



Standard Test Method for Low-Temperature Torque of Ball Bearing Grease¹

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

1. Scope

1.1 This test method covers the determination of the extent to which a grease retards the rotation of a slow-speed ball bearing by measuring starting and running torques at low temperatures (below -20°C (0°F)).

1.1.1 Torque measurements are limited by the capacity of the torque-measuring equipment.

NOTE 1—When initially developed, the original dynamometer scale limited the torque capacity to approximately 30 000 g·cm; the original dynamometer scale is obsolete, however. The suggested replacement scale has not been evaluated; it could extend the limit to approximately 75 000 g·cm.

1.2 The values stated in SI units are to be regarded as the standard in this test method, except for torque values which are given in cgs-metric units, which are universally used in grease specifications. Other units are provided for information only.

1.3 *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 and health practices and determine the applicability of regulatory limitations prior to use.* For specific hazard and warning statements, see Note 2, Note 4, Note 5, Note 6, and Note 8.

2. Referenced Documents

2.1 ASTM Standards:

D 235 Specification for Mineral Spirits (Petroleum Spirits) (Hydrocarbon Drycleaning Solvents)²

D 4693 Test Method for Low-Temperature Torque of Grease-Lubricated Wheel Bearings³

Test Methods for Rating Motor, Diesel, and Aviation Fuels; Motor Fuels (Section I), Reference Materials and Blending Accessories (Annex 2), Reference Materials (A2.7), and Table 32; (Specification for ASTM Knock Test Reference Fuel, n-heptane)⁴

2.2 ANSI/AFBMA Standard:

Standard 20-1987 Radial Bearings of Ball, Cylindrical, Roller, and Spherical-Roller Type—Metric Designs (AFBMA Code 20BCO2JO)⁵

3. Terminology

3.1 Definitions of Terms Specific to This Standard:

3.1.1 *low-temperature torque, n*—the torque in g·cm required to restrain the outer ring of a No. 6204 size open ball bearing lubricated with the test grease while the inner ring is rotated at 1 ± 0.05 r/min at the test temperature.

3.1.2 *running torque, n*—the 15-s average value of the torque after rotation for a specified period of time (60 min).

3.1.3 *starting torque, n*—the maximum torque measured at the start of rotation.

4. Summary of Test Method

4.1 A No. 6204 open ball bearing is packed completely full of the test grease and cleaned off flush with the sides. The bearing remains stationary while ambient temperature is lowered to the test temperature and held there for 2 h. At the end of this time, the inner ring of the ball bearing is rotated at 1 ± 0.05 r/min while the restraining force on the outer ring is measured.

4.2 Torque is determined by multiplying the restraining force by the radius of the bearing housing. Both starting torque and torque after 60 min of rotation (running torque) are determined.

5. Significance and Use

5.1 This test method was developed using greases having very low torque characteristics at -54°C (-65°F). Specifications for greases of this type commonly require testing at this temperature. Specifications for greases of other types can require testing at temperatures from -75 to -20°C (-100 to 0°F).

5.2 This test method has proved helpful in the selection of greases for low-powered mechanisms, such as instrument bearings used in aerospace applications. The suitability of this test method for other applications requiring different greases, speeds, and temperatures should be determined on an individual basis.

¹ This test method is under the jurisdiction of ASTM Committee D02 on Petroleum Products and Lubricants and is the direct responsibility of Subcommittee D02.G on Lubricating Grease.

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² Annual Book of ASTM Standards, Vol 06.04.

³ Annual Book of ASTM Standards, Vol 05.03.

⁴ Annual Book of ASTM Standards, Vol 05.04.

⁵ Available from AFBMA (Anti-Friction Bearing Manufacturers' Association), 1101 Connecticut Avenue, N.W., Suite 700, Washington, DC 20036-4303.