ANSI/AGMA 9005-E02
(Revision of
ANSI/AGMA 9005–D94)

AMERICAN NATIONAL STANDARD

Industrial Gear Lubrication

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ABSTRACT

This standard provides lubrication guidelines for enclosed and open gearing which is installed in general industrial power transmission applications. It is not intended to supplant specific instructions from the gear manufacturer.

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Foreword

[The foreword, footnotes and annexes, if any, in this document are provided for informational purposes only and are not to be construed as a part of ANSI/AGMA Standard 9005–E02, *Industrial Gear Lubrication*.]

AGMA formed the Lubrication Committee in 1938 to study gear lubrication problems. This committee drafted tentative standard 250.01, *Lubrication of Enclosed and Open Gearing,* which was accepted in 1943 and adopted as a full standard in 1946. Lubrication Standard 250.01 was revised to include only industrial enclosed gearing and was accepted by the membership in 1955 as AGMA 250.02. AGMA 250.03, which was published in 1972, superseded AGMA 250.02 as well as AGMA 250.02A, *Typical Manufacturer's Oils Meeting AGMA Standard 250.02,* May, 1956; and AGMA 252.02, *Mild Extreme Pressure Lubricants*, May, 1959. The list of Typical Manufacturer's Oils was eliminated due to difficulties in keeping such a list up to date. AGMA 250.03 contained instead, a list of detailed specifications which had to be met before an oil could be recommended for use in AGMA rated gear drives. It then became the responsibility of the oil supplier to certify a particular product as meeting AGMA specifications. AGMA 250.04, published in 1981, eliminated lead naphthenate as an EP additive and adjusted the AGMA lubricant numbering system to be coincident with the viscosity ranges established by the American Society for Testing Materials (ASTM 2422), the British Standards Institute (B.S. 4231), and the International Standards Organization (ISO 3448).

The elimination of open gearing, where the bearings are lubricated separately, from AGMA 250.02 created the need for a new standard to cover this area of lubrication. AGMA Standard AGMA 251.01, *Lubrication of Industrial Open Gearing,* was approved in April, 1963. This standard was revised in September, 1974. AGMA 251.02 extended coverage to bevel gears. Other changes included the addition of AGMA Lubricant Numbers based on the ASTM viscosity system and complete specifications for R & O gear oils and EP gear lubricants, and the addition of an appendix on test procedures and limits.

AGMA Standard 9005–D94 again combined enclosed and open gearing, superseding AGMA 250.04 and AGMA 251.02. In addition, it was updated to reflect market changes in availability of heavy bodied open gear lubricants. It was also expanded to provide coverage of modern technology in the area of synthetic oils. Synthetic oils were recognized as a separate class of lubricants with their own specification requirements. Specifications of EP oils were upgraded to reflect advances in technology. EP oils were no longer recommended for wormgear service. Pitchline velocity replaced center distance as the parameter for lubricant selection in other than double enveloping wormgear applications. Annex B provided a copy of table 3 from AGMA 250.04 for information only.

References to Saybolt viscosity (SSU) were eliminated in favor of kinematic viscosity (mm^2/s, commonly referred to as cSt). This was consistent with practices of the American Society for Testing Materials, the Society of Tribologists and Lubrication Engineers, the British Standards Institution, and industry in general. Annex A provided information on the theory of elastohydrodynamic lubrication.

ANSI/AGMA 9005–E02 attempts to offer the end user and equipment builder more definitive guidelines for selecting lubricants based on current theory and practice in the industry, and attempts to align with current ISO standards. The document is focused on providing the correct viscosity and performance level for the application by providing the user a series of informative tables to match their equipment type, operation, and needs to define an appropriate finished lubricant. The end user is encouraged to work with their equipment builder and lubricant supplier to achieve the most reliable system for their needs.

The first draft of ANSI/AGMA 9005–E02 was made in May, 1999. It was approved by the AGMA membership on March 13, 2003. It was approved as an American National Standard on December 31, 2002.

Suggestions for improvement of this standard will be welcome. They should be sent to the American Gear Manufacturers Association, 500 Montgomery Street, Suite 350, Alexandria, Virginia 22314.

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American National Standard –

Industrial Gear Lubrication

1 Scope

This standard provides the end user, original equipment builder, gear manufacturer, and lubricant supplier with guidelines for minimum performance characteristics for lubricants suitable for use in general power transmission applications. These guidelines cover both open and enclosed gearing which have been designed and rated in accordance with applicable AGMA standards. The types of gearing included herein are metallic spur, helical including herringbone, straight and spiral bevel, and worm. These guidelines may or may not be applicable to non-metallic gears.

This standard does not address grease lubricated enclosed drives, aerospace applications or address special regulatory requirements associated with food or drug handling or manufacturing equipment. This standard is not intended to replace any existing standards such as in automotive applications where similar gearing may be used.

NOTE: This standard is not intended to supplant any specific recommendations of gear manufacturers.

2 Normative references

The following standards contain provisions, which through reference in this text, constitute provisions of this standard. At the time of publication, the editions listed were valid. All standards are subject to revision and parties to agreements based on this standard are encouraged to apply the most recent editions of the standards indicated below.

ISO number	ASTM number	Title
ISO 2160:1998	ASTM D130-94	*Petroleum products - Corrosiveness to copper - Copper strip test*
ISO 2592:2000	ASTM D92-97	*Determination of flash and fire points - Cleveland open cup method*
ISO 2909:1991	ASTM D2270-93	*Petroleum products - Calculation of viscosity index from kinematic viscosity*
ISO 3104:1994	ASTM D445-96	*Petroleum products - Transparent and opaque liquids - Determination of kinematic viscosity and calculation of dynamic viscosity*
ISO 3448:1992	ASTM D2422-97	*Industrial liquid lubricants - ISO viscosity classification*
ISO 4263:1995	ASTM D943-95	*Petroleum products – Determination of water - Coulometric Karl Fischer titration method*
ISO 6247:1998	ASTM D892-95	*Petroleum products - Determination of foaming characteristics of lubricating oils*
ISO 7120:1987	ASTM D665-95	*Petroleum products and lubricants - Petroleum oils and other fluids - Determination of rust-preventing characteristics in the presence of water*
ISO 12937:2000	ASTM D6304-00	*Petroleum products – Determination of water in liquid petroleum products by Karl Fischer reagent*
ISO 14635-1:2000	ASTM D5182-97	*Gears - FZG Test procedures - Part 1: FZG test method A/8,3/90 for relative scuffing load-carrying capacity of oils*
- -	ASTM D2711-99	*Standard test method for demulsibility characteristics of lubricating oils*
- -	ASTM 2893-99	*Standard test method for oxidation characteristics of extreme-pressure lubrication oils*
- -	ASTM D2983-87	*Standard test method for low-temperature viscosity of automotive fluid lubricants measured by Brookfield viscometer*