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Bevel and hypoid gear geometry

Géométrie des engrenages coniques et hypoïdes



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ISO copyright office
Ch. de Blandonnet 8 • CP 401
CH-1214 Vernier, Geneva, Switzerland
Tel. +41 22 749 01 11
Fax +41 22 749 09 47
copyright@iso.org
www.iso.org

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Contents

	Page
Foreword	v
Introduction	vi
1 Scope	1
2 Normative references	1
3 Terms, definitions and symbols	1
3.1 Terms and definitions.....	5
3.2 Symbols.....	7
4 Design considerations	9
4.1 General.....	9
4.2 Types of bevel gears.....	10
4.2.1 General.....	10
4.2.2 Straight bevels.....	10
4.2.3 Spiral bevels.....	10
4.2.4 Zerol bevels.....	10
4.2.5 Hypoids.....	11
4.3 Ratios.....	11
4.4 Hand of spiral.....	11
4.5 Preliminary gear size.....	12
5 Tooth geometry and cutting considerations	12
5.1 Manufacturing considerations.....	12
5.2 Tooth taper.....	12
5.3 Tooth depth configurations.....	14
5.3.1 Taper depth.....	14
5.3.2 Uniform depth.....	15
5.4 Dedendum angle modifications.....	17
5.5 Cutter radius.....	17
5.6 Mean radius of curvature.....	17
5.7 Hypoid design.....	18
5.8 Most general type of gearing.....	18
5.9 Hypoid geometry.....	19
5.9.1 Basics.....	19
5.9.2 Crossing point.....	21
6 Pitch cone parameters	21
6.1 Initial data for pitch cone parameters.....	21
6.2 Determination of pitch cone parameters for bevel and hypoid gears.....	22
6.2.1 Method 0.....	22
6.2.2 Method 1.....	22
6.2.3 Method 2.....	26
6.2.4 Method 3.....	31
7 Gear dimensions	33
7.1 Initial data for tooth profile parameters.....	33
7.2 Determination of basic data.....	36
7.3 Determination of tooth depth at calculation point.....	38
7.4 Determination of root angles and face angles.....	38
7.5 Determination of pinion face width, b_1	40
7.6 Determination of inner and outer spiral angles.....	42
7.6.1 Pinion.....	42
7.6.2 Wheel.....	43
7.7 Determination of tooth depth.....	44
7.8 Determination of tooth thickness.....	44
7.9 Determination of remaining dimensions.....	46

This is a preview of "ISO 23509:2016". [Click here to purchase the full version from the ANSI store.](#)

8	Undercut check	47
	8.1 Pinion	47
	8.2 Wheel	49
	Annex A (informative) Structure of ISO formula set for calculation of geometry data of bevel and hypoid gears	51
	Annex B (informative) Pitch cone parameters	57
	Annex C (informative) Gear dimensions	68
	Annex D (informative) Analysis of forces	75
	Annex E (informative) Machine tool data	78
	Annex F (informative) Sample calculations	79
	Bibliography	138

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Foreword

ISO (the International Organization for Standardization) is a worldwide federation of national standards bodies (ISO member bodies). The work of preparing International Standards is normally carried out through ISO technical committees. Each member body interested in a subject for which a technical committee has been established has the right to be represented on that committee. International organizations, governmental and non-governmental, in liaison with ISO, also take part in the work. ISO collaborates closely with the International Electrotechnical Commission (IEC) on all matters of electrotechnical standardization.

The procedures used to develop this document and those intended for its further maintenance are described in the ISO/IEC Directives, Part 1. In particular the different approval criteria needed for the different types of ISO documents should be noted. This document was drafted in accordance with the editorial rules of the ISO/IEC Directives, Part 2 (see www.iso.org/directives).

Attention is drawn to the possibility that some of the elements of this document may be the subject of patent rights. ISO shall not be held responsible for identifying any or all such patent rights. Details of any patent rights identified during the development of the document will be in the Introduction and/or on the ISO list of patent declarations received (see www.iso.org/patents).

Any trade name used in this document is information given for the convenience of users and does not constitute an endorsement.

For an explanation on the meaning of ISO specific terms and expressions related to conformity assessment, as well as information about ISO's adherence to the World Trade Organization (WTO) principles in the Technical Barriers to Trade (TBT) see the following URL: www.iso.org/iso/foreword.html.

The committee responsible for this document is ISO/TC 60, *Gears*, Subcommittee SC 2, *Gear capacity calculation*.

This second edition cancels and replaces the first edition (ISO 23509:2006), which has been technically revised with the following changes:

- minor corrections of several formulae;
- the figures have been reworked;
- explanations have been added in [4.4](#);
- the structure of [Formula \(129\)](#) has been changed to cover the case $\zeta_m = 0^\circ$;
- a formula for the calculation of c_{be2} has been added as [Formula \(F.160\)](#);
- the values for α_{nC} and α_{nD} in [Formulae \(F.318\)](#) and [\(F.319\)](#) have been extended to three decimal digits to prevent rounding errors.

Introduction

For many decades, information on bevel, and especially hypoid, gear geometry has been developed and published by the gear machine manufacturers. It is clear that 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 could not be used in general for all bevel gear types. This situation changed with the introduction of universal, multi-axis, CNC-machines, which in principle are able to 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 do specific formulae for each method have to 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.

An additional objective of this document is that, on the basis of the combined bevel gear geometries, an ISO hypoid gear rating system can be established in the future.