American
Gear Manufacturers
Association

Technical Resources

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American National Standard

Design Guide for Vehicle Spur and Helical Gears

ANSI/AGMA 6002-B93

Design Guide for Vehicle Spur and Helical Gears
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American National Standards Institute, Inc.

ABSTRACT

This standard provides the engineer, who is familiar with gear designing, a guide to sound design approaches for vehicle gear applications. It is the updated and expansion of AGMA 170.01–1976 *Design Guide for Vehicle Spur and Helical Gears.*

Through this standard, the engineer is guided to selecting design considerations paramount to the parallel axis gear sets required in vehicle drive lines. These include tooth and blank proportions, lubrication, profile and lead modification requirements, and gear tooth tolerances. Properties of the commonly used steels and processes for their heat treatment are outlined, as well as details for calculating design limits for bending and contact stresses.

An annex is provided detailing sample problems showing design procedures and calculations.

For full effectiveness, this guide should be used in conjunction with other applicable AGMA Standards.

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FOREWORD

[The foreword, footnotes, and annexes, if any, are provided for informational purposes only, and should not be construed as part of American Gear Manufacturers Association Standard 6002–B93, *Design Guide for Vehicle Spur and Helical Gears*.]

This standard was prepared by the AGMA Vehicle Gearing Committee. It is provided as a guide to sound approaches for designing gears used in vehicle drive lines. This guide is intended for use by design engineers capable of selecting reasonable values for rating factors, material grades, heat treatment, and gear manufacturing capabilities. It updates, expands, and replaces AGMA 170.01–1976, *Design Guide for Vehicle Spur and Helical Gears*. The committee intends to continue updating this standard to incorporate the latest data and technologies as they are developed.

This guide establishes a gear set design by following a sequential approach using:

a) Design considerations;

b) Material and heat treatment;

c) Load capacity determination;

d) Variable loading.

The decision to produce a vehicle gearing design guide was made by the Vehicle Gearing Committee on May 4, 1971. The first draft of AGMA 170.01 was dated May 1972. Standard AGMA 170.01 was approved by the Committee in July 1974, by the Board of Directors and Technical Division Executive Committee in July 1975 and by the AGMA membership as of February 1976.

The Vehicle Gearing Committee was reactivated in October 1987 to develop an updated vehicle gearing design guide.

ANSI/AGMA 6002–B93 was approved by the Committee in February 1990, by the Board of Directors and Technical Division Executive Committee in September 1992, and by the AGMA membership in November 1992.

Suggestions for the improvement of this standard will be welcome. They should be sent to the American Gear Manufacturers Association, 1500 King Street, Suite 201, Alexandria, Virginia, 22314.

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American National Standard –

Design Guide for Vehicle Spur and Helical gears

1 Scope

1.1 Use

This standard provides information on the design of spur and helical vehicle power transmission gears. Included are considerations for design, material and heat treatment, determination of load capacity, mounting features, and typical design problems.

In determining load capacity, the knowledge and judgment required to evaluate the various rating factors come from years of accumulated experience in designing, manufacturing, and operating gear units. This standard is intended for use by the experienced gear designer, capable of selecting reasonable values for the rating factors. It is not intended for use by the engineering public at large.

1.2 Applications

Vehicle Gearing is defined as: "Drive line components of self–propelled, wheeled or non–wheeled vehicles; for transportation, recreational or industrial use. Propulsion of these vehicles should be a primary function of its power source, and its mobility not confined to the constraints of a closely defined area."

1.3 References

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

AGMA 246.02A, *Recommended Procedure for Carburized Aerospace Gearing.*

AGMA 908–B89, *Geometry Factors for Determining the Pitting Resistance and Bending Strength of Spur, Helical, and Herringbone Gear Teeth.*

ANSI/AGMA 2000–A88, *Gear Classification and Inspection Handbook.*

ANSI/AGMA 2001–B88, *Fundamental Rating Factors and Calculation Methods for Involute Spur and Helical Gear Teeth.*

ANSI/AGMA 2007–B92, *Surface Temper Etch Inspection After Grinding.*

ANSI/AGMA 6033–A88, *Standard for Marine Propulsion Gear Units, Part 1, Materials.*

ANSI/SAE AMS 2301G, *Magnetic Particle Inspection, Aircraft–Quality Steel Cleanliness.*

ASTM A388–80, *Recommended Practice for Ultrasonic Examination of Heavy Steel Forgings.*

ASTM A534–87, *Standard Specification for Carburizing Steels for Anti–Friction Bearings.*

ASTM A609–83, *Specification for Steel Castings, Carbon and Low Alloy, Ultrasonic Examination Thereof.*

ASTM E428–71, *Recommended Practice for Fabrication and Control of Steel Reference Blocks Used in Ultrasonic Inspection.*

ASTM E709–80, *Magnetic Particle Examination.*

1.4 Definitions and symbols

1.4.1 Definitions

The terms used, wherever applicable, conform to the following standards:

ANSI/AGMA 1012–F90, *Gear Nomenclature, Definitions of Terms with Symbols*

AGMA 904–B89, *Metric Usage*

ANSI Y10.3–1968, *Letter Symbols for Quantities Used in Mechanics of Solids*

1.4.2 Symbols

The symbols used in the pitting resistance and bending strength formulas are shown in table 1.

NOTE – The symbols and definitions used in this standard may differ from other AGMA Standards. The user should not assume that familiar symbols can be used without a careful study of these definitions.