

IEEE Specification Format for Single-Degree-of-Freedom Spring-Restrained Rate Gyros

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Acknowledgment

The Institute wishes to acknowledge its indebtedness to those who have so freely given of their time and knowledge and have conducted experimental work on which many of the IEEE publications are based.

This Specification Format and the Test Procedure for Single-Degree-of-Freedom Spring-Restrained Rate Gyros (IEEE Standards Publication No. 293) represent a group effort on a large scale. They were generated as projects of the Gyro and Accelerometer Panel from May of 1962 to November of 1967. The Gyro and Accelerometer Panel (GAP) affiliated with the IEEE in May of 1965 and is now a part of the IEEE Aerospace and Electronic Systems Group. A total of 238 individuals attended 30 GAP meetings while these documents were in preparation. Fifty-one individuals attended six meetings or more and provided 61 percent of the total attendance of 916. These people are listed here.

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Introduction

This Specification Format has been prepared as a *guide* for the preparation of a single-degree-of-freedom spring-restrained rate gyro specification. Prepared by the Gyro and Accelerometer Panel of the Aerospace Electronic Systems Group of the Institute of Electrical and Electronics Engineers, this format provides a common meeting ground of terminology and practice for manufacturers and users.

Two other documents, Aerospace Industries Association EETC Report No. 5 (Revision A), "Standard Gyro Terminology,"* and IEEE Standards Publication No. 293, "Test Procedure for Single-Degree-of-Freedom Spring-Restrained Rate Gyros," have been utilized in the preparation of this format. This format will be limited to conventional single-degree-of-freedom spring-restrained rate gyros. A model equation is given in paragraph 6.3 for reference, and is to be included in a specification only to the extent necessary.

Table 1, on this page, lists various rate gyro design features for which this format is applicable. The table is not intended to make any suggestion regarding the selection of particular design features that might restrict the free choice of manufacturers.

Blank spaces are provided in the Specification Format for the insertion of specific values. Brackets are used to designate possible alternates. Boxed information is intended for explanatory purposes. Figures 1, 2, and 3 are to be used as a guide for the preparation of specific figures or drawings.

The user is cautioned not to *overspecify*. Only those parameters that are required to guarantee proper instrument performance in the intended usage should be controlled.

* Available from: National Standards Association, Inc.
1321 Fourteenth Street N.W.
Washington, D.C. 20005

Table 1—Rate Gyro Design Features

Pickoff	Spin Motor	Damping Regulation	Self-Test Torquer	Rotor Rotation Detector
1. Variable reluctance (microsyn)	1. Ac synchronous hysteresis (3-phase, 2-phase)	1. Self-compensating	1. Variable reluctance	1. Pulse
2. Potentiometer	2. Ac induction (squirrel cage rotor) (3-phase, 2-phase)	2. Controlled temperature (heater controlled)	2. Dc permanent magnet	2. Near sinusoidal
3. Switch	3. Dc (with governor)	3. Uncompensated		
4. Other (optical, capacitance)				

NOTE — The intent of this table is to indicate configurations of a spring-restrained rate gyro for which this specification format is applicable. The features may be employed in any combination.

SPECIFICATION COVER SHEET

RATE GYRO, _____ DEGREES PER SECOND

Specification No. _____

Date

Procuring Firm or Organization Data

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IEEE Specification Format for Single-Degree-of-Freedom Spring-Restrained Rate Gyros

1. Scope

This specification defines the requirements for a single-degree-of-freedom spring-restrained rate gyro for [aircraft, missile, spacecraft, _____] applications. The rate gyro shall be capable of providing [(dc, ac) voltage outputs proportional to angular rate inputs up to _____ degrees per second, a switch closure(s) at angular rates (exceeding, less than) _____ (+, -, $\pm$) _____ degrees per second].

2. Applicable Documents

The following documents of the issue in effect on date of invitation for bid or request for proposal form a part of the specification to the extent specified herein. In the event of any conflict between the requirements of this document and the listed documents, the requirements of this document shall govern.

2.1 Specifications

2.1.1 Government

2.1.2 Industry/Technical

2.1.3 Company

2.2 Standards

2.2.1 Government

2.2.2 Industry/Technical

2.2.2.1

Aerospace Industries Association, EETC Report No. 5 (Revision A), "Standard Gyro Terminology," June 1965.

2.2.2.2

IEEE Standards Publication No. 293, "Test Procedure for Single-Degree-of-Freedom Spring-Restrained Rate Gyros."

2.2.3 Company

2.3 Drawings

2.3.1 Government

2.3.2 Industry/Technical

2.3.3 Company

2.4 Bulletins

2.4.1 Government

2.4.2 Industry/Technical

2.4.3 Company

2.5 Other Publications

Other applicable documents should be listed under the appropriate paragraph.
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3. Requirements

3.1 Description

The major components of the rate gyro herein specified are a [variable reluctance (microsyn), potentiometer, switch,_____] pickoff, a rotor, a [hysteresis synchronous, induction, direct current,_____] spin motor, and [self-compensated, controlled temperature, uncompensated] damping. The elastic restraint is accomplished by a mechanical spring. A [variable reluctance (microsyn), direct-current permanent magnet,_____] torquer and a rotor rotation detector are included as self-test features. See Figure 1.

Self-test features may or may not be required.
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3.2 General Requirements

3.2.1 Precedence

In the event of conflict among the purchase agreement, this specification, and other documents referred to herein, the order of precedence shall be as follows:

- a) purchase agreement,
- b) this specification and its applicable drawings (see paragraphs 3.4.2, 3.4.6, and 3.5.1),
- c) other applicable documents (see Section 2.).

3.2.2 Definitions

The following documents define terminology used in this specification, and the test techniques that will be utilized to determine unit compliance.

3.2.2.1 : Standard Gyro Terminology, Aerospace Industries Association EETC Report No. 5 (Revision A).

3.2.2.2 : Test Procedure for Single-Degree-of-Freedom Spring-Restrained Rate Gyros, IEEE Standards Publication No. 293.

3.3 Performance

The tolerances include a summation of manufacturing and test errors, and environmental effects. Any exceptions due to environmental effects are listed under paragraph 3.6.3.1.

3.3.1 Input Limits

$\pm$ _____ °/s.

The positive and negative input limits need not be equal.

3.3.1.1 Limit Stops

The output angle shall be mechanically limited to an input limit value of $\pm$ _____ °/s.

A tolerance may be specified if necessary. The positive and negative limit stops need not be equal.

3.3.1.2 Mechanical Overload

The rate gyro shall perform within specification after an angular rate of _____ °/s has been applied about the _____ [axis, axes] for _____ seconds a total of _____ times. The rate gyro shall perform within specification after an angular acceleration of _____ °/S² has been applied about the _____ [axis, axes] for _____ seconds, a total of _____ times.

3.3.2 Gyro Scale Factor

_____ $\pm$ _____ V/(°/s).

3.3.3 Natural Frequency

[_____ $\pm$ _____ hertz, not less than _____ hertz].

3.3.4 Damping Ratio

_____ $\pm$ _____.

Acceptable limits are sometimes specified graphically.