# ISO 23509:2006-09 (E)

## Bevel and hypoid gear geometry

## Contents

Page


Foreword ..... v

Introduction ..... vi

1 Scope ..... 1

2 Normative references ..... 1

3 Terms, definitions and symbols ..... 1
3.1 Terms and definitions ..... 6
3.2 Symbols ..... 8

4 Design considerations ..... 10
4.1 General ..... 10
4.2 Types of bevel gears ..... 11
4.2.1 Straight bevels ..... 11
4.2.2 Spiral bevels ..... 11
4.2.3 Zerol bevels ..... 11
4.2.4 Hypoids ..... 12
4.3 Ratios ..... 12
4.4 Hand of spiral ..... 12
4.5 Preliminary gear size ..... 13

5 Tooth geometry and cutting considerations ..... 13
5.1 Manufacturing considerations ..... 13
5.2 Tooth taper ..... 13
5.3 Tooth depth configurations ..... 15
5.3.1 Taper depth ..... 15
5.3.2 Uniform depth ..... 16
5.4 Dedendum angle modifications ..... 18
5.5 Cutter radius ..... 18
5.6 Mean radius of curvature ..... 18
5.7 Hypoid design ..... 19
5.8 Most general type of gearing ..... 19
5.9 Hypoid geometry ..... 20
5.9.1 Basics ..... 20
5.9.2 Crossing point ..... 22

6 Pitch cone parameters ..... 22
6.1 Initial data ..... 22
6.2 Determination of pitch cone parameters for bevel and hypoid gears ..... 23
6.2.1 Method 0 ..... 23
6.2.2 Method 1 ..... 23
6.2.3 Method 2 ..... 27
6.2.4 Method 3 ..... 32

7 Gear dimensions ..... 35
7.1 Additional data ..... 35
7.2 Determination of basic data ..... 37
7.3 Determination of tooth depth at calculation point ..... 39
7.4 Determination of root angles and face angles ..... 39
7.5 Determination of pinion face width, b1 ..... 41

7.6 Determination of inner and the outer spiral angles ..... 43
7.6.1 Pinion ..... 43
7.6.2 Wheel ..... 44
7.7 Determination of tooth depth ..... 45
7.8 Determination of tooth thickness ..... 46
7.9 Determination of remaining dimensions ..... 47

8 Undercut check ..... 48
8.1 Pinion ..... 48
8.2 Wheel ..... 50

Annex A (informative) Structure of ISO formula set for calculation of geometry data of bevel and hypoid gears ..... 52

Annex B (informative) Pitch cone parameters ..... 58

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