



Designation: F2511 – 05 (Reapproved 2022)

Standard Specification for Rollers, Bearing, Needle, Ferrous, Solid¹

This standard is issued under the fixed designation F2511; 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 (ε) 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 the procurement requirements for solid ferrous needle bearing rollers including the MS19065 spherical ended solid ferrous needle rollers as specified in Specification F2443.

1.2 *Intended Use*—The rollers covered in this specification are intended for use in bearings and bearing applications.

1.3 This specification contains many of the requirements of MIL-R-22440, which was originally developed by the Department of Defense and maintained by the Defense Supply Center in Richmond. The following government activity codes may be found in the Department of Defense, Standardization Directory SD-1.²

Preparing Activity	Custodians	Review Activities
DLA-GS4	Army-AT Navy-OS Air Force-99 DLA-GS4	Army-CR4 Air Force-84

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

1.5 *This standard does not purport to address all of the safety concerns, if any, associated with its use. It is the responsibility of the user of this standard to establish appropriate safety, health, and environmental practices and determine the applicability of regulatory limitations prior to use.*

1.6 *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.*

¹ This specification is under the jurisdiction of ASTM Committee F34 on Rolling Element Bearings and is the direct responsibility of Subcommittee F34.01 on Rolling Element.

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² The Military codes that are listed in SD-1 give the address and phone numbers of the DoD contacts. These are found in the DoD's ASSIST website <http://assist.daps.dla.mil/online/start/>.

2. Referenced Documents

2.1 ASTM Standards:³

- A295/A295M Specification for High-Carbon Anti-Friction Bearing Steel
- A751 Test Methods and Practices for Chemical Analysis of Steel Products
- D1974/D1974M Practice for Methods of Closing, Sealing, and Reinforcing Fiberboard Boxes
- D3951 Practice for Commercial Packaging
- D3953 Specification for Strapping, Flat Steel and Seals
- D5118/D5118M Practice for Fabrication of Fiberboard Shipping Boxes
- D5168 Practice for Fabrication and Closure of Triple-Wall Corrugated Fiberboard Containers
- D6251/D6251M Specification for Wood-Cleated Panelboard Shipping Boxes
- E18 Test Methods for Rockwell Hardness of Metallic Materials
- E140 Hardness Conversion Tables for Metals Relationship Among Brinell Hardness, Vickers Hardness, Rockwell Hardness, Superficial Hardness, Knoop Hardness, Scleroscope Hardness, and Leeb Hardness
- E381 Method of Macroetch Testing Steel Bars, Billets, Blooms, and Forgings
- E384 Test Method for Microindentation Hardness of Materials
- F2443 Specification for Roller, Bearing, Needle, Ferrous, Solid, Spherical End

2.2 ANSI Standards:⁴

- ASME B46.1 Surface Texture (Surface Roughness, Waviness, and Lay)
- ASME Y14.5 Dimensioning and Tolerancing
- ANSI/ASQ Z1.4 Sampling Procedures and Tables for Inspection by Attributes

³ 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.

⁴ Available from American National Standards Institute (ANSI), 25 W. 43rd St., 4th Floor, New York, NY 10036.

2.3 ISO Standards:⁵

ISO 5593 Rolling Bearings—Vocabulary

ISO 10012-1 Quality Assurance Requirements for Measuring Equipment

2.4 Military Standards:⁶

MIL-PRF-121 Barrier Materials, Greaseproof, Waterproof, Flexible, Heat-Sealable

MIL-STD-129 Military Marking for Shipment and Storage

MIL-PRF-131 Barrier Materials, Watervaporproof, Greaseproof, Flexible, Heat-Sealable

MIL-STD-2073-1 DOD Standard Practice for Military Packaging

MIL-PRF-22191 Barrier Materials, Transparent, Flexible, Heat-Sealable

MIL-R-22440 Roller, Bearing, Needle, Ferrous, Solid

2.5 SAE Standards:⁷

SAE AMS-STD-66 Steel, Chemical Composition and Hardness

SAE J418a Grain Size Determination of Steel

3. Terminology

3.1 *Definitions*—For definitions of terms used in this specification, refer to ISO 5593.

3.2 Definitions of Terms Specific to This Standard:

3.2.1 *heat of steel*—batch of steel that was produced in a single furnace run. Steel from the same “heat” may be found in several different billets, bars, or coils of wire.

3.2.2 *lot*—lot shall consist of the finished rollers of the same type, diameter, length, and material, manufactured under the same conditions, and submitted for acceptance at the same time. This inspection lot shall be identified by a unique number (manufacturer’s lot control number) that will provide the traceability of the rollers to be finished bearing assemblies.

3.2.3 *surface roughness (Ra)*—the Ra, or roughness average, surface roughness is the arithmetic average of the absolute value of the departure of the filtered roughness profile measured from the mean line. Ra values are normally specified in microinches (micrometres). 1 $\mu\text{in.}$ = 0.0254 μm (1 μm = 39.37 $\mu\text{in.}$). See ASME B46.1 for more information on surface roughness.

4. Classification

4.1 The rollers shall be of the following types, as specified in the contract or order (see Section 5 and Fig. 1):

4.1.1 *Type I*—Spherical end.

4.1.2 *Type II*—Flat end.

4.1.3 *Type III*—Ball end.

4.1.4 *Type IV*—Crankpin end.

4.1.5 *Type V*—Conical end.

4.1.6 *Type VI*—Trunnion end.

5. Ordering Information

5.1 Procurement documents should specify the following:

5.1.1 Title, number, and date of this specification,

5.1.2 Type of rollers required (see 4.1),

5.1.3 Material required, if different than 6.1,

5.1.4 Diameter and length of rollers required (see 8.1),

5.1.5 Quantity required,

5.1.6 Dimensions and tolerances governing formulation of roller ends, if different than 8.1,

5.1.7 Inspection records required (see 16.1.1),

5.1.8 Required levels of packaging (see 15.1),

5.1.9 Preservative required, if different than 15.2.1.2 and 15.2.1.3,

5.1.10 Method of unit packaging required (see 15.2.1.3),

5.1.11 Number of rollers per unit package (see 15.2.1.3),

5.1.12 When case liner is not required (see 15.3.1.3), and

5.1.13 Special marking, if required (see 15.4).

6. Materials and Manufacture

6.1 *Material*—Unless otherwise specified in the contract or order (see Section 5), the rollers shall be manufactured from chrome alloy steel conforming to the chemical composition of steel number AISI E52100 of SAE AMS-STD-66, AMS 6440 or AMS 6444. The steel shall be homogeneous in structure, free from pipes, seams, laminations, bursts, flakes, excessive segregation, and other detrimental defects (see 11.2.1). The steel shall have an austenite grain size of 7 or finer (see 11.3.3). The rollers shall be free from surface decarburization (see 11.2.2).

6.1.1 *Inclusion Rating*—The chrome alloy steel shall not exceed the inclusion rating specified for billets for wire and rods used in the manufacture of balls and rollers, as specified in Specification A295/A295M.

7. Other Requirements

7.1 *Hardness*—The rollers shall have a uniform hardness of 60 to 64 Rockwell C or equivalent (see 11.2.3).

8. Dimensions and Permissible Variations

8.1 *Construction and Dimensions*—The rollers shall be of the type, diameter, and length specified in the contract or order (see Section 5) and shall be of solid construction. An illustration of the types of rollers covered herein is shown in Fig. 1. Unless otherwise specified in the contract or order (see Section 5), dimensions and tolerances governing the formation of the ends of the roller shall be in accordance with commercial practice. Dimensions and tolerances shall be interpreted in accordance with ASME Y14.5.

8.1.1 *Diameter*—The diameter of the roller shall be within +0.0000 in. (+0.000 mm) to −0.0002 in. (−0.005 mm) of the value specified in the contract or order (see Section 5).

8.1.2 Length:

8.1.2.1 *Types I, III, V, and VI*—The length of the roller shall be within +0.000 in. (+0.00 mm) to −0.020 in. (−0.51 mm) of the value specified in the contract or order (see Section 5).

8.1.2.2 *Type II*—The length of the roller shall be within +0.000 in. (+0.00 mm) to −0.006 in. (−0.15 mm) of the value specified in the contract or order (see Section 5).

⁵ Available from International Organization for Standardization (ISO), 1 rue de Varembe, Case postale 56, CH-1211, Geneva 20, Switzerland.

⁶ Available from DLA Document Services, Building 4/D, 700 Robbins Ave., Philadelphia, PA 19111-5094, <http://quicksearch.dla.mil>.

⁷ Available from Society of Automotive Engineers (SAE), 400 Commonwealth Dr., Warrendale, PA 15096-0001.