
**Cylindrical gears — ISO system of
flank tolerance classification —**

**Part 1:
Definitions and allowable values of
deviations relevant to flanks of gear
teeth**

*Engrenages cylindriques — Système ISO de classification des
tolérances sur flancs —*

*Partie 1: Définitions et valeurs admissibles des écarts pour les flancs
de la denture*



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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

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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.

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 1328-1 was prepared by Technical Committee ISO/TC 60, *Gears*.

This second edition cancels and replaces the first edition (ISO 1328-1:1995), which has been technically revised. In particular, the following are the major changes:

- the scope of applicability has been expanded;
- revisions have been made to the formulae which define the flank tolerances;
- annexes have been added to describe additional methods for analysis of modified profiles and helices;
- the evaluation of runout, previously handled in ISO 1328-2, has been brought back into this part of ISO 1328.

ISO 1328 consists of the following parts, under the general title *Cylindrical gears — ISO system of flank tolerance classification*:

- *Part 1: Definitions and allowable values of deviations relevant to flanks of gear teeth*
- *Part 2: Definitions and allowable values of deviations relevant to radial composite deviations and runout information¹⁾*

1) It is intended that, upon revision, the main element of the title of Part 2 will be aligned with the main element of the title of Part 1.

Introduction

ISO 1328:1975 (third edition, withdrawn) included definitions and allowable values of gear element deviations, along with advice on appropriate inspection methods.

The first edition of this part of ISO 1328 retained the definitions and allowable values for gear flank deviations (single pitch, cumulative pitch, total cumulative pitch, total profile and total helix), while the advice on appropriate inspection methods was given in ISO/TR 10064-1 (listed in [Clause 2](#)).

Cylindrical gears — ISO system of flank tolerance classification —

Part 1:

Definitions and allowable values of deviations relevant to flanks of gear teeth

IMPORTANT — It is strongly recommended that any user of this part of ISO 1328 be very familiar with the methods and procedures outlined in ISO/TR 10064-1. Use of techniques other than those of ISO/TR 10064-1 combined with the limits described in this part of ISO 1328 might not be suitable.

CAUTION — The use of the flank tolerance classes for the determination of gear performance requires extensive experience with specific applications. Users of this part of ISO 1328 are cautioned against the direct application of tolerance values for unassembled (loose) gears to a projected performance of an assembly using these gears.

1 Scope

This part of ISO 1328 establishes a tolerance classification system relevant to manufacturing and conformity assessment of tooth flanks of individual cylindrical involute gears. It specifies definitions for gear flank tolerance terms, the structure of the flank tolerance class system, and allowable values.

This part of ISO 1328 provides the gear manufacturer and the gear buyer with a mutually advantageous reference for uniform tolerances. Eleven flank tolerance classes are defined, numbered 1 to 11, in order of increasing tolerance. Formulae for tolerances are provided in 5.3. These tolerances are applicable to the following ranges:

$$5 \leq z \leq 1\,000$$

$$5\text{ mm} \leq d \leq 15\,000\text{ mm}$$

$$0,5\text{ mm} \leq m_n \leq 70\text{ mm}$$

$$4\text{ mm} \leq b \leq 1\,200\text{ mm}$$

$$\beta \leq 45^\circ$$

where

d is the reference diameter;

m_n is the normal module;

b is the facewidth (axial);

z is the number of teeth;

β is the helix angle.

See [Clause 4](#) for required and optional measuring methods.

Gear design is beyond the scope of this part of ISO 1328.

Surface texture is not considered in this part of ISO 1328. For additional information on surface texture, see ISO/TR 10064-4.

2 Normative references

The following documents, in whole or in part, are normatively referenced in this document and are indispensable to its application. For dated references, only the edition cited applies. For undated references, the latest edition of the referenced document (including any amendments) applies.

ISO 701, *International gear notation — Symbols for geometrical data*

ISO 1122-1, *Vocabulary of gear terms — Part 1: Definitions related to geometry*

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

ISO/TR 10064-1, *Code of inspection practice — Part 1: Inspection of corresponding flanks of gear teeth*

ISO/TS 16610-1, *Geometrical product specifications (GPS) — Filtration — Part 1: Overview and basic concepts*

ISO 16610-21, *Geometrical product specifications (GPS) — Filtration — Part 21: Linear profile filters: Gaussian filters*

ISO 21771, *Gears — Cylindrical involute gears and gear pairs — Concepts and geometry*

3 Terms, definitions and symbols

3.1 Fundamental terms and symbols

For the purposes of this part of ISO 1328, the following terms, definitions and symbols apply.

NOTE 1 For other definitions of geometric terms related to gearing, see ISO 701, ISO 1122-1 and ISO 21771.

NOTE 2 Some of the symbols and terminology contained in this part of ISO 1328 might differ from those used in other documents and International Standards.

NOTE 3 The terminology and symbols used in this part of ISO 1328 are listed, in alphabetical order, by term in [Table 1](#), and in alphabetical order, by symbol in [Table 2](#). The text of terms used in [Table 1](#) has been adjusted to form groups of logical terms. Subscript “T” is used for tolerance values.

Table 1 — Terms, listed in alphabetical order, with symbols

Term	Symbol	Unit
Active tip diameter	d_{Na}	mm
Active tip diameter point on line of action	N_a	–
Adjacent pitch difference	f_u	μm
Adjacent pitch difference tolerance	f_{uT}	μm
Adjacent pitch difference, individual	f_{ui}	μm
Amount of root relief	$C_{\alpha f}$	μm
Amount of tip relief	$C_{\alpha a}$	μm
Base diameter	d_b	mm
Contact pattern evaluation	c_p	–
Contact point tangent at base circle	T	–