

INTERNATIONAL STANDARD

**Wearable electronic devices and technologies -
Part 403-1: Test method of surface electromyography sensors on forearm and
hand for wearable applications**

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INTERNATIONAL ELECTROTECHNICAL COMMISSION

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The text of this International Standard is based on the following documents:

Draft	Report on voting
124/390/FDIS	124/395/RVD

Full information on the voting for its approval can be found in the report on voting indicated in the above table.

The language used for the development of this International Standard is English.

This document was drafted in accordance with ISO/IEC Directives, Part 2, and developed in accordance with ISO/IEC Directives, Part 1 and ISO/IEC Directives, IEC Supplement, available at www.iec.ch/members_experts/refdocs. The main document types developed by IEC are described in greater detail at www.iec.ch/publications.

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Sample Document

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1 Scope

This document specifies test methods for surface electromyography (sEMG) sensors by evaluating the quality of sEMG signals obtained from contracting the muscles of the forearm and hand for wearable applications. It is applicable to sEMG sensors that are used to decipher movement intentions and use them as control signals in situations such as virtual reality, game, unmanned aerial vehicles (UAV), robot control, and home automation. This document does not apply to sEMG sensors intended for medical diagnosis or treatment. For medical devices, national requirements can apply.

2 Normative references

The following documents are referred to in the text in such a way that some or all of their content constitutes requirements of this document. For dated references, only the edition cited applies. For undated references, the latest edition of the referenced document (including any amendments) applies.

IEC 60050-702:1992, *International Electrotechnical Vocabulary (IEV) - Part 702: Oscillations, signals and related devices*
 IEC 60050-702:1992/AMD1:2016
 IEC 60050-702:1992/AMD2:2016
 IEC 60050-702:1992/AMD3:2017
 IEC 60050-702:1992/AMD4:2018
 IEC 60050-702:1992/AMD5:2019
 IEC 60050-702:1992/AMD6:2021

3 Terms and definitions

For the purposes of this document, the terms and definitions given in IEC 60050-702 and the following apply.

ISO and IEC maintain terminology databases for use in standardization at the following addresses:

- IEC Electropedia: available at <https://www.electropedia.org/>
- ISO Online browsing platform: available at <https://www.iso.org/obp>

3.1

surface electromyography

sEMG

technique in which electrodes are placed on the skin over muscles to detect the electrical activity of the muscles

3.2

electrode

part of the sensor that transfers the electric potential on the skin to the electric circuit of the sensor

3.3

sEMG sensor

device that produces a signal by measuring the electrical potential difference between the electrodes

3.4

sEMG signal

electrical signal of muscles detected by sensors that are placed on the skin above those muscles

3.5**subject**

person or animal that is being tested or studied

Note 1 to entry: In this document, it is the person being tested.

3.6**palpation**

act of examining part of the body by touching it

3.7**baseline noise**

electrical signal acquired from sEMG sensors attached to the skin when targeted muscles are relaxed as much as possible

3.8**signal-to-noise ratio****SNR**

ratio, generally expressed in decibels, of the power of the wanted signal to that of the coexistent noise at a specified point in a transmission channel under specified conditions

[SOURCE: IEC 60050-702:1992, 702-08-61, modified – Note to entry deleted.]

3.9**passive sEMG sensor**

sEMG sensor that produces raw signals which can require further amplification or signal processing

3.10**active sEMG sensor**

sEMG sensor that is equipped with amplifier or signal processing circuit

4 Test conditions**4.1 Test environment**

The test is carried out under the environmental operating range (ambient temperature, relative humidity, atmospheric pressure) specified by the manufacturer. It is recommended to have the test conducted in an environment that is isolated from power line sources, and other external noise sources (such as vibrations from a machine, and crowded place).

4.2 Subject requirement

The requirements for subjects are as follows.

- a) The test methods in this document apply to subjects with intact upper limbs.
- b) The subjects shall be healthy and free from muscle or nerve-related disorders.
- c) Subjects shall wear loose clothes that allow their forearms and hands to be exposed easily.
- d) The subject shall clean their forearm to remove the oil and skin debris before the test, or the test operator can choose not to clean the skin and record the testing condition of the skin. It is also recommended to shave excessive hairs on the forearm.
- e) The subjects shall maintain the posture they are comfortable with during the test, or the experimenter can choose whether the subject should maintain the posture or move the upper arm in a specific sequence and record the testing conditions.