

IEEE Standard for Sensor Performance Parameter Definitions

IEEE Electron Devices Society

Sponsored by the
Microelectromechanical Systems Standards Development Committee

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Microelectromechanical Systems Standards Development Committee
of the
IEEE Electron Devices Society

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Abstract: A common framework for sensor performance specification terminology, units, conditions and limits is provided. Specifically, the accelerometer, magnetometer, gyrometer/gyroscope, barometer/pressure sensors, hygrometer/humidity sensors, temperature sensors, ambient light sensors, and proximity sensors are discussed.

Keywords: ambient light, accelerometer, gyroscope, humidity, IEEE 2700™, magnetometer, MEMS, microelectromechanical proximity, sensors systems, pressure, temperature, terminology

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Introduction

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Microelectromechanical systems (MEMS) have become a key enabling technology for many of today's high-technology products, including automotive sensors, smart phones, and the new consumer market of wearable fitness devices. MEMS are also supporting new breakthroughs in areas such as green energy and portable medical diagnostic and treatment technologies. These factors make them a keystone for advanced manufacturing, jobs, and technology innovation. The MEMS Industry Group (MIG) and its member MEMS companies, large and small, have recognized MEMS testing as a growing industrial issue and a pre-competitive place in the value chain where cooperation would benefit all competitors and customers.

MIG has documented that the lack of testing standards attributes to increasing costs of MEMS device manufacturing. Today, the cost to test MEMS devices is from a third to as much as two thirds of the total manufacturing costs. Often, the most complex and promising devices have the highest testing costs. The industry group sees an urgent need to standardize MEMS testing whose impact is only increasing as a direct result of advances in MEMS innovation. IEEE Std 2700 addresses the issue of non-uniformity in MEMS sensor data sheets, by defining the sensor performance parameters that are typically used in MEMS sensor technologies. Potential customers use data sheets to select the devices that they will design into their systems. Potential customers use data sheets to compare the performance of devices from multiple manufacturers. Data sheets contain specifications of the device performance, the package design, operating temperature, input and output signals, etc. Even though the data sheets may not reflect the type of testing that goes into qualification or production test, they should not conflict with those measurements.

This standard is expected to be the first in many that will follow. The performance parameters defined in this standard will each need standard testing protocols to ensure that device performance data measured by any party (buyer or seller) is in agreement and within a determined uncertainty.

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1. Overview

1.1 Scope

This standard provides a common framework for sensor performance specification terminology, units, conditions, and limits. The specific sensors discussed in this standard are the accelerometer, magnetometer, gyrometer/gyroscope, barometer/pressure sensors, hygrometer/humidity sensors, temperature sensors, ambient light sensors (ALSs), and proximity sensors.

1.2 Objective

The explosive adoption of sensor technologies in the consumer electronics industry and the variety of sensor types, vendors, and integration considerations present original equipment manufacturers (OEMs), independent software vendors (ISVs), and other platform providers with a non-scalable integration challenge. Therefore, it is imperative that this ever-expanding industry adopt a common methodology for specifying sensor performance. This standard intends to minimize and distribute adoption burden while preserving product differentiation and innovation.

1.3 Purpose

This standard presents a standard methodology for defining sensor performance parameters in order to ease system integration burden and accelerate time to market (TTM). This standard fulfills the need for a