

# New

## Insight User Manual



### EMOTIV INSIGHT

This document is intended to help you get started using the EMOTIV INSIGHT our 5-channel, prosumer EEG system using semi-dry polymer sensors. Designed for self-quantification, brain-computer interface, and field research, EMOTIV INSIGHT 5-channel mobile EEG boasts advanced electronics that are fully optimised to produce clean, robust signals anytime, anywhere.

If you have any queries beyond the scope of this document, please contact us through our [online support](#).

EMOTIV products are intended to be used for research applications and personal use only. Our products are not sold as Medical Devices as defined in EU directive 93/42/EEC. Our products are not designed or intended to be used for diagnosis or treatment of disease.

## Introduction

# Technical Specifications

<b>Headset Version</b>	Pre-2019	2019
<b>Number of Channels</b>	5 (plus CMS/DRL reference on left mastoid)	5 (plus CMS/DRL reference or left mastoid)
<b>Channel names (International 10-20 locations)</b>	AF3, AF4, T7, T8, Pz	AF3, AF4, T7, T8, Pz
<b>Sampling Method</b>	Sequential sampling, single ADC	Sequential sampling, single ADC
<b>Sampling Rate</b>	128 SPS (2048 Hz internal)	128 SPS (2048 Hz internal)
<b>EEG Resolution</b>	14 bits 1 LSB = 0.51µV (16 bit ADC, 2 bits instrumental noise floor discarded)	14 bits 1 LSB = 0.51µV (16 bit ADC, 2 bits instrumental noise floor discarded)
<b>Bandwidth</b>	0.5 - 43Hz, digital notch filters at 50Hz and 60Hz	0.5 - 43Hz, digital notch filters 50Hz and 60Hz
<b>Filtering</b>	Built in digital 5th order Sinc filter	Built in digital 5th order Sinc filter
<b>Dynamic Range (Input referred)</b>	8400 uV (pp)	8400 uV (pp)
<b>Coupling Mode</b>	AC coupled	AC coupled
<b>Connectivity</b>	Proprietary 2.4GHz wireless (with dongle), BLE	Proprietary 2.4GHz wireless (with dongle), BLE
<b>Battery Capacity</b>	LiPo battery 480mAh	LiPo battery 450mAh
<b>Battery Life (typical)</b>	Up to 8 hours	Up to 8 hours
<b>Impedance Measurement</b>	Real-time contact quality using patented system	Real-time contact quality using patented system
<b>IMU Part</b>	LSM9DS0	ICM-20948
<b>Accelerometer</b>	3-axis +/-8g	3-axis +/-4g
<b>Gyroscope</b>	3-axis +/- 500 dps	Output as Quaternion
<b>Magnetometer</b>	3-axis +/- 12 gauss	3-axis +/- 4900 uTesla

<b>Motion Sampling</b>	128 Hz	64 Hz
<b>Quaternion Outputs</b>	No	Yes
<b>Motion Resolution</b>	14-bit	14-bit (dongle) / 8-bit (BLE)
<b>Sensor Material</b>	Semi dry polymer	Semi dry polymer

## Safety Precautions

Please note the following safety considerations:

- CHOKING HAZARD – detachable small parts. Keep away from small children.
- INSIGHT is a consumer product, it is not intended to use for in-patient health care or in hazardous environments.
- INSIGHT is designed to use at room temperature

**WARNING:** Device is powered by a Lithium-Polymer battery that is rated for operation in <45C environments. It is not user replaceable, please contact support if you suspect a fault or have any questions.

**WARNING:** Do not open the enclosure. Doing so will void the warranty and can damage the headset.

- DO NOT attach the Insight to the charger or USB connector while in use.
- ALWAYS remove the Insight during charging and avoid touching the sensors if fitted. Although unlikely, an insulation failure in the charger or USB source may cause the Insight to become live. Insight will automatically enter sleep mode while attached to the charger, so it is not possible to extend use while charging. Insight may be operated while charging ONLY when used in conjunction with the Emotiv Extender.

**WARNING:** Radio emissions may interfere with appliances and medical equipment including heart pacemakers and automated medical dosimetry systems. Use with caution.

**WARNING:** Discontinue to use if the system becomes uncomfortable to wear or if skin irritation occurs. Users are advised not to share sets of sensors to avoid cross-infection risks.

## Regulatory Compliance

**EMOTIV products are intended to be used for research applications and personal use only. Our products are not sold as Medical Devices as defined in EU directive 93/42/EEC. Our products are not designed or intended to be used for diagnosis or treatment of disease.**

The EMOTIV INSIGHT has been tested for EMC and Safety compliance as a consumer product against FCC, UL and CE standards.

FCC ID Number **2ADIH-INSIGHT01** and IC ID Number: **12769A-INSIGHT01**.

EMOTIV has undertaken testing and confirms:

This device complies with the radio equipment directive (2014/53/EU).

This device complies with part 15 of the FCC Rules. Operation is subject to the following two conditions:

- This device may not cause harmful interference
- 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 causes 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
- Connect the equipment into an outlet on a circuit different from that to which the receiver is connected
- Consult the dealer or experienced person for help

This Class B digital apparatus complies with Canadian ICES-003.

Cet appareil numérique de la classe B est conforme à la norme NMB-003 du Canada.

This device contains licence-exempt transmitter(s)/receiver(s) that comply with Innovation, Science and Economic Development Canada's licence-exempt RSS(s). Operation is subject to the following two conditions:

1. This device may not cause interference
2. This device must accept any interference, including interference that may cause undesired operation of the device

L'émetteur/récepteur exempt de licence contenu dans le présent appareil est conforme aux CNR d'Innovation, Sciences et Développement économique 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'appareil doit accepter tout brouillage radioélectrique subi, même si le brouillage est susceptible d'en

compromettre le fonctionnement.

**Please note that the changes or modifications not expressly approved by the party responsible for compliance could void the user's authority to operate the equipment.**

Our USB dongle has FCC ID Number **XUE-USBD01**.

Type	Standards Tested
EMC and Telecom: Class B	TSI EN 300 440
	EN 301 489-1
	EN 301 328
	AS/NZS CISPR22 :2009
	AS/NZS 4268 :2008
	FCC CFR 47 Part 15C
Safety	IEC 60950-1:2005 (2nd Edition); Am 1:2009 EN 60950-1:2006 + A1:2010 + A11:2009 + A12:2011 AS/NZS 60950.1:2011
	CSA C22.2 No. 60950-1-07, 2nd Edition 2011-12

# Quick Start

## Package Contents

What to expect when your headset arrives and opening the packaging.

Please remove the outer shipping box. Once you open, you will see the INSIGHT travel case and sleeve as shown below.





Remove the travel case from the sleeve by pushing the handle through the sleeve and then sliding the cardboard sleeve off the case. Unzip the case and you will see the following.



INSIGHT travel case open

In the top zippered section of the case, you will find the sensor pack, USB charge cable and a universal USB dongle. At the bottom, you have the headset and the removable headband which clips together as

shown below.



## Setup

Getting the headset assembled and power on.

Setting up INSIGHT is very quick and easy. The sensors are made from a semi-dry polymer. If they are not in use, they should be kept in the sensor holder in the zip lock bag. For ease of setup, we have fitted the sensors for T7 and the reference arm and covered these with a protective film. Please remove the plastic film.





INSIGHT headset inner face with protective film as shipped

Please locate the sensor pack as shown below.



INSIGHT Sensor Pack contents

- Sensor holder has
  - 4 x Standard sensor
  - 1 x Three Prong sensor
  -

- 1 x T7 gummy
- 2 x reference gummy
- Primer fluid bottle
- Allen key for reference and T7 covers



The sensor pack has an extra sensor, for users with thick hair, we recommend to use the three prong sensor. This is designed to have a better hair penetration and recommended to be fitted to the short arm Pz. Please keep the spare sensors within the sensor pack to ensure they do not dry out. Please fit the sensors to the headset as shown below.





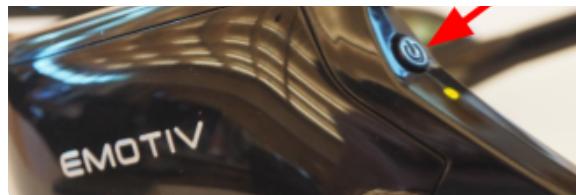
Assembled INSIGHT headset

Before each use, we recommend that you prime the sensors with a small amount of fluid so that they are not dry.



The headset is turned on by pressing the power switch which is located between Pz and the headband; see the image below.





Power button

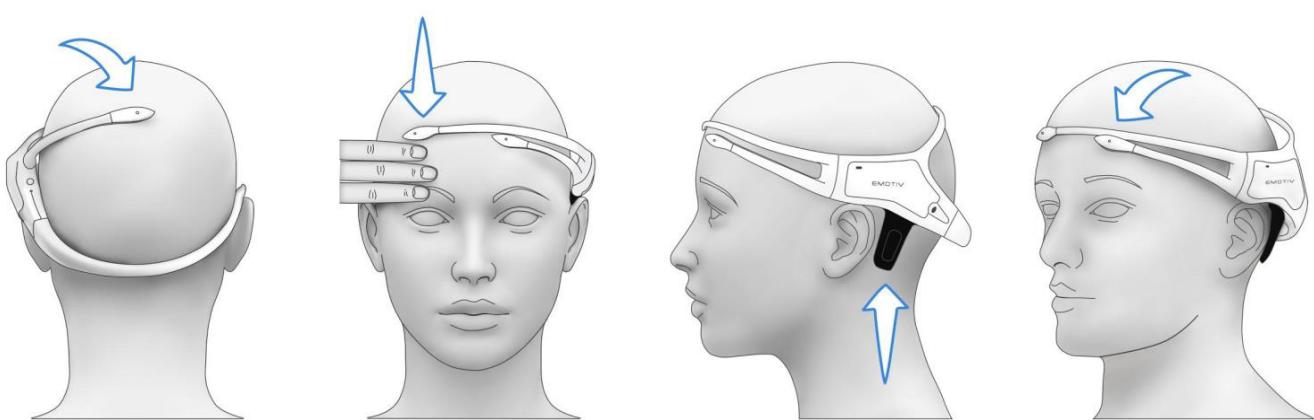
When the unit is on, the white indicator light turns on, its location is shown below. The headset can now be connected to the enclosed dongle or paired to your device via Bluetooth Low Energy (BLE) and it will start to stream data.



Power LED location

## Fitting the headset

Before fitting your headset, please add primer fluid from the sensor pack onto each of the five sensors and both references. Turn on the headset, ensuring the white LED on the front lights and connect it via BLE or to a USB dongle prior to fitting onto the head.



Fitting the INSIGHT

Gently slide the headset onto the head. The reference sensors, which are on the black arm, should make contact with the skin behind the ear. If necessary, gently bend the reference sensor arm so that the sensors make contact with the skin. The frontal sensors should be positioned about three finger widths above the

eyebrows. Below are some shots of the placement for Pz, with the three prong gummy slide it back and forth to work the sensors through the hair to make contact with the scalp.





## Adjusting the headband



INSIGHT headset

The long arm is referred to as the headband and it is manufactured to fit a wide variety of head sizes. The arm is angled inwards so that the sensor when fitted is making contact with the T8 location and not the plastic arm. The headband can be adjusted for users with bigger heads where the shipped headband is not comfortable. This can be done at home using a hairdryer. The arm is made from two separate layers of plastic but can be adjusted by warming the plastic with a hairdryer until it becomes pliable and allows you to slowly adjust the headband and they both need to be warm or it could separate while adjustment.

Please do not try to bend when cold or the plastic could crack.

This method can be used on any of the arms if you feel they aren't making good contact onto the head.

# Tips and Tricks

## Obtaining Good Contact Quality

1. With the headset off, bend the reference band (black arm hanging off the back) in towards the centre of the headset (about 45 degrees) so that when it sits on your mastoid bone it is making full contact with the skin.
2. Get familiar with the location of each of the sensors so you know where to focus on when the headset is on the head.
3. Put on the Glycine/Saline Mix straight from the bottle onto each sensor. Only 1-2 drops are needed. Spread it out with your finger tip.
4. Long Hair? Put it up in a half-pony tail (to sit loosely in a pony on top of the head) so that the part is where P7 Sensor Sits (about crown of head) and the “direction” of the hair on the side of the hair is going up so the hair is against the grain. Your goal is to expose as much skin as possible so having it “slicked back” is not going to help, particularly if your hair is thick.
5. Put headset on, ensuring reference sensors are contacting SKIN on the mastoid bone (the bony part behind the ear)
6. On the headset map in the app, ensure that the reference sensor is green (the one with the black circle). If it is not, add more saline solution, ensure there is no hair in the way and that both the sensors are touching skin. It does not have to be super tight.
7. Work your way around your head to each sensor, focusing on getting scalp contact for each one.
8. Make sure the Pz Sensor (on top of the head) sits on the crown of the head. Part the hair there to ensure contact with the scalp.
9. Get rid of any hair sitting under the sensors by using a finger / bobby pin / pen lid / something that can fish the hair out from underneath the sensor. You should feel the sensor against the scalp. The T7 Sensor (left side, above the ear underneath the main body of the Insight...stick your finger /bobby pin/ pen lid underneath here and pull the hair out of the way. Slightly rub/scratch this part of the headset against your skin until you can really feel the contact with the scalp.
10. SIT STILL and look at the headset map. WAIT at least 5 seconds for each sensor to “settle” before re-adjusting. If needed, readjust each sensor one at a time, sitting still and waiting for it to settle between each adjustment. Aim to get a green sensor for each one before moving onto the next.
11. If needed, put more glycine/saline mix on the head underneath where the sensor is sitting while the headset is still on the head

## Charging

Plug the cable into the Insight (see photo below) ensuring the connector is fully inserted. Attach the cable to an active USB port on your PC or charger. There is a red and green LED located below the power button which will light orange when the charging and green when complete.



Charging Port & LED Indicator

Note the device requires 5V supply and it draws a maximum of 0.5 A from the charge port. If it is plugged into a USB port on your PC, the Insight will check for the maximum available current from the port up to a limit of 0.5 A. Note that if the port does not support extended power mode, Insight will draw 0.1 A and it will charge much more slowly. Try a different USB port if Insight takes more than 2 hours to reach full charge.