value: <b>UTF-8</b> Character encoding is done according to UTF-8.	Mandatory	In fact, the encoding needs to be known before the file is read.
<b>DataFile</b>	Name of the EEG data file.	Mandatory	It is assumed that the header file, the EEG data file and the optional marker file are in the same folder.

## 2.3 "Marker Infos" section of the marker file

Keyword	Meaning	Mandatory/Optional	Comment
<b>Mk&lt;x&gt;</b> <x> stands for the marker number. In other words, the keyword for the first marker is Mk1, for the second marker Mk2, etc	Individual properties for the marker are specified separated by commas: <type>,[<description>], <position>,<points>,<channel number>,[<date>]  <i>Example</i> Mk1=Time 0,,26,1,0, The first marker in this example has the type "Time 0", there is no description, its position is at data point 26, its length is 1 data point and the channel number is 0 (which means that this marker applies to all channels), there is no date.  The optional date has the following format: 4 digits = year 2 digits = month 2 digits = day 2 digits = hour (24-hour system) 2 digits = minute 2 digits = second 6 digits = microsecond The date has a time resolution of a microsecond.  <i>Date Example</i> 19990311140312003012 means 11 March 1999, 14:03:12.003012	Mandatory structure <type>,, <position>,<points>,<channel number>,	<ul style="list-style-type: none"> <li>• &lt;description&gt; is of type string (may be empty as in <i>Example</i>)</li> <li>• &lt;position&gt; is of type unsigned integer</li> <li>• &lt;points&gt; is of type unsigned integer</li> <li>• &lt;channel number&gt; is of type integer</li> <li>• &lt;date&gt; see column "meaning", is of type string (may be empty)</li> <li>• In BrainVision Recorder 1 the &lt;date&gt; value is only evaluated if the marker type is "New Segment".</li> </ul>

Notes: All rights on the BrainVision data format are reserved by Brain Products GmbH (e.g. changes on the data format can only be made by Brain Products GmbH).