American Gear Manufacturers Association

ANSI/AGMA 2015-2-B15
(Revision of ANSI/AGMA 2015-2-A06)

American National Standard

Gear Tooth Flank Tolerance Classification System – Definitions and Allowable Values of Double Flank Radial Composite Deviations

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Approved September 2, 2015

ABSTRACT

This standard establishes a classification system for double flank radial composite tolerances—allowable values of deviations—of individual cylindrical involute gears, sector gears, racks, cylindrical worms, worm gears and hypoid or bevel gears. It serves as a concise means of specifying allowable gear geometry deviations and simplifies discussions between the gear manufacturer and purchaser. It specifies the appropriate definitions of double flank radial composite gear tooth geometry deviations, the structure of the tolerance system and the tolerances.

Published by

American Gear Manufacturers Association
1001 N. Fairfax Street, Suite 500, Alexandria, Virginia 22314

Printed in the United States of America

ISBN: 978-1-55589-005-6

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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 2015-2-B15, *Gear Tooth Flank Tolerance Classification System – Definitions and Allowable Values of Double Flank Radial Composite Deviations*.]

This standard provides tolerance classes from R20 to R30 for unassembled cylindrical involute gears, sector gears, racks, cylindrical worms, worm gears and hypoid or bevel gears. Applicable definitions are provided. The purpose is to provide a common basis for specifying gear tooth flank tolerances for the procurement of unassembled gears. It is not a design manual for determining the specific quality levels for a given application.

AGMA 390.03 (1973) was a consolidation of several AGMA publications, including:

AGMA 235.02 (1966), *Information Sheet for Master Gears*

AGMA 239.01 (1965), *Measuring Methods and Practices Manual for Control of Spur, Helical and Herringbone Gears*

AGMA 239.01A (1966), *Measuring Methods and Practices Manual for Control of Bevel and Hypoid Gears,* and parts of

AGMA 236.05 (ASA B6.11, June 1956), *Inspection of Fine-Pitch Gears*

AGMA 390.02 (1964), *Gear Classification Manual* originally published as AGMA 390.01 (1961)

Data was added in AGMA 390.03 for gear rack and fine-pitch worms and worm gears. The former AGMA 390.02 for coarse pitch and fine pitch spur, helical and herringbone gearing was enhanced to offer a single, compatible classification system. The tolerance identifier “Q” was added to indicate that the tolerances in 390.03 apply. If Q is not used as a prefix in the quality number, tolerances in AGMA 390.01 and 390.02 applied.

ANSI/AGMA 2000-A88 was an update of those sections from AGMA 390.03 for parallel axis gears only. The other material in AGMA 390.03 on bevels and worms was replaced by ANSI/AGMA 2009-A99 and ANSI/AGMA 2011-A98, respectively. ANSI/AGMA 2000 was approved by the AGMA membership in January 1988 and as an American National Standard Institute (ANSI) standard on March 31, 1988.

ANSI/AGMA 2015-2-A06 combined the grading system of ISO 1328-2:1997 with the methods of ANSI/AGMA 2000-A88 and ISO/TR 10064-2:1996. The descriptions and measuring methods that were found in ISO 1328:1975 were put in ISO/TR 10064-2 and are included in AGMA 915-2-A05. ANSI/AGMA 2015-2-A06 and AGMA 915-2-A05 are made to work together as a system.

AGMA 2015-2-B15 differs from ANSI/AGMA 2015-2-A06 in the relationship between the tooth-to-tooth and total radial composite tolerances in a given tolerance class. The evaluation of tooth-to-tooth radial composite deviations by removing the once per revolution eccentricity effects has been withdrawn from this version of the standard. The step size between classes has been reduced from $\sqrt{2}$ to 1.2. Rounding rules have been simplified to the nearest micron. This standard now includes in its scope more gear types including sector gears, racks, cylindrical worms, worm gears and hypoid or bevel gears. In order to avoid confusion between this version and previous versions of the standard, the prefix letter has been changed from “C” to "R" and the numeric suffix identifying the tolerance class now utilizes a new series of numbers. An annex has been added for radial composite deviation over multiple, k, teeth.

The first draft of AGMA 2015-2-B15 was made in October 2012. It was approved by the AGMA membership in July 2015. It was approved as an American National Standard on September 2, 2015.

Suggestions for improvement of this standard will be welcome. They may be submitted to tech@agma.org.

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American National Standard –

Gear Tooth Flank Tolerance Classification System – Definitions and Allowable Values of Double Flank Radial Composite Deviations

1 Scope

This part of ANSI/AGMA 2015 establishes a gear tooth classification system relevant to radial composite deviations of individual:

- cylindrical involute gears;
- sector gears;
- racks;
- cylindrical worms;
- worm gears;
- bevel gears, all types.

It specifies the appropriate definitions of gear tooth deviations, the structure of the gear tooth flank classification system and the allowable values of the above mentioned deviations.

The radial composite classification system is comprised of 11 tolerance classes for total and tooth-to-tooth radial composite deviations of which class R20 is the most accurate and class R30 is the least accurate.

NOTE: There is no correlation or interrelation between the classes specified in this standard and other standards such as ANSI/AGMA ISO 1328-1, ANSI/AGMA ISO 17485, ANSI/AGMA 2009, ANSI/AGMA 2011 and their predecessor standards. This standard uses a unique set of tolerance classes (i.e., R20 to R30) in order to further reinforce that no correlation to other elemental or radial composite standards exists.

The equations in this standard are applicable for reference diameters of up to 600 mm.

This standard provides equations to calculate tolerances for individual product gears when mated with a master gear. Tolerance tables are not included in this standard, however, tolerance curves for some classes are shown in Annex A for a module 1.0 mm spur gear to demonstrate the mathematical nature of the tolerance equations. An optional tolerance element for radial composite deviation over multiple, k, teeth is described in Annex B. Calculation examples to assist with interpretation and to verify calculation procedure are included in Annex C. The measurement of gearing mated in an assembly for a specific application is beyond the scope of this document.

NOTE: See AGMA 915-2 for measuring methods and practices.

2 Normative references

The following documents contain provisions which, through reference in this text, constitute provisions of this standard. At the time of publication, the editions were valid. All publications are subject to revision, and the users of this standard are encouraged to investigate the possibility of applying the most recent editions of the publications listed.

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

ISO 701:1998, *International Gear Notation – Symbols for Geometrical Data*

