

Neurobit Optima+™ 4 / 2 BT / USB

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Portable equipment for neurofeedback, biofeedback & physiological data acquisition

Highlights

Neurobit Optima is a family of highly integrated, **multimodal**, portable devices enabling measurements of physiological signals for psychological training, scientific research, education and similar applications.

They are equipped with 2-4 **versatile**, accurate, low noise measurement channels with **individually configurable** functions, sampling rates, frequency characteristics and other parameters.

High sampling rates up to 2000 sps (with 4 times faster input oversampling) allow wideband biosignals to also be captured.

The devices are available in a wireless, battery powered, **wearable version** and in a **USB powered version**, with medical grade galvanic isolation from the computer for safety and low interference.

Neurobit Optima+ models include an **extension port** for extra modality sensors: BVP, nIR HEG and pIR HEG. It also allows new digital sensors to be added in the future.

Neurobit Optima+ 4 models are also equipped with an **EEG cap interface**, with configurable connections between measurement channels and 10-20 system cap. It facilitates quick QEEG assessments and multi-site EEG training.

All Neurobit Optima devices have built-in **tests of electrode-skin impedances** and circuit continuity.

All channels have individual reference inputs, with connections to **references configured in software**.

High amplifier parameters and configurable filters of mains power noise (50 Hz | 60 Hz | off) increase **immunity to external interference**.

The equipment works with many software applications (including some freeware) for flexible, **real-time signal processing**, visualization, and storage. The **Neurobit API** allows new software to be integrated with any Neurobit device.

Our products are made in the European Union.

REMARK: Neurobit Optima devices are not medical products.



Product features

model	NO-2 BT	NO-2 USB	NO+2 BT	NO+2 USB	NO+4 BT	NO+4 USB
product code	101011	101012	101013	101014	101021	101022
data link	Bluetooth	isolated	Bluetooth	isolated	Bluetooth	isolated
power	batteries	USB	batteries	USB	batteries	USB
number of versatile channels	2	2	2	2	4	4
built-in impedance tests	✓	✓	✓	✓	✓	✓
software setup of reference inputs	✓	✓	✓	✓	✓	✓
selectable frequency characteristics	✓	✓	✓	✓	✓	✓
selectable time constants, incl. DC ¹	✓	✓	✓	✓	✓	✓
configurable filter of mains power noise	✓	✓	✓	✓	✓	✓
active shielding option	✓	✓	✓	✓	✓	✓
main supported modalities	EEG	✓	✓	✓	✓	✓
	sEMG	✓	✓	✓	✓	✓
	ECG	✓	✓	✓	✓	✓
	EOG	✓	✓	✓	✓	✓
	GSR	✓	✓	✓	✓	✓
	HRV	✓	✓	✓	✓	✓
	SCP	✓	✓	✓	✓	✓
	RESP ²	✓	✓	✓	✓	✓
	breath air flow	✓	✓	✓	✓	✓
	skin temperature	✓	✓	✓	✓	✓
	nIR HEG ³			✓	✓	✓
	PIR HEG ³			✓	✓	✓
	BVP (PPG) ³			✓	✓	✓
	extension port			✓	✓	✓
	additional channel for digital sensors ⁴			✓	✓	✓
	EEG cap interface ⁵					✓
belt clip	✓		✓		✓	
power, link and signal state lights	✓	✓	✓	✓	✓	✓
interoperation with many computer applications ⁶	✓	✓	✓	✓	✓	✓
remote firmware upgrade	✓	✓	✓	✓	✓	✓
application programming interface (API)	✓	✓	✓	✓	✓	✓
CE mark	✓	✓	✓	✓	✓	✓

Notes:

¹ DC coupling available for the highest voltage ranges

² measurement of respiratory effort with a belt

³ in channel A, via EXT port

⁴ 3rd or 5th channel; currently it enables events to be marked with a button

⁵ with software setup of connections between 4 channels and the cap electrodes

⁶ BioExplorer, BioEra, BrainBay, Mind-Body Training Tools, Neurobit Recorder and more

Technical data⁹

Number of versatile measurement channels

- NO* 4 models 4
- NO* 2 models 2

Number of extra digital channels (NO+* models) 1

Resolution of ADC conversion 16 bits

Measurement capabilities:

Measured quantity	Application (modalities)	Measurement ranges	Accuracy	Output sample rate (independent for ea. chan.)
Voltage	EEG, sEMG, HRV, EOG etc.	800 μ V 6 mV 24 mV	1 % ¹	2000 1000 500 250 125 62.5 sps
Resistance	resistive sensors of non-electrical quantities	31.25 k Ω 125 k Ω 1 M Ω	1 % ²	15.625 sps
Conductance	GSR (EDA) etc.	1..20 μ S (μ mho) 8..160 μ S (μ mho) 32..640 μ S (μ mho)		15.625 sps
Temperature	skin temperature, breath airflow	-18..120 $^{\circ}$ C	0.2 $^{\circ}$ C (from 0 to 70 $^{\circ}$ C)	15.625 sps
Current (NO+, chan. A)	BVP (PPG) etc.	400 nA AC 2 μ A AC 25 μ A DC		62.5 sps
nIR HEG (NO+, chan. A)	nIR HEG	0..200 %		62.5 sps
pIR HEG (NO+, chan. A)	pIR HEG	0..50 $^{\circ}$ C		62.5 sps

Maximum total sample stream >4000 sps

Oversampling factor 4 (up to 8000 sps input sample rate)

Passband³

- lower corner frequency (-3dB) 0 (DC)⁴ | 0.01 | 0.5 Hz
- upper corner frequency (-3dB)
 - linear phase sharp frequency char. 40 % of output sample rate (up to 800 Hz)
 - linear phase mild frequency char. 30 % of output sample rate (up to 600 Hz)

Notch width of mains power noise filter³ (-3dB) 20 % of the mains power frequency

Common mode rejection ratio (CMRR)^{3,8} >130 dB (60 Hz)

Differential input impedance³ >10 G Ω (DC)

Differential input capacitance³ 340 pF

Equivalent input noise³ 1 μ Vpp (0.15 μ Vrms)⁵

Maximum differential DC component ^{3,6}	±240 mV
Frequency used for measurement of impedance, resistance and conductance	31.25 Hz
Wireless data transmission (BT models)	Bluetooth 2.0 (2.4 GHz), class 2
Wireless link range (BT models)	up to 10 m
Power supply	
<ul style="list-style-type: none"> • BT models • USB models 	2 x AA alkaline or rechargeable NiMH batteries USB port
Battery life ⁷ (BT models)	24 h typ. (alkaline batteries)
USB galvanic isolation barrier (USB models)	
<ul style="list-style-type: none"> • Rated dielectric insulation voltage • Input to output resistance • Input to output capacitance 	2500 Vrms min. (1 minute) 1 TΩ min. 13 pF typ.
Measurement sockets	Touch-Proof 1.5mm (DIN 42802-1)
EEG cap connector (NO+4 models)	DB-25, compatible with Electro-Cap products
USB port connector (USB models)	micro B 2.0
Dimensions (L x W x D)	
<ul style="list-style-type: none"> • BT models (w. clip) • USB models 	117 x 79 x 32 mm 117 x 79 x 27 mm
Weight (w. batteries)	
<ul style="list-style-type: none"> • NO*4 BT models • NO*2 BT models 	190 g 170 g
Working ambient temperature	0..40 °C

Notes:

¹ sine test signal of 8 Hz and amplitude equal to 90 % of the measurement range

² test resistance equal to 90 % of the measurement range

³ for voltage measurements

⁴ DC coupling available for 6 and 24 mV ranges

⁵ EEG profile, 800 μV range, 125 sps, lower corner freq. 0.5 Hz, short-circuited inputs

⁶ for AC measurements

⁷ NO+4 BT device turned on and transmitting

⁸ bipolar measurements, zero source impedance

⁹ for firmware 2.7 and Neurobit Runtime 4.9 or newer