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IEEE Standard for Specifying and Testing Single-Axis Interferometric Fiber Optic Gyros

STANDARDS

IEEE Aerospace and Electronics Society

Developed by the
Gyro and Accelerometer Panel

IEEE Std 952™-2020
(Revision of IEEE Std 952-1997

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Gyro and Accelerometer Panel
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IEEE Aerospace and Electronics Systems Society

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Abstract: Specification and test procedures for a single-axis interferometric fiber optic gyro (IFOG) for use as a sensor in attitude control systems, angular displacement measuring systems, and angular rate measuring systems are defined. The test procedures are derived from those presently used in the industry.

Keywords: fiber gyro, fiber optic gyro, FOG, gyro, gyroscope, IEEE 952™, IFOG, inertial instrument, inertial sensor, interferometric fiber optic gyro, optical gyro, Sagnac effect, Sagnac gyro, specification, test procedures

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Participants

This standard represents a large-scale, group effort. A total of 116 individuals attended 40 meetings of the Gyro and Accelerometer Panel during preparation of the original standard, IEEE Std 952™-1997. The major contributors to IEEE Std 952-1997 were as follows:

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At the time this revised standard was completed, the Sensors Working Group had the following participants:

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The following members of the individual balloting committee voted on this standard. Balloters may have voted for approval, disapproval, or abstention.

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Introduction

This introduction is not part of IEEE Std 952-2020, IEEE Standard for Specifying and Testing Single-Axis Interferometric Fiber Optic Gyros.

This standard was prepared by the Gyro and Accelerometer Panel of the IEEE Aerospace and Electronic Systems Society.

Clause 4 through Clause 8 are used to develop a single-axis interferometric fiber optic gyro (IFOG) specification. The user is cautioned not to over-specify; only those parameters that are required for proper instrument performance in the specific application should be controlled. Parameters in addition to those given in this standard are not precluded. However, the specification should contain only those requirements that can be verified.

Clause 9 through Clause 12 are used to develop procedures for testing a single-axis IFOG. These procedures, including test conditions to be considered, are derived from those currently in use. For a specific application, the test procedure should reflect the requirements of the specifications; therefore, not all tests outlined in this standard need to be included, nor are additional tests precluded. In some cases, alternative methods for measuring performance characteristics have been included or indicated.

The intent is for the specification writer to extract the applicable test conditions and equipment requirements from Clause 11 for inclusion in the appropriate subclauses listed under 6.5. Similarly, it is intended that the writer extracts the applicable test procedures from Clause 12 for inclusion in the appropriate subclauses listed under 6.6. Clause 9 through Clause 12 can also be used to prepare a separate single-axis IFOG test specification with appropriate clause numbering. Each requirement should have a test procedure under subclause 6.6. A test should only be included if a related requirement exists under Clause 5.

Blank spaces in the text of this standard permit the specification writer to insert specific information, such as parameter values and their tolerances, clause numbers, etc. Brackets are to be used to enclose alternative choices of dimensional units, signs, axes, etc. Boxed statements are included for information only and are not part of the specification or test procedures. The terminology used conforms to *IEEE Standards Dictionary Online*[1], IEEE Std 528™-1994[2, 3], and IEEE Std 812™-1984[4]. The units used conform to ANSI 268-1992. The abbreviation of units conforms to IEEE Std 260.1™-1993. The graphic symbols used conform to IEEE Std 315™-1975 and IEEE Std 315A™-1986. The letter symbols used conform to IEEE Std 280™-1985.

This standard defines the requirements and test procedures for an IFOG in terms unique to that gyro. The requirements contained in this standard cover application where the gyro is used as an angular motion sensor in navigation and control systems.

The term *interferometric fiber optic gyro* is accepted to include the electronics necessary to operate the gyro and to condition the output signal.

Annex A lists various gyro design features for which this format is applicable. The table therein is not intended to make any suggestions regarding the selection of particular design features that might restrict the free choice of manufacturers.

Annex B is an overview of dynamic and stochastic modeling.

[1] *IEEE Standards Dictionary Online* is available at: http://ieeexplore.ieee.org/.
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Annex C is an overview of noise process variance analysis as a method for determination of the drift rate coefficients and the quantization coefficient.

Annex D is a compliance matrix, and Annex E is a comprehensive bibliography.

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IEEE Standard for Specifying and Testing Single-Axis Interferometric Fiber Optic Gyros

1. Overview

1.1 Scope

This standard defines requirements and test procedures for a single-axis interferometric fiber optic gyro (IFOG), including any necessary electronics, to be used in an attitude control system, an angular displacement measuring system, an angular rate measuring system, or other such system.

1.2 Purpose

This standard provides a common format for the development of a single-axis IFOG specification that includes best-practice test procedures and uses common terminology for manufacturers and users.

1.3 Word usage

The word *shall* indicates mandatory requirements strictly to be followed in order to conform to the standard and from which no deviation is permitted (*shall* equals *is required to*).[1, 2]

The word *should* indicates that among several possibilities one is recommended as particularly suitable, without mentioning or excluding others; or that a certain course of action is preferred but not necessarily required (*should* equals *is recommended that*).

The word *may* is used to indicate a course of action permissible within the limits of the standard (*may* equals *is permitted to*).

The word *can* is used for statements of possibility and capability, whether material, physical, or causal (*can* equals *is able to*).

[1] The use of the word *must* is deprecated and cannot be used when stating mandatory requirements, *must* is used only to describe unavoidable situations.

[2] The use of *will* is deprecated and cannot be used when stating mandatory requirements, *will* is only used in statements of fact.

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