International Standard

ISO 23509-1

Bevel and hypoid gear geometry —

Part 1:
Basic methods

Géométrie des engrenages coniques et hypoïdes —

Partie 1: Méthodes de base

First edition
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Foreword

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This document was prepared by Technical Committee ISO/TC 60, *Gears*, Subcommittee SC 2, *Gear capacity calculation*.

This first edition cancels and replaces ISO 23509:2016, which has been technically revised.

The main changes are as follows:

— Clause 3 has been rearranged, Figures 1 to 3 have been moved to a new Clause 4;

— different symbols for pinion offset angles (approximate, intermediate, in pitch plane, in axial plane) for the different methods have been harmonized;

— Figure 1, keys 4, 5, 6, and 26 have been rearranged, keys 27 to 31 have been added;

— subclause 5.2.6 on skew bevel with new Figure 8 has been inserted;

— indication of mean whole depth, mean addendum and mean dedendum in Figure 11 a) and Figure 11 b) have been revised;

— subclause 6.4 has been renamed angle modification and revised, and new Figures 13 and 14 have been inserted;

— keys 2 and 16 of Figure 16 have been revised;

— subclause 7.2.2, the condition to stop the iteration process for the determination of the pitch cone parameters for Method 1 has been modified;

— Table 4 has been updated;

— Clause 8 has been updated respecting new content related to angle modification in 6.4;

— subclause 8.5, Formulae (157) and (158) related to the determination of the pinion face and pinion root apex have been corrected;

— subclause 8.6, Formulae (167) and (168) related to the increment along pinion axis have been corrected;

— subclause 8.9, Formula (220) related to the mean chordal addendum has been corrected;

— A.4 has been modified to distinguish between theoretical and modified tooth contour, Figures A.3 and A.5 have been revised and new Figures A.6 and A.7 have been inserted;

— Table C.1, has been modified to introduce accuracy grades according to ISO 17485;

— C.5, addendum and dedendum angle of wheels has been specified to non-uniform tooth depth;

— Table E.1 has been updated;

— sample calculations of former Annex F have been removed and are intended to be published as a separate Technical Report.

A list of all parts in the ISO 23509 series can be found on the ISO website.

Any feedback or questions on this document should be directed to the user's national standards body. A complete listing of these bodies can be found at www.iso.org/members.html.

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Introduction

For many decades, information on bevel, and especially hypoid, gear geometry has been developed and published by the gear machine manufacturers. The specific formulae for their respective geometries were developed for the mechanical generation methods of their particular machines and tools. In many cases, these formulae were not used in general for all bevel gear types. This situation changed with the introduction of universal, multi-axis, computerized numerical control (CNC)-machines, which in principle can produce nearly all types of gearing. The manufacturers were, therefore, asked to provide CNC programs for the geometries of different bevel gear generation methods on their machines.

This document integrates straight bevel gears and the three major design generation methods for spiral bevel gears into one complete set of formulae. In only a few places, specific formulae for each method will be applied. The structure of the formulae is such that they can be programmed directly, allowing the user to compare the different designs.

The formulae of the three methods are developed for the general case of hypoid gears and to calculate the specific case of spiral bevel gears by entering zero for the hypoid offset. Additionally, the geometries correspond such that each gear set consists of a generated or non-generated wheel without offset and a pinion which is generated and provided with the total hypoid offset.

This document deals with the macro geometry of bevel gears. Some information on micro geometry and manufacturing can be found in ISO/TR 22849[4].

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