

ISO 23509:2016-11 (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 | 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 | Zero 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 |
| 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 bevelandhypoidgears | | 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 |