American Gear Manufacturers Association

Technical Resources

(Revision of ANSI/AGMA 9004-A99)
Reaffirmed May 2014

American National Standard

Flexible Couplings - Mass Elastic Properties and Other Characteristics

ANSI/AGMA 9004-B08

American National Standard

Flexible Couplings – Mass Elastic Properties and Other Characteristics
ANSI/AGMA 9004–B08
[Revision of ANSI/AGMA 9004–A99]

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 referenced. Citations should read: See ANSI/AGMA 9004–B08, *Flexible Couplings – Mass Elastic Properties and Other Characteristics,* published by the American Gear Manufacturers Association, 500 Montgomery Street, Suite 350, Alexandria, Virginia 22314, http://www.agma.org.]

Approved December 19, 2008

ABSTRACT

This standard provides information and calculation methods related to mass elastic properties of flexible couplings. Properties discussed are coupling weight, polar weight moment of inertia (WR^2), center of gravity, axial stiffness, axial natural frequency, lateral stiffness, lateral natural frequency and torsional stiffness. Calculation examples are provided in informative annexes.

Published by

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

Printed in the United States of America

ISBN: 978–1–55589–973–8

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 9004-B08, *Flexible Couplings - Mass Elastic Properties and Other Characteristics.*]

This standard was developed through intensive study of existing practices, standards, text books and literature. The intent of this standard is to offer to rotating equipment designers, builders and users, a standard for design practice and methods of calculation of certain physical and mass elastic properties of flexible couplings. In general, the information in this standard is a consolidation of the most common practices and calculations currently in use by the flexible coupling manufacturers, rotating equipment designers and users.

This AGMA standard utilizes the physical dimensions and properties of the coupling or coupling components for the calculation methods presented. This standard does not cover coupling characteristics that are covered in other AGMA flexible coupling standards, such as coupling balance, which is covered in ANSI/AGMA 9000-C90, *Flexible Couplings - Potential Unbalance Classification.*

Work was started on this standard in 1989 at the suggestion of the AGMA Flexible Coupling Committee. The purpose was to gain uniformity in the methods of calculation of some of the mass elastic properties of flexible couplings.

This revision of ANSI/AGMA 9004-A99 corrects errors in equation 6 (axial natural frequency) and equation 8 (floating shaft coupling with central weight, lateral natural frequency). It also corrects equations E.3 and E.4 in Annex E; reworks Annex G to reflect the changes made to equation 6 and adds a paragraph to Annex G that discusses the damped response to external forced vibration that was added to ANSI/AGMA 9104-A06 during its development. There were also minor editorial and clarification changes to the annexes.

The first draft of ANSI/AGMA 9004-B08 was made in October, 2004. It was approved by the AGMA Technical Division Executive Committee in August, 2008. ANSI/AGMA 9004-B08 was approved as a standard by the AGMA membership on September 30, 2008, and approved as an American National Standard on December 19, 2008.

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 Flexible Couplings Committee

Chairman: Glenn Pokrandt . . . . Rexnord Industries Coupling Operations
Vice Chairman: Jim Paluh . . . . Ameridrives Coupling

ACTIVE MEMBERS

T. Hewitt . . . . Lord Corporation
D. Hindman . . . . Rexnord Industries Coupling Operations
D. Lyle . . . . Ameridrives Coupling
H.A. Lynn, III . . . . Rexnord Industries Coupling Operations
J.W. Mahan . . . . Lovejoy, Inc.
J.R. Mancuso . . . . Kop-Flex/Emerson Power Transmission
G.E. Saunders . . . . Ameridrives Coupling
T. Schatzka . . . . Rexnord Industries, Inc.
J. Sherred . . . . Ameridrives Coupling
J. Smihal . . . . T.B. Woods, Inc.
R. Whitney . . . . Riverhawk Company

(This page is intentionally blank)

American National Standard -

Flexible Couplings - Mass Elastic Properties and Other Characteristics

1 Scope

This standard presents information and calculation methods for the mass elastic properties and other characteristics of flexible couplings. This data is of importance to system designers for the selection of system components and natural frequency calculations. Calculation methods of the properties of the coupling flexible elements are not included in this standard. Due to the diversity of coupling types, this standard presents generally accepted practices rather than rigorous engineering analysis. Some characteristics are not covered in this standard, such as coupling balance which is covered in ANSI/AGMA 9000-C90, *Flexible Couplings - Potential Unbalance Classification*.

2 Definitions and symbols

2.1 Definitions

2.1.1 Flexible element

The part of a coupling which provides flexibility. Various flexible element designs utilize a number of operating principles to provide flexibility. The design of this element determines the character of the coupling in terms of reaction forces, dynamics and reliability. For this standard, common flexible element types have been grouped into three major categories which are defined below. Note that the character of a particular flexible element type may cross or fall outside the definitions below. Also note the properties of flexible elements themselves are not covered in this standard. The reader is directed to the appropriate coupling manufacturers for information on the properties of a particular type of flexible element.

2.1.2 Metallic element

A form of flexible element which accommodates misalignment by material deflection of a metal or composite member. These elements are very much like springs in that they have a free form shape and will resist a change in shape with a reaction force. Examples of metallic elements are metal or composite contoured diaphragm, convoluted diaphragm and disc.

2.1.3 Mechanical element

A form of flexible element which accommodates misalignment by sliding or rolling on mating surfaces. These parts normally require lubrication. These elements do not have a free state position. They can be at rest at any combination of axial and angular positions within their flexible capability. Mechanical elements resist change in axial and angular position mainly as a function of shaft torque and coefficient of friction between the mating surfaces. Examples of mechanical elements are gear, grid and pin-bushing.

2.1.4 Elastomeric element

These flexible elements are characterized by the use of an elastomer. There are many types of elastomeric elements which accommodate misalignment through varying degrees of material deflection and sliding motion. Reaction forces of these types of flexible elements are determined by element configuration, material stiffness, coefficient of friction and torque. They can be categorized into two general types, compression and shear, based upon the way torque is transmitted through the flexible element. Because of the great variety of designs some actually fit both categories in varying degrees.

2.2 Symbols

The symbols used in this standard are, wherever possible, consistent with other approved AGMA documents. It is known, because of certain limitations, that some symbols, their titles and their definitions, as used in this document, are different than in similar literature.

