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Technical Resources

AGMA Information Sheet

Double Helical Epicyclic Gear Units

American
Gear

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Double Helical Epicyclic Gear Units

AGMA 940-A09

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ABSTRACT

This information sheet addresses epicyclic gear drives which utilize double helical type gearing on the planetary elements. It is intended to be a supplement to and used in conjunction with ANSI/AGMA 6123-B06, *Design Manual for Enclosed Epicyclic Gear Drives*. It covers only those topics which are unique to double helical gear arrangements in epicyclic gear drives.

Notable features include the addition of a factor to account for load distribution between the helices of the double helical elements, K_{DH} , and discussion of assembly considerations.

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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 Information Sheet 940–A09, *Double Helical Epicyclic Gear Units*.]

The purpose of this information sheet is to provide specification, comparison and design data for double helical epicyclic gear units as a supplement to ANSI/AGMA 6123–B06, *Design Manual for Enclosed Epicyclic Gear Drives*. While the scope of ANSI/AGMA 6123–B06 includes only spur and single helical epicyclic drives, a significant portion of the material presented is applicable to the double helical configuration and will be referenced by this information sheet.

The double helical epicyclic configuration is generally used when it is desired to maximize power density. This information sheet will discuss the considerations and complexities of the double helical epicyclics which include application, arrangements, meshing/assembly, load sharing, lubrication and components (gearing, bearings, splines and carriers).

The formulas presented or referenced in this information sheet contain numerous terms whose individual values can vary significantly depending on application, system effects, accuracy and manufacturing methods. Proper evaluation of these terms is essential for realistic rating. The knowledge and judgment required to properly evaluate the various rating factors comes primarily from years of accumulated experience in designing, testing, manufacturing and operating similar gear units. The detailed treatment of the general rating formulas for specific product applications is best accomplished by those experienced in the field.

This information sheet is dedicated to Don McVittie. His participation and inspiration led to the development of this information sheet. Mr. McVittie was the first Chairman of the Epicyclic Enclosed Drives Committee. His thoroughness and enthusiasm for gearing, along with his contributions, as well as the contributions of his fellow committee members brought out the best information from the committee as a whole.

The first draft of AGMA 940–A09 was made in May, 2005. It was approved by the AGMA Technical Division Executive Committee in January, 2009.

Suggestions for improvement of this document will be welcome. They should be sent to the American Gear Manufacturers Association, 1001 N. Fairfax Street, 5th Floor, Alexandria, Virginia 22314.

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American Gear Manufacturers Association – Double Helical Epicyclic Gear Units

1 Scope

This information sheet provides specific design considerations for epicyclic gear drives which use double helical gearing. Double helical epicyclic gear units have special concerns and complexities in their design, manufacturing and assembly. These include:

- assembly protocols of the gear elements;
- apex runout, sometimes referred to as axial runout or apex wobble;
- effects which influence gear face load distribution;
- special considerations for load sharing;
- special considerations applicable to floating ring designs.

Double helical epicyclic gear units with pitchline velocities in excess of 35 meters per second and aircraft propulsion gears are excluded.

This information sheet is a supplement to ANSI/AGMA 6123-B06 covering design issues of double helical epicyclic units which are not covered in that standard.

2 Normative references

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

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

ANSI/AGMA 2101-D04, *Fundamental Rating Factors and Calculation Methods for Involute Spur and Helical Gear Teeth*

ANSI/AGMA 6123-B06, *Design Manual for Enclosed Epicyclic Gear Drives*

3 Symbols and terminology

The terms used, wherever applicable, conform to ANSI/AGMA 1012-G05. The symbols used in this information sheet 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 information sheet should assure themselves that they are using these symbols and terms in the manner indicated herein.

4 Applications

In addition to the following special design considerations for double helical epicyclic drives, clause 4 in ANSI/AGMA 6123-B06 provides extensive information on drive selection, loading, and service factors that is applicable for double helical drives as well.