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(Metric Edition of
ANSI/AGMA1003–H07)
Reaffirmed February 6, 2020

AMERICAN NATIONAL STANDARD

Tooth Proportions for Fine-Pitch Spur and Helical Gearing (Metric Edition)

ANSI/AGMA 1103-H07

AGMA STANDARD

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American National Standard

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Approved September 19, 2007

ABSTRACT

Tooth proportions for fine-pitch gearing are similar to those of coarse pitch gearing except in the matter of clearance. For 20 degree profile angle fine-pitch gearing, this standard provides a system of enlarged pinions which use the involute form above 5 degrees of roll. Data on 14-1/2 and 25 degree profile angle systems , as well as a discussion of enlargement and tooth thickness are included in the annexes.

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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 AGMA Standard 1103–H07, *Tooth Proportions for Fine–Pitch Spur and Helical Gearing (Metric Edition)*.]

As originally developed by the American Gear Manufacturers Association, this standard was in two parts: the first part, *Clearance for 20–Degree Pressure Angle Fine–Pitch Gears* (AGMA 470.01); and the second, *20–Degree Involute Fine–Pitch System for Spur Gears* (AGMA 207.02).

In May, 1949, the two standards were combined and completely re–edited. The next revision of this standard was begun in 1955.

As a result of the increasing use of gears by sintering and injection molding process, and for greater tooth strength, tooth forms for 25 degree pressure angle were included. Control gearing containing large numbers of teeth was recognized by data on the 14–1/2 degree pressure angle system in the information sheets.

AGMA 207.05, was approved by Sectional Committee B6 and by the sponsors, and designated USA Standard B6.7–1967 as of September 18, 1967.

Due to difficulties encountered in fabricating gears with involute profiles to the base circle, the Fine–Pitch committee developed a new set of tooth proportions for enlarged pinions that would not require active tooth profiles below five degrees of roll.

AGMA 207.06 was approved by the Fine–Pitch Gearing Committee in June, 1971 and approved by the membership as of May, 1974.

ANSI/AGMA 1003–G93 was a revision of AGMA 207.06. The term “profile angle” was introduced in place of the basic rack “pressure angle”. Metric data were added, including ISO symbols. Tables for 20 degree profile angle were revised, and supported with simpler equations and procedures. The lower range of tooth numbers was redone with less enlargement, improved contact ratio, and less specific sliding. Data for 7 and 8 tooth pinions were omitted, as they require special design consideration beyond the scope of this standard. A revised procedure was employed to verify undercut limits, superseding the approximate and more conservative prior method. Formulas were supplied for all tabulated data. The data on helical gearing was revised using a simple procedure to allow helical configuration.

Information was added to clarify the distinction between form diameter as generated and the limit diameter established by operational contact, which determines the contact ratio. Clarification was made regarding categories of center distance which often was a source of confusion in the prior standard. Cautionary notes were added to indicate that meshes employing very small numbers of teeth, while geometrically correct, still require analyses for strength, durability, and clearances. The 5 degree form diameter enlargement method was extended to include the 14–1/2 degree system, and revisions were made to the 25 degree system.

ANSI/AGMA 1003–G93 was approved by the Fine–Pitch Gearing Committee in February, 1992 and approved by the AGMA Board of Directors as of May, 1992.

ANSI/AGMA 1103–H07 adds clause 4.9 on fillet root radius values due to cutting tool tip radius, and annex E, which compares several systems for selecting tooth thickness of pinions.

The first draft of ANSI/AGMA 1103–H07 was made in September, 1999. It was approved by the AGMA membership in March, 2006. It was approved as an American National Standard on September 19, 2007..

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 –

Tooth Proportions for Fine-Pitch Spur and Helical Gearing (Metric Edition)

1 Scope

This standard is applicable to external spur and helical gears with 1.25 through 0.2 module and a profile angle of 20 degrees.

It only applies to standard gears with 24 teeth or more; enlarged pinions with 9 through 23 teeth; and reduced gears for meshing with enlarged pinions at standard center distances.

Much of this same information is applicable to internal gears.

1.1 Tooth proportions

The tooth proportions shown herein may be used for many gear designs of finer than 0.2 module; however, such designs should be checked for suitability, particularly in the areas of contact ratio, undercutting, and clearance.

This standard is similar to ISO 53, *Cylindrical gears for general and heavy engineering - Standard basic rack tooth profile.*

The main difference between the proportions of fine-pitch gears and those of coarse-pitch is in the clearance. In fine-pitch gearing, wear on the points of the cutting tools is proportionally greater than in coarse-pitch tools. The fillet radius produced by such tooling will therefore be proportionally greater. The increased clearance in gearing of 1.25 module and finer provides both for the relatively larger fillet and also for foreign material that tends to accumulate at the bottoms of the teeth.

1.2 Number of teeth

Gear designs with low numbers of teeth should be checked for suitability, particularly in the areas of contact ratio, undercutting, and clearance, as well as for strength and durability for load and life considerations.

2 Normative 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 904-C96, *Metric Usage*

AGMA 917-B97, *Design Manual for Fine-Pitch Gearing*

ANSI/AGMA 1012-G05, *Gear Nomenclature, Definitions of Terms with Symbols*

ANSI/AGMA 1102-A03, *Tolerance Specification for Gear Hobs*

ANSI/AGMA 2002-B88, *Tooth Thickness Specification and Measurement*

ANSI B94.21, *Shaper Cutters*

3 Terms and symbols

3.1 Terms

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

ANSI/AGMA 1012-G05, *Gear Nomenclature, Definitions of Terms with Symbols*

AGMA 904-B89, *Metric Usage*

3.2 Symbols

The symbols used in this standard 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.

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