



IEEE Standard Specification Format Guide and Test Procedure for Single-Axis Laser Gyros

IEEE Aerospace and Electronic Systems Society

Sponsored by the
Gyro and Accelerometer Panel

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Gyro and Accelerometer Panel
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Abstract: Specification and test requirements for a single-axis ring laser gyro (RLG) for use as a sensor in attitude control systems, angular displacement measuring systems, and angular rate measuring systems are defined. A standard specification format guide for the preparation of a single-axis RLG is provided. A compilation of recommended procedures for testing an RLG, derived from those presently used in the industry, is also provided.

Keywords: dithered gyro, gyro, gyroscope, inertial instrument, inertial sensor, optical gyro, resonant cavity, ring laser gyro, RLG, Sagnac effect, Sagnac gyro.

The Institute of Electrical and Electronics Engineers, Inc.
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Introduction

This introduction is not part of IEEE Std 647-2006, IEEE Standard Specification Format Guide and Test Procedure for Single-Axis Laser Gyros.

This standard is a minor revision of IEEE Std 647-1995 that corrects errors made in the publication process and adds minor technical improvements. It consists of two parts.

Part I is a specification format guide for the preparation of a laser gyro specification. It provides a common meeting ground of terminology and practice for manufacturers and users. The user is cautioned not to overspecify; only those parameters that are required to guarantee proper instrument performance in the specific application should be controlled. In general, the specification should contain only those requirements that can be verified by test or inspection. Parameters in addition to those given in this standard are not precluded.

Part II is a compilation of recommended procedures for testing a laser gyro. 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 specification; therefore, not all tests outlined in this standard need 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 clauses listed under 6.5. Similarly, it is intended that the writer extract the applicable test procedures from Clause 12 for inclusion in the appropriate subclauses listed under 6.6. Part II can also be used as a guide in the preparation of a separate laser gyro test specification with appropriate clause numbering. In general, the intent is for the specification writer to ensure consistency and traceability between Part II test procedures and Part I requirements for performance, mechanical, electrical, environmental, reliability, and quality assurance. To that end, a test procedure should not be listed in Part II unless a related requirement exists in Part I.

Blank spaces in the text of this document permit the specification writer to insert specific information such as parameter values and their tolerances, clause numbers, etc. Brackets are 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 following standards were used in the development of this standard.

ANSI/IEEE Std 260.1, IEEE Standard Letter Symbols for Units of Measurement (SI Units, Customary Inch-Pound Units, and Certain Other Units).

ANSI/IEEE Std 268, American National Standard for Metric Practice.

ANSI/IEEE Std 280, IEEE Standard Letter Symbols for Quantities Used in Electrical Science and Electrical Engineering.

ANSI/IEEE Std 315, IEEE Graphic Symbols for Electrical and Electronics Diagrams.

IEEE Std 528, IEEE Standard for Inertial Sensor Terminology.

This standard defines the requirements and test procedures for a single-axis laser gyro in terms unique to the laser gyro. The requirements contained herein cover applications where the laser gyro is used as an angular motion sensor in navigation and control systems.

The term *laser gyro* is accepted to include the electronics necessary to operate the gyro and to condition the output signal. The laser gyro provides an output frequency proportional to inertial angular rate about its input axis.

Annex A lists various laser gyro design features for which this format is applicable. The list is not intended to make any suggestion 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.

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 bibliography.

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Errata, if any, for this and all other standards can be accessed at the following URL: <http://standards.ieee.org/reading/ieee/updates/errata/index.html>. Users are encouraged to check this URL for errata periodically.

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Participants

This standard represents a large-scale group effort. A total of 143 individuals attended 46 meetings of the Gyro and Accelerometer Panel during preparation of this standard.

The following individuals on the Gyro and Accelerometer Panel were major contributors to IEEE Std 647-2006:

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David Anderson	Thomas Fuhrman	Jay Murphy
Michael Ash	Frank Garcia	Gordon Murray*
Cleon Barker	Kerry Green	Jay Neugroschl
Stephen Becka	Michael Hooser	Rex Peters*
Joseph Beri	Bert Katz	Loren Richardson
Stephen Bongiovanni	Menno Koning	Gerald Shaw
Pierre Bouniol	Lalit Kumar	Philip Simpson
Herbert Califano	Kurt Lantz	Norman Sinnott*
Anthony Campbell*	Thomas Lear*	Timothy Stanley
Joseph D'Angelo	David Lynch	Mohammad Tehrani
James Davies*	David Macy	Leroy Thielman
George Erickson	R. D. (Sam) Marquess	Ludd Trozpek
Julius Feldman	Harold Morris	Bud Wimber*
Joseph Ficalora	Gerald Morrison*	David Winkel
Scott Finken	Ralph (Bart) Morrow	Bruce Youmans

*Past Chair

A total of 50 individuals attended 12 meetings of the Gyro and Accelerometer Panel during the preparation of this revision. The following individuals on the Gyro and Accelerometer Panel contributed to this standard:

Randall Curey, *Chair*

Michael Ash	George Erickson	Reese Sturdevant
Cleon Barker	Kerry Green	Daniel Tazartes
Sid Bennett*	Jean-François Kieffer	Leroy Thielman
Timothy Buck	Robert Martinez	Bruce Youmans
Herbert Califano	Ralph (Bart) Morrow	

*Past Chair

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

Michael Ash	Randall Curey	Vladimir Skvortzov
Cleon Barker	Robert Dahlgren	Daniel Tazartes
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Angela Ortiz
IEEE Standards Program Manager, Technical Program Development

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