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# IEEE Standard for Sensor Performance Parameter Definitions

IEEE Electron Devices Society

Sponsored by the
Microelectromechanical Systems Standards Development Committee

IEEE
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USA

**IEEE Std 2700™-2017**
(Revision of IEEE Std 2700-2014)

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# IEEE Standard for Sensor Performance Parameter Definitions

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**Microelectromechanical Systems Standards Development Committee**
of the
**IEEE Electron Devices Society**

Approved 15 June 2017

**IEEE-SA Standards Board**

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

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

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The P2700 Working Group gratefully acknowledges the contribution of the following entities. Without their assistance and dedication, this standard would not have been completed.

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## Introduction

This introduction is not part of IEEE Std 2700-2017, IEEE Standard for Sensor Performance Parameter Definitions.

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 & Sensors Industry Group® (MSIG) and its member companies, large and small, have recognized standardized MEMS device performance definitions as an industrial need and a pre-competitive place in the value chain where cooperation would benefit all competitors and customers.

MSIG has documented that the lack of performance definitions and testing standards contributes to increasing costs of MEMS device manufacturing. Furthermore, the most advanced devices have the highest performance testing requirements. This standard addresses the issue of non-uniformity in MEMS sensor data sheets, by defining the sensor performance parameters that are used in typical MEMS sensor technologies. Potential customers use data sheets to compare the performance of devices from multiple manufacturers and select the devices that they will design into their systems. 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 help ensure that device performance data measured by any party (buyer or seller) is in agreement and within a determined uncertainty.

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# IEEE Standard for Sensor Performance Parameter Definitions

## 1. Overview

### 1.1 Scope

This standard provides a common framework for sensor performance specification terminology, units, conditions, and limits. This standard is intended for sensor technologies with digital I/O interfaces. The specific sensors discussed in this standard are the accelerometer, magnetometer, gyrometer/gyroscope, accelerometer/magnetometer/gyroscope combination sensors, barometer/pressure sensors, hygrometer/humidity sensors, temperature sensors, light sensors (ambient and RGB), and proximity sensors.

### 1.2 Objective

Given the explosive adoption of sensor technologies in the consumer electronics industry and the variety of sensor types, vendors, and integration considerations, it is acknowledged that original equipment manufacturers (OEMs), independent software vendors (ISVs), and other platform providers are faced with a non-scalable integration challenge. Therefore, it is imperative that a common methodology for specifying sensor performance is adopted by the ever-expanding industry. It is intended that adoption burden be reduced and distributed while preserving product differentiation and innovation.

Additionally, as this standard strives to reflect innovations in the sensor industry, it has been revised with the following additions:

— Accelerometer Allan Variance parameter

— Accelerometer, magnetometer, and gyroscope combination sensor with a sensor to sensor axis aligment parameter

— Relative humidity (RH) sensor hysteresis parameter

— Red green blue (RGB) light sensor added to appropriate ambient light sensor (ALS) parameters

### 1.3 Purpose

This standard presents a standard methodology for defining sensor performance parameters with the intent to ease system integration burden and accelerate time to market (TTM). Here within, a minimum set of performance parameters are defined with required units, conditions, and distributions for each sensor. Note that these performance parameters shall be included with all other industry accepted performance parameters.