

MuscleBANBE

Data Sheet

MB 03072016

SPECIFICATIONS

- > **Communication:** Bluetooth Low Energy
- > **Range:** up to ~10m (in line of sight)
- > **On-board Sensors:** 1 EMG; 1 Triaxial Accelerometer ($\pm 4g$); 1 Triaxial Magnetometer ($\pm 1200\mu T$)
- > **ACC resolution:** 14-bit
- > **MAG resolution:** 16-bit
- > **EMG resolution:** 12-bit
- > **EMG signal noise:** $3\mu V$
- > **Battery:** 155mA 3.7 LiPo rechargeable (enables up to 8h in continuous operation)
- > **Medical grade charger:** guarantees galvanic isolation
- > **Size:** 28x70x12mm
- > **Weight:** 25g



Fig. 1. MuscleBAN BE form factor.

FEATURES

- > Streams enveloped or raw signal at a maximum rate of 50Hz ¹
- > Raw signal acquired with a selectable base frequency from 1Hz to 1000Hz ¹
- > Selectable frequency divisor for enveloped signal filtering ¹
- > EMG measurements with virtual ground (the reference point is internally created)
- > Envelope algorithm performs the mean of the modulus of the raw signal for the window selected by the base frequency divided by the frequency divisor
- > Battery voltage level events
- > On-/off-body detection events
- > Miniaturized and bendable form factor for better adaption to the body shape

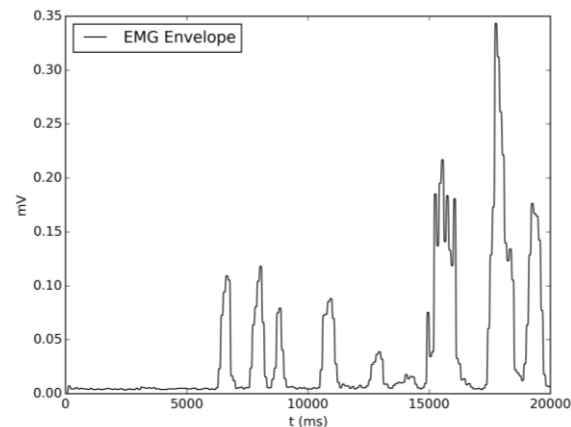


Fig. 2. Enveloped EMG signal

APPLICATIONS

- > Life sciences studies
- > Biomedical research
- > Human-Computer Interaction
- > Robotics & Cybernetics
- > Physiology studies
- > Psychophysiology
- > Biomechanics
- > Ergonomics

¹ This feature is only available using PLUX API since OpenSignals does not support it now. OpenSignals only allows the choice of the base frequency (1000Hz, 800Hz, 400Hz, 200Hz, 160Hz, and 80Hz) and the frequency divisor is fixed at 0.1 of the base frequency (100, 80, 40, 20, 16 and 8).

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REV A

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GENERAL DESCRIPTION

This wearable device measures Electromyography (EMG) and motion data, enabling a wide array of biomedical research, sport and physiotherapy applications.

A total of 7 channels of high-resolution data are available (1 EMG, 3 accelerometer, and 3 magnetometer), which can be streamed in real time as raw data or envelope (selectable) to a computer or mobile device via Bluetooth low energy.

EMG RAW TRANSFER FUNCTION

[-1.14mV, 1.14mV]

$$EMG_{raw}(V) = \frac{\left(\frac{ADC}{2^n - 1} - \frac{1}{2}\right) \cdot VCC}{G_{EMG}}$$

$$EMG_{raw}(mV) = EMG_{raw}(V) * 1000$$

$VCC = 2.5V$ (operating voltage)

$G_{EMG} = 1100$ (sensor gain)

$EMG_{raw}(V)$ – Raw EMG value in Volt (V)

$EMG_{raw}(mV)$ – Raw EMG value in millivolt (mV)

ADC – Value sampled from the channel

n – Number of bits of the channel²

EMG ENVELOPED TRANSFER FUNCTION

[0mV, 1.14mV]

$$EMG_{env}(V) = \frac{ADC}{2^n - 1} \cdot \frac{VCC}{G_{EMG}}$$

$$EMG_{env}(mV) = EMG_{env}(V) * 1000$$

$VCC = 2.5V$ (operating voltage)

$G_{EMG} = 1100$ (sensor gain)

$EMG_{env}(V)$ – Enveloped EMG value in Volt (V)

$EMG_{env}(mV)$ – Enveloped EMG value in millivolt (mV)

ADC – Value sampled from the channel

n – Number of bits of the channel²

² The number of bits for each channel depends on the resolution of the Analog-to-Digital Converter (ADC); in MuscleBAN the default is 16-bit resolution ($n = 16$), although 8-bit ($n = 8$) may also be choose.

MuscleBAN BE

Data Sheet

ACCELEROMETER TRANSFER FUNCTION

[-4G, 4G]

$$Acc(g) = \left(ADC - \frac{2^n}{2}\right) \cdot \left(\frac{8}{2^n}\right)$$

$Acc(g)$ – Accelerometer value in g
 ADC – Value sampled from the channel
 n – Number of bits of the channel³

MAGNETOMETER TRANSFER FUNCTION

[-1200 μ T, 1200 μ T]

$$Mag(\mu T) = \left(ADC - \frac{2^n}{2}\right) \cdot 0,1$$

$Mag(\mu T)$ – Magnetometer value in microTesla (μ T)
 ADC – Value sampled from the channel
 n – Number of bits of the channel³

³ The number of bits for each channel depends on the resolution of the Analog-to-Digital Converter (ADC); in MuscleBAN the default is 16-bit resolution ($n = 16$), although 8-bit ($n = 8$) may also be choose.

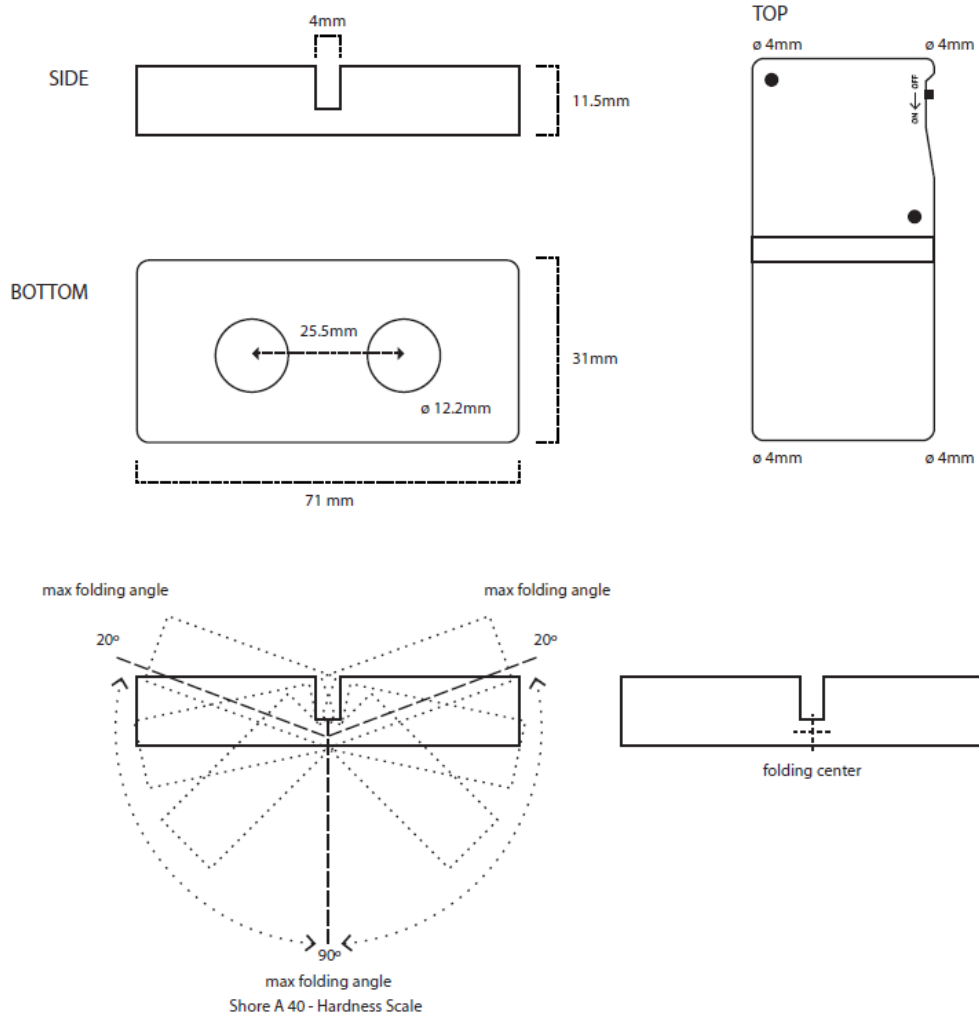
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Data Sheet

PHYSICAL CHARACTERISTICS

> **W x L x H:** 31x71x11mm

> **S:** Sky Blue or Snow White



ORDERING GUIDE

Reference	Package Description