

Electromyography (EMG)

Sensor Data Sheet

EMG 151015

SPECIFICATIONS

- > **Gain:** 1000
- > **Range:** $\pm 1.65\text{mV}$ (with $V_{CC} = 3.3\text{V}$)
- > **Bandwidth:** 10-400Hz
- > **Consumption:** $\sim 4\text{mA}$
- > **Input Impedance:** 100GOhm
- > **CMRR:** 110dB

FEATURES

- > Bipolar differential measurement
- > Pre-conditioned analog output
- > High signal-to-noise ratio
- > Small form factor
- > Raw data output
- > Easy-to-use

APPLICATIONS

- > Human-Computer Interaction
- > Robotics & Cybernetics
- > Physiology studies
- > Psychophysiology
- > Biomechanics
- > Biofeedback
- > Muscle reflex studies
- > Nerve conduction measurement
- > Biomedical devices prototyping

GENERAL DESCRIPTION

Muscle activation is triggered by bioelectrical signals of very low amplitude sent from motor control neurons on our brain to the muscle fibers. Electromyography (EMG) enables the translation of these electrical signals into numerical values, enabling them to be used in a wide array of applications. Our sensor is especially designed for surface EMG, and works both with pre-gelled and most types of dry electrodes. The bipolar configuration is ideal for low-noise data acquisition, and the raw data output enables it to be used for human-computer interaction and biomedical projects alike. Here are a few examples:

<https://www.youtube.com/watch?v=pVAaFeym8TQ>
<https://www.youtube.com/watch?v=7Q4HC0vxFsc>
<http://www.physioplux.com/>

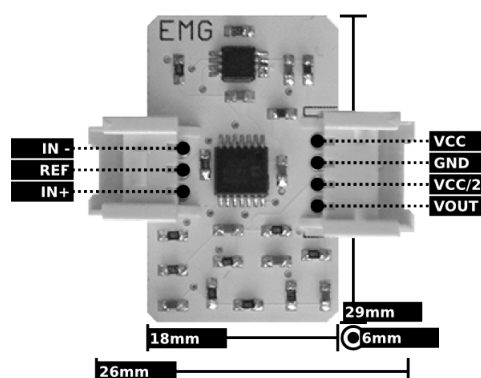


Fig. 1. Pin-out and physical dimensions.

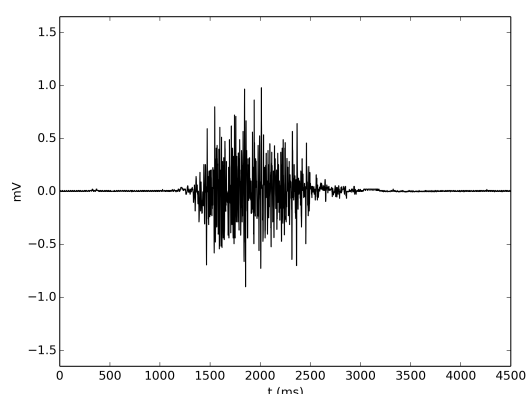


Fig. 2. Typical raw EMG data (acquired with BITalino).

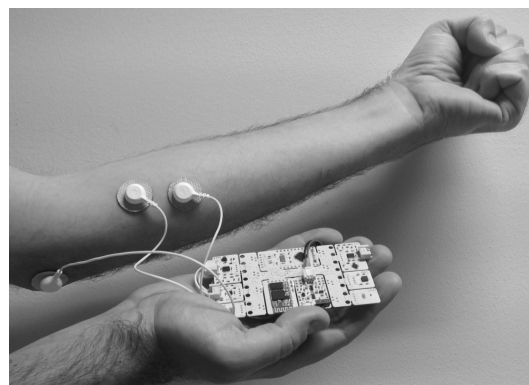


Fig. 3. Example electrode placement, with REF in a bone region (electrically neutral), and IN+ & IN- 20mm apart over the muscle belly (aligned with the muscle fibers).

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REV A

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TRANSFER FUNCTION

$[-1.65mV, 1.65mV]$

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

$$EMG(mV) = EMG(V) \cdot 1000$$

$VCC = 3.3V$ (operating voltage)

$G_{EMG} = 1000$ (sensor gain)

$EMG(V)$ – EMG value in Volt (V)

$EMG(mV)$ – EMG value in millivolt (mV)

ADC – Value sampled from the channel

n – Number of bits of the channel¹

¹ The number of bits for each channel depends on the resolution of the Analog-to-Digital Converter (ADC); in BITalino the first four channels are sampled using 10-bit resolution ($n = 10$), while the last two are sampled using 6-bit ($n = 6$).