Reaffirmed December 2008

American Gear Manufacturers Association

Technical Resources

American National Standard

Design, Rating and Application of Industrial Globoidal Wormgearing

ANSI/AGMA 6035-A02

American National Standard

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

Approval of an American National Standard requires verification by ANSI that the requirements for due process, consensus, and other criteria for approval have been met by the standards developer.

Consensus is established when, in the judgment of the ANSI Board of Standards Review, substantial agreement has been reached by directly and materially affected interests. Substantial agreement means much more than a simple majority, but not necessarily unanimity. Consensus requires that all views and objections be considered, and that a concerted effort be made toward their resolution.

The use of American National Standards is completely voluntary; their existence does not in any respect preclude anyone, whether he has approved the standards or not, from manufacturing, marketing, purchasing, or using products, processes, or procedures not conforming to the standards.

The American National Standards Institute does not develop standards and will in no circumstances give an interpretation of any American National Standard. Moreover, no person shall have the right or authority to issue an interpretation of an American National Standard in the name of the American National Standards Institute. Requests for interpretation of this standard should be addressed to the American Gear Manufacturers Association.

CAUTION NOTICE: AGMA technical publications are subject to constant improvement, revision, or withdrawal as dictated by experience. Any person who refers to any AGMA technical publication should be sure that the publication is the latest available from the Association on the subject matter.

[Tables or other self–supporting sections may be quoted or extracted. Credit lines should read: Extracted from ANSI/AGMA 6035–A02, *Design, Rating and Application of Industrial Globoidal Wormgearing,* with the permission of the publisher, the American Gear Manufacturers Association, 500 Montgomery Street, Suite 350, Alexandria, Virginia 22314.]

Approved March 20, 2003

ABSTRACT

This standard provides guidelines for the design, rating and application of globoidal wormgearing mounted with axes at a 90 degree angle. Specific definitions for globoidal wormgearing terms are presented, along with formulas for determining the geometric sizes of the major features for the worm and gear. Design considerations, design procedures, gear blanks and self–locking conditions are also discussed. Procedures for rating the load capacity of globoidal wormgearing are included.

Published by

American Gear Manufacturers Association
500 Montgomery Street, Suite 350, Alexandria, Virginia 22314

Printed in the United States of America

ISBN: 1–55589–792–4

Contents

Annexes

Figures

Tables

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 6035–A02, *Design, Rating and Application of Industrial Globoidal Wormgearing.*]

This standard revises, combines and supersedes two previous independent standards: ANSI/AGMA 6030–C87, *Design of Industrial Double–Enveloping Wormgears,* and ANSI/AGMA 6017–E86, *Rating and Application of Single and Multiple Reduction Double–Enveloping Worm and Helical–Worm Speed Reducers.* It presents guidelines and practices for the design, rating and application for industrial globoidal wormgearing.

The first draft of ANSI/AGMA 6035–A02 was made in December 2000. It was approved by the AGMA membership in October, 2001. It was approved as an American National Standard on March 20, 2003.

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.

PERSONNEL of the AGMA Wormgearing Committee

Chairman: R. Gregory Estell . . . . . Accurate Specialties, Inc.
Vice Chairman: James A. Bentley . . . . . Peerless–Winsmith, Inc.

ACTIVE MEMBERS

H.M. Ball . . . . . Gear Products, Inc.
N. Chen . . . . . Peerless–Winsmith, Inc.
R.J. Dickhaus . . . . . Colfax PT Group/Delroyd Worm Gear Operation
J.H. Forberg . . . . . Baldor Motors and Drives
J.E. Hardy . . . . . Textron Power Transmission
J.B. Hagaman . . . . . Textron Power Transmission
S. Moulis . . . . . EPT Gearing
G.E. Olson . . . . . Olson Engineering Service
P.C. Patel . . . . . Rockwell Automation/Dodge
G.M. Sawchak . . . . . Rexnord Corporation

ASSOCIATE MEMBERS

K.E. Acheson . . . . . The Gear Works – Seattle, Inc.
D. Brick . . . . . Leeson Electric Corporation
A.S. Cohen . . . . . Engranes y Maquinaria Arco, S.A.
W.P. Crosher . . . . . Flender Corporation
P. DeRegt . . . . . PDR Enterprises, Inc.
F. Eberle . . . . . Rockwell Automation/Dodge
R.J. Ericson . . . . . Otis Elevator Company
L. Faure . . . . . Compagnie Engrenages et Reducteurs
R.K. Glatt . . . . . Flender Corporation
G.G. Rey . . . . . Instituto Superior Politcnico
G. Henriot . . . . . Ingenieur Conseil
T. Keenan . . . . . EPT Gearing
C.R. Mason . . . . . Franke Gear Works, Inc.
M. Octrue . . . . . Centre Technique des Industries Mecanique
M. Peculis . . . . . Cleveland Gear Company
W.P. Pizzichil, Jr. . . . . Rockwell Automation/Dodge
J.T. Rawlinson . . . . . Renold, Inc.
P.N. Salvucci . . . . . Boston Gear
H.O. Schlenker . . . . . Hub City, Inc.
L.J. Smith . . . . . Consultant
R.E. Smith . . . . . R.E. Smith & Co., Inc.
L. Spiers . . . . . Emerson Power Transmission Corporation
R.K. Stephens . . . . . Regal–Beloit Corporation
F.C. Uherek . . . . . Flender Corporation
P. Vogel . . . . . Reishauer, Ltd.
D. Von Eschen . . . . . Hub City, Inc.
C. Weyand . . . . . M&M Precision Systems Corporation
G.I. Wyss . . . . . Reishauer Corporation

American National Standard –

Design, Rating and Application of Industrial Globoidal Wormgearing

1 Scope

This standard provides guidelines for the design, rating and application of globoidal wormgearing mounted with axes at a 90 degree angle. This type of gearing is called double enveloping wormgearing in the United States, but the term globoidal is more commonly used worldwide.

This standard discusses the two main categories of globoidal wormgearing manufactured in industry today: the traditional Hindley designs, and the more recently developed full contact designs. The standard presents the formulas for calculating general gearset proportions for the globoidal designs and a rating procedure for Hindley designs. It does not provide a detailed or complete procedure for the design of gearsets and the cutting tools required.

Globoidal wormgearing of the Hindley design has been used in industrial applications for over 200 years. The manufacturers of Hindley wormgearing have each designed and built their own tooling to manufacture the gearing. The Hindley design uses a common base circle to form all of the tooth profiles. The worm thread is generated by a cutting edge (line) rotating in a single plane.

The more recently developed full contact designs do not use a constant base circle to form the tooth profiles. The worm thread is generated in multiple planes by a generating surface. The manufacturers of full contact gearing have each conducted their own research, and the details of their designs are proprietary to each company. This design may provide increased load carrying capability over the Hindley design, but a standard rating method for full contact designs has not been established.

1.1 Types of reducers

This standard provides information pertaining to globoidal wormgear speed reducers of the following specific types:

- single reduction reducers incorporating globoidal wormgearing;
- multiple reduction reducers incorporating globoidal wormgearing in each stage of reduction;
- the wormgear portion of multiple reduction reducers incorporating globoidal wormgearing with other types of gearing.

1.2 Speed limitation

The velocity factor table in this standard provides data for sliding velocities up to 6000 feet per minute. For velocities in excess of 6000 feet per minute, the manufacturer should be consulted.

Where the sliding velocity of the worm thread exceeds 2000 feet per minute, additional consideration must be given to the lubrication of gears and bearings. Special lubricants and a pressurized lubrication system may be required.

1.3 Included ratios

The input power formulas for globoidal wormgearing apply for ratios of 3:1 and greater. Engineering practice dictates that ratios in excess of 74:1 should be discussed with the manufacturer.

1.4 Exceptions

Wildhaber plane enveloping globoidal gearing is not covered in this standard.

This standard does not pertain to globoidal wormgearing used as speed increasers. For such applications, the manufacturer should be consulted.

1.5 Intended use

The equations and values presented provide a general approach to design and rating. Deviations from the methods and values stated in this manual may be made when justified by experience, testing or more specific analysis. It is intended for use by experienced gear designers capable of selecting reasonable values based on their knowledge of the