
**Gears — Cylindrical involute gears and
gear pairs — Concepts and geometry**

*Engrenages — Roues et engrenages cylindriques à développante —
Concepts et géométrie*



PDF disclaimer

This PDF file may contain embedded typefaces. In accordance with Adobe's licensing policy, this file may be printed or viewed but shall not be edited unless the typefaces which are embedded are licensed to and installed on the computer performing the editing. In downloading this file, parties accept therein the responsibility of not infringing Adobe's licensing policy. The ISO Central Secretariat accepts no liability in this area.

Adobe is a trademark of Adobe Systems Incorporated.

Details of the software products used to create this PDF file can be found in the General Info relative to the file; the PDF-creation parameters were optimized for printing. Every care has been taken to ensure that the file is suitable for use by ISO member bodies. In the unlikely event that a problem relating to it is found, please inform the Central Secretariat at the address given below.

This document is a preview generated by EVS



COPYRIGHT PROTECTED DOCUMENT

© ISO 2007

All rights reserved. Unless otherwise specified, no part of this publication may be reproduced or utilized in any form or by any means, electronic or mechanical, including photocopying and microfilm, without permission in writing from either ISO at the address below or ISO's member body in the country of the requester.

ISO copyright office
Case postale 56 • CH-1211 Geneva 20
Tel. + 41 22 749 01 11
Fax + 41 22 749 09 47
E-mail copyright@iso.org
Web www.iso.org

Published in Switzerland

Contents

Page

Foreword.....	iv
1 Scope	1
2 Normative references	1
3 Symbols, subscripts and units	2
3.1 Symbols	2
3.2 Subscripts	8
3.3 Units	9
4 Individual cylindrical gears	10
4.1 Concepts for an individual gear	10
4.2 Reference surfaces, datum lines and reference quantities	12
4.3 Involute helicoids	17
4.4 Angular pitch and pitches	21
4.5 Diameters of gear teeth	24
4.6 Gear tooth height	24
4.7 Tooth thickness, space width	25
5 Cylindrical gear pairs	27
5.1 Concepts for a gear pair	27
5.2 Mating quantities	28
5.3 Calculation of the sum of the profile shift coefficients	31
5.4 Tooth engagement	32
5.5 Backlash	40
5.6 Sliding conditions at the tooth flanks	41
6 Tooth flank modifications	44
6.1 Tooth flank modifications which restrict the usable flank	44
6.2 Transverse profile modifications	45
6.3 Flank line (helix) modifications	48
6.4 Flank face modifications	49
6.5 Descriptions of modifications by functions	51
7 Geometrical limits	52
7.1 Counterpart rack tooth profile	53
7.2 Machining allowance	54
7.3 Deviations in tooth thickness	55
7.4 Generating profile shift, generating profile shift coefficient	56
7.5 Generated root diameter	57
7.6 Usable area of the tooth flank, tip and root form diameter	57
7.7 Undercut	59
7.8 Overcut	59
7.9 Minimum tooth thickness at the tip circle of a gear	59
Annex A (informative) Calculations related to tooth thickness	60
Bibliography	83

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.

International Standards are drafted in accordance with the rules given in the ISO/IEC Directives, Part 2.

The main task of technical committees is to prepare International Standards. Draft International Standards adopted by the technical committees are circulated to the member bodies for voting. Publication as an International Standard requires approval by at least 75 % of the member bodies casting a vote.

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.

ISO 21771 was prepared by Technical Committee ISO/TC 60, *Gears*, Subcommittee SC 1, *Nomenclature and wormgearing*.

This first edition of ISO 21771 cancels and replaces ISO/TR 4467:1982, of which it constitutes a technical revision.

Gears — Cylindrical involute gears and gear pairs — Concepts and geometry

1 Scope

This International Standard specifies the geometric concepts and parameters for cylindrical gears with involute helicoid tooth flanks. Flank modifications are included.

It also covers the concepts and parameters for cylindrical gear pairs with parallel axes and a constant gear ratio, which consist of cylindrical gears according to it. Gear and mating gear in these gear pairs have the same basic rack tooth profile.

The equations given are not restricted to the pressure angle, $\alpha_p = 20^\circ$.

The standard is structured as follows.

- Listing of symbols and nomenclature for a unique description of gears and gear pairs (see Clause 3).
- Equations and explanations of the relevant values for defining a cylindrical gear and its tooth system. The equations for determination of the nominal values for zero-deviation gear description parameters are stated for radial tooth dimensions (gear tooth heights), the distance between flanks of the same hand, the distance between flanks of opposite hand, as well as the tooth flank characterizing parameters (see Clause 4).
- Equations and explanations of the relevant values for defining cylindrical gear pairs. The equations for the essential parameters characterizing the engagement conditions of the unloaded gear pair are listed (see Clause 5).
- Equations and suggestions for desired flank modifications (see Clause 6).
- Concepts and recommendations needed for a unique geometrical definition of the intended results from manufacture (Clause 7).
- Equations for determination of the nominal values or the limiting values for the most used inspection methods for tooth thickness (see Annex A).

2 Normative references

The following referenced documents are indispensable for the application of this document. For dated references, only the edition cited applies. For undated references, the latest edition of the referenced document (including any amendments) applies.

ISO 53:1998, *Cylindrical gears for general and heavy engineering — Standard basic rack tooth profile*

ISO 1328-1:1995, *Cylindrical gears — ISO system of accuracy — Part 1: Definitions and allowable values of deviations relevant to corresponding flanks of gear teeth*

ISO 1328-2:1997, *Cylindrical gears — ISO system of accuracy — Part 2: Definitions and allowable values of deviations relevant to radial composite deviations and runout information*