



## Standard Specification for Tachometers, Various<sup>1</sup>

This standard is issued under the fixed designation F2046; the number immediately following the designation indicates the year of original adoption or, in the case of revision, the year of last revision. A number in parentheses indicates the year of last reapproval. A superscript epsilon ( $\epsilon$ ) indicates an editorial change since the last revision or reapproval.

*This standard has been approved for use by agencies of the U.S. Department of Defense.*

### 1. Scope

1.1 This specification covers various tachometers capable of measuring rotational shaft speed.

1.2 Special requirements for tachometer types used in naval shipboard applications are included in Supplement S1.

1.3 The values stated in SI units are to be regarded as standard. The values given in parentheses are mathematical conversions to inch-pound units that are provided for information only and are not considered standard.

1.4 *This international standard was developed in accordance with internationally recognized principles on standardization established in the Decision on Principles for the Development of International Standards, Guides and Recommendations issued by the World Trade Organization Technical Barriers to Trade (TBT) Committee.*

### 2. Referenced Documents

2.1 *ASTM Standards:*<sup>2</sup>

D3951 Practice for Commercial Packaging

### 3. Terminology

3.1 *Definitions:*

3.1.1 *SI (Le Systeme International d'Unites) Units, n*—units of measurement recognized by the Comite' International des Poids et Mesures (CIPM).

3.1.2 *tachometer, n*—an instrument capable of generating, transmitting, and indicating information or signal that can be converted into a function of rotational speed.

### 4. Classification

4.1 *Design Types*—The following are among the types of tachometers available:

- (1) Centrifugal;
- (2) Centrifugal, flexible drive;
- (3) Chronometric;
- (4) Electrical, alternating current (ac) voltage responsive, direct drive;
- (5) Electrical reactance;
- (6) Electrical, magnetovoltmeter, direct drive;
- (7) Electrical, magnetovoltmeter;
- (8) Frequency responsive, electrical control box and voltmeter, direct drive;
- (9) Frequency sensitive, electrical, nonrotating magnetic pickup, direct drive, consists of a magnetic pickup, transducer, and indicator;
- (10) Photoelectric;
- (11) Digital contact;
- (12) Centrifugal, flexible drive; and
- (13) Vibrating resonant reed.

### 5. Ordering Information

5.1 The buyer shall provide the manufacturer with all of the pertinent application data in accordance with the acquisition requirements, 5.2.

5.2 *Acquisition Requirements*—Acquisition documents shall specify the following:

- (1) Title, number, and date of this specification;
- (2) Quantity of tachometers required;
- (3) Range;
- (4) Manufacturer's part number;
- (5) When qualification inspection is required;
- (6) Final disposition of qualification test samples;
- (7) Type of electrical connection;
- (8) Mounting method;
- (9) Environmental requirements;
- (10) Materials;
- (11) Size and weight restrictions;
- (12) Critical service life requirements;
- (13) Performance requirements;
- (14) Surface finish requirements;
- (15) Cleaning requirements;
- (16) When certification is required;
- (17) Marking requirements;
- (18) Packaging requirements; and
- (19) Preservation requirements.

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<sup>2</sup> For referenced ASTM standards, visit the ASTM website, www.astm.org, or contact ASTM Customer Service at service@astm.org. For *Annual Book of ASTM Standards* volume information, refer to the standard's Document Summary page on the ASTM website.

## **6. Materials and Manufacture**

6.1 *Material Selection*—The materials for all parts shall be selected for long-term compatibility with the environment in which the tachometer will be installed or used.

6.2 *Material Inspection*—The manufacturer shall be responsible for ensuring that materials used are manufactured, examined, and tested in accordance with the specifications and standards as applicable.

## **7. Physical Properties**

7.1 *Size and Weight*—The buyer may have intended applications where size and weight are limited. Size and weight limitations shall be specified in the acquisition requirements.

## **8. Performance Requirements**

8.1 *Service Life*—The buyer may have a minimum specified service life requirement. Critical service life requirements shall be specified in the acquisition requirements.

8.2 *Tachometer Performance*—Performance tolerances are usually specified in percentage of range span. The following performance characteristics and environmental exposures may or may not be important to each buyer's intended application.

- (1) Accuracy,
- (2) Repeatability,
- (3) Damping,
- (4) Temperature,
- (5) Humidity,
- (6) Salt spray,
- (7) Vibration,
- (8) Shock, and
- (9) Electromagnetic interference (EMI).

## **9. Workmanship, Finish, and Appearance**

9.1 *Cleaning, Finish, and Appearance*—Any special cleaning, surface finish, and appearance requirements shall be specified in the acquisition requirements.

## **10. Inspection**

10.1 *Classification of Inspections*—The inspection requirements specified herein are classified as follows:

- (1) Qualification testing, and
- (2) Quality conformance testing.

10.2 *Qualification Testing*—Qualification test requirements shall be specified, where applicable. Test methods should be identified for each design and performance characteristic specified. Test report documentation requirements should also be specified.

10.3 *Quality Conformance Testing*—Quality conformance inspection is accomplished when acceptance and qualification testing is satisfied by a previous acquisition or when the product has demonstrated reliability in similar applications. Quality conformance inspection is usually less intensive than acceptance and qualification, often verifying that samples of a production lot meet a few critical performance requirements.

## **11. Number of Tests and Retests**

11.1 *Test Specimens*—The number of test specimens to be subjected to qualification testing shall depend on the tachometer design. If each range is covered by a separate and distinct design, a test specimen for each range will require testing. In instances in which a singular design series may cover multiple ranges and types, it is recommended that three test specimens be tested provided the electrical and mechanical similarities are approved by the buyer. In no case, however, should less than three units, one unit each representing low, medium, and high ranges, be tested, regardless of design similarity.

## **12. Test Methods**

12.1 *Tests*—All tests shall be performed in accordance with ASTM, American Society of Mechanical Engineers (ASME), or industry standards as specified.

12.2 *Test Data*—All test data shall remain on file at the manufacturer's facility for review by the buyer upon request. It is recommended that test data be retained in the manufacturer's files for at least three years or a period of time acceptable to the buyer and manufacturer.

## **13. Quality Assurance Provisions**

13.1 *Warranty*:

13.1.1 *Responsibility for Warranty*—Unless otherwise specified, the manufacturer is responsible for the following:

- (1) All materials used to produce a unit and
- (2) Manufacturer will warrant his product to be free from defect of workmanship to produce the unit.

## **14. Certification**

14.1 When specified in the purchase order or contract, the buyer shall be furnished certification that samples representing each lot have been either tested or inspected as directed in this specification, and the requirements have been met. When specified in the purchase order or contract, a report of the test results shall be furnished.

## **15. Product Marking**

15.1 User-specified product marking shall be listed in the acquisition requirements. The minimum data to be clearly marked on each tachometer shall include the following:

- (1) Manufacturer's name,
- (2) Manufacturer's part number,
- (3) Serial number or lot number,
- (4) Date of manufacture, and
- (5) Range.

## **16. Packaging and Package Marking**

16.1 *Packaging of Product for Delivery*—Product shall be packaged for shipment in accordance with Practice **D3951**.

16.2 Any special preservation, packaging, or package marking requirements for shipment or storage shall be identified in the acquisition requirements.

## **17. Keywords**

17.1 tachometer