American National Standard

Bevel Gear Classification, Tolerances, and Measuring Methods
American National Standard

**Bevel Gear Classification, Tolerances, and Measuring Methods**
ANSI/AGMA 2009-B01
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**ABSTRACT**

This standard, for bevel gearing, correlates gear accuracy grades with gear tooth tolerances. It provides information on manufacturing practices as well as gear measuring methods and practices. Annex material provides guidance on specifying an accuracy grade and information on additional methods of gear inspection.

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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 2009-B01, Bevel Gear Classification, Tolerances, and Measuring Methods.]

The accuracy grades have been significantly changed from the previous AGMA 390.03a. The “B” designator has been added to differentiate from previous classification systems.

This standard provides tolerances for different gear accuracy grades from B3 to B10 for unassembled bevel gears. It further describes methods and practices for measuring the various gear elements for which tolerances are provided. Applicable definitions are provided.

The purpose is to provide a common basis for specifying accuracy, and for the procurement of unassembled gears. It is not a design manual for determining the specific accuracy grades for a given application. It is not intended for use as a reference in procurement of enclosed drives.

The AGMA Standard 390.03 was published in 1973 as a consolidation and updating of several withdrawn AGMA publications, including:

- AGMA 235.02 (February, 1966), Information Sheet for Master Gears
- AGMA 239.01 (October, 1965), Measuring Methods and Practices Manual for Control of Spur, Helical and Herringbone Gears
- AGMA 239.01A (September, 1966), Measuring Methods and Practices Manual for Control of Bevel and Hypoid Gears, and parts of
- AGMA 236.04(05), Inspection of Fine-Pitch Gears
- AGMA 390.02 (September, 1964), Gear Classification Manual originally published as AGMA 390.01 (1961)

The tolerance source identifier “Q” was added to indicate that the tolerances in 390.03 applied. If Q is not used as a prefix in the quality number, tolerances in AGMA 390.01 and 390.02 applied.

This standard is an update of those sections from AGMA 390.03a for bevel gears only. Additionally, the formulas have also been developed to derive the tolerances in metric terms. The spur and helical portions of AGMA 390.03 were removed and updated, and are now in ANSI/AGMA 2000-A88. The other material in AGMA 390.03a on racks and worms is not covered here, and is left unchanged in AGMA 390.03a.

ANSI/AGMA 2009-A98 was approved by the AGMA membership in October, 1998, and approved as an American National standard on December 10, 1998.

ANSI/AGMA 2009-B01 is a correction of ANSI/AGMA 2009-A98. In 2000, an errata revision of clauses 7.2.3 and 7.2.8 was balloted. This was approved by the AGMA membership in March 2001, and approved as an American National standard on November 20, 2001.

Suggestions for 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 -

Bevel Gear
Classification, Tolerances, and
Measuring Methods

1 Scope

This standard establishes a classification system which may be used to communicate geometrical accuracy specifications of unassembled bevel gearing. It provides a designation system for accuracy of bevel gears and gear pairs. It also provides information on measuring methods and practices. This standard provides the gear manufacturer and the gear buyer with a mutually advantageous reference for uniform tolerances. Eight accuracy grades are defined in this standard, numbered B3 through B10, in order of decreasing precision.

1.1 Equations for tolerances

Equations for tolerances and their ranges of validity are provided in 7.2 for the defined accuracy of gearing. In general, these tolerances cover the following ranges:

\[ 0.2 \leq m_{mn} \leq 50 \]
\[ 5 \leq z \leq 400 \]
\[ 5 \text{ mm} \leq d_T \leq 2000 \text{ mm} \]

where
\( d_T \) is tolerance diameter (see 3.2);
\( m_{mn} \) is mean normal module;
\( z \) is number of teeth.

See clause 4 for required and optional measuring methods.

1.2 Tolerance tables

Tolerance tables are provided in annex D for those who prefer to use tables rather than computations for the values of the tolerances that define the accuracy of gearing. These tables are calculated from the equations in 7.2.

1.3 Measuring methods and practices

Measuring methods and practices are included to promote uniform measurement procedures (see clause 5). These methods permit the user to conduct measuring procedures which are accurate and repeatable to a degree compatible with the specified accuracy. Experienced personnel, with calibrated instruments in suitable surroundings, are required.

1.4 Exceptions

This standard does not apply to enclosed gear unit assemblies, including speed reducers or increasers, gear motors, shaft mounted reducers, high speed units, or other enclosed gear units which are manufactured for a given power, speed, ratio or application.

Gear design is beyond the scope of this standard. The use of the accuracy grades for the determination of gear performance requires extensive experience with specific applications. Therefore, the users of this standard are cautioned against the direct application of tolerance values to a projected performance of unassembled (loose) gears when they are assembled. Refer to the latest AGMA Publications Index for applicable standards.

NOTE: Tolerance values for gears outside the limits stated in this standard should be established by determining the specific application requirements. This may require setting a tolerance smaller than calculated by the formulas in this standard.

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 the American National Standard are encouraged to investigate the possibility of