American Gear Manufacturers Association

ANSI/AGMA 6013-B16
(Revision of ANSI/AGMA 6013-A06)

American National Standard

Standard for Industrial Enclosed Gear Drives

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[Revision of ANSI/AGMA 6013-A06]

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ABSTRACT

This standard includes design, rating, lubrication, testing, and selection information for enclosed gear drives, including foot mounted, shaft mounted, screw conveyor drives, and gearmotors. These drives may include spur, helical, herringbone, double helical, or bevel gearing in single or multistage arrangements as either parallel, concentric, or right angle configurations.

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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 6013-B16, *Standard for Industrial Enclosed Gear Drives*.]

This standard revises, combines and supersedes two previous independent standards, ANSI/AGMA 6009-A00, *Standard for Gearmotors, Shaft Mounted and Screw Conveyor Drives*, and ANSI/AGMA 6010-F97, *Standard for Spur, Helical, Herringbone and Bevel Enclosed Drives*. The history of these standards have their roots in:

- AGMA 420.04, *Practice for Enclosed Speed Reducers or Increasers Using Spur, Helical, Herringbone and Spiral Bevel Gears*
- AGMA 460.05, *Practice for Gearmotors Using Spur, Helical, Herringbone and Spiral Bevel Gears*
- AGMA 480.06, *Practice for Spur, Helical and Herringbone Gear Shaft-Mounted Speed Reducers*

ANSI/AGMA 6013-A06 presents general guidelines and practices for design, rating and lubrication of parallel, concentric, and right angle shaft drives. It includes foot mounted, shaft mounted, screw conveyor drives, and gearmotors. It includes the available data, gear technology, and operational experience.

The comprehensive thermal rating procedure has been removed but is included by reference to AGMA ISO 14179-1.

This standard reflects the consolidation of “Enclosed Drives”, to include gearmotors, shaft mounted, and screw conveyor drives, into a single document.

The allowable stress numbers used in this standard are derived from ANSI/AGMA 2001-D04, *Fundamental Rating Factors and Calculation Methods for Involute Spur and Helical Gear Teeth* and ANSI/AGMA 2003-C10, *Rating the Pitting Resistance & Bending Strength of Generated Straight Bevel, Zerol Bevel, and Spiral Bevel Gear Teeth*, and, along with other rating factors, provide a rating basis for enclosed gear reducers and increasers. The rating formulas are based on many years of experience in the design and application of enclosed gear drives for industrial use. Provisions are included in this standard for using stress cycle factors other than 1.0 to adjust the rating for extended or reduced life. Using a stress cycle adjustment factor does not guarantee a certain number of life hours or stress cycles, but is a method of approximating gear life under different load and speed conditions.

In addition to a general update to match current industry practices, substantial changes in the new ANSI/AGMA 6013-B16 include:

- moved wormgearing related text to Annex I;
- expanded crane service factor recommendations;
- revised and updated lubrication clause.

The competence to design enclosed gear drives, especially the knowledge and judgment required to properly evaluate the various rating factors, comes primarily from years of experience in designing, testing, manufacturing, and operating similar gear drives. The proper application of the general rating formulas for enclosed gear drives is best accomplished by those experienced in the field.

The first draft of ANSI/AGMA 6013-A06 was created in November 2000. It was approved by the AGMA membership in March 2006. It was approved as an American National Standard on April 25, 2006.

The first draft of ANSI/AGMA 6013-B16 was created in November 2011. It was approved by the AGMA membership in October 2015. It was approved as an American National Standard on April 5, 2016.

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

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American National Standard–

Standard for Industrial Enclosed Gear Drives

1 Scope

This standard is applicable to enclosed gear drives including configurations of parallel, concentric, and right angle shafts. It includes foot mounted, shaft mounted, screw conveyor drives, and gearmotors. These enclosed drives utilize spur, helical, herringbone, double helical, or bevel gearing in single or multiple stages. Bevel gear drives may include shaft angles other than 90 degrees.

1.1 Limitations

This standard is applicable to gear drives having single or multiple stage gearing with pitch line velocities not exceeding 7000 ft/min for spur, helical and spiral bevel gearing and 6000 ft/min for straight bevel, and shaft speeds not exceeding 4500 rpm for helical, spur, straight bevel, and spiral bevel gearing.

1.2 Exceptions

This standard does not cover epicyclic or crossed-helical gear drives. This standard does not cover the rating of spur, helical, or bevel gears due to wear or scuffing. The design and rating of the electric motor is beyond the scope of this standard. This standard does not apply to gear drives that are covered by other specific AGMA application standards.

For gear drives using wormgears, the design parameters shall be in accordance with the methods and procedures of ANSI/AGMA 6035-A02 for double enveloping wormgears and ANSI/AGMA 6034-B92 for cylindrical wormgears. Refer to Annex I for more details.

2 Normative references

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

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

AGMA ISO 14179-1, *Gear Reducers – Thermal Capacity* Based on ISO/TR 14179-1

ANSI/AGMA 1010-F14, *Appearance of Gear Teeth – Terminology of Wear and Failure*

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

ANSI/AGMA 2001-D04, *Fundamental Rating Factors and Calculation Methods for Involute Spur and Helical Gear Teeth*

ANSI/AGMA 2003-C10, *Rating the Pitting Resistance and Bending Strength of Generated Straight Bevel, Zerol Bevel, and Spiral Bevel Gear Teeth*

ANSI/AGMA 6000-B96, *Specification for Measurement of Linear Vibration on Gear Units*

ANSI/AGMA 6001-E08, *Design and Selection of Components for Enclosed Gear Drives*

ANSI/AGMA 6025-D98, *Sound for Enclosed Helical, Herringbone, and Spiral Bevel Gear Drives*

ANSI/AGMA 6034-B92, *Practice for Enclosed Cylindrical Wormgear Speed Reducers and Gearmotors*

ANSI/AGMA 6035-A02, *Design, Rating and Application of Industrial Globoidal Wormgearing*

ANSI/AGMA ISO 6336-6-A08, *Calculation of Load Capacity of Spur and Helical Gears – Part 6: Calculation of Service Life Under Variable Load*

ANSI/AGMA 9002-C14, *Bores and Keyways for Flexible Couplings (Inch Series)*

ANSI/AGMA 9005-F16, *Industrial Gear Lubrication*

ANSI B17.1 – 1967, *Keys and Keyseats*

3 Symbols and terms

3.1 Symbols

The symbols used in this standard are shown in Table 1.

NOTE: The symbols and terms contained in this document may vary from those used in other AGMA standards. Users of this standard should assure themselves that they are using these symbols and terms in the manner indicated herein.

Table 1 – Symbols

Symbol	Term	Units	Where first used
C_f	Surface condition factor	- -	6.1.1
C_L	Stress cycle factor for pitting, bevel gears	- -	6.1.2
C_{ma}	Mesh alignment factor	- -	6.1.1.2
C_R	Reliability factor		6.1.2
d_p	Pitch diameter of element on shaft	in	10
K_L	Stress cycle factor for bending strength, bevel gears	- -	6.2.2
K_m	Load distribution factor	- -	6.1.1
K_o	Overload factor	- -	6.1.1
K_{oh}	Overhung load factor	- -	10
K_R	Reliability factor	- -	6.1.1
K_{SF}	Service factor	- -	4.1
K_T	Temperature factor	- -	6.1.1
K_v	Dynamic factor	- -	6.1.1
P_A	Application power	HP	5.3
P_{ac}	Allowable transmitted power for pitting resistance	HP	6.1
P_{at}	Allowable transmitted power for bending strength	HP	6.2
P_{mc}	Minimum component power rating	HP	5.3
P_T	Thermal power rating	HP	5.3
Q_v	Transmission accuracy level number	- -	6.1.2.2
S_F	Safety factor for bending strength	- -	6.2.1
S_H	Safety factor for pitting resistance	- -	6.1.1
T	Transmitted shaft torque	lb in	10
W_{oc}	Effective overhung load	lb	10
Y_N	Stress cycle factor for bending strength, spur and helical gears	- -	6.1.1.3
Z_N	Stress cycle factor for pitting, spur and helical gears	- -	6.1.1
S_{ay}	Allowable yield stress number	lb/in^2	5.4