INTERNATIONAL STANDARD

ISO 10300-1

First edition
2001-08-01

Calculation of load capacity of bevel gears —

Part 1: Introduction and general influence factors

Calcul de la capacité de charge des engrenages coniques —
Partie 1: Introduction et facteurs généraux d'influence

Reference number
ISO 10300-1:2001(E)

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Printed 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 3.

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 part of ISO 10300 may be the subject of patent rights. ISO shall not be held responsible for identifying any or all such patent rights.

International Standard ISO 10300-1 was prepared by Technical Committee ISO/TC 60, *Gears*, Subcommittee SC 2, *Gear capacity calculation*.

ISO 10300 consists of the following parts, under the general title *Calculation of load capacity of bevel gears*:

— *Part 1: Introduction and general influence factors*

— *Part 2: Calculation of surface durability (pitting)*

— *Part 3: Calculation of tooth root strength*

Annex A forms an integral part of this part of ISO 10300. Annex B and annex C are for information only.

Introduction

Parts 1, 2 and 3 of ISO 10300, taken together with ISO 6336-5, are intended to establish general principles and procedures for the calculation of the load capacity of bevel gears. Moreover, ISO 10300 has been designed to facilitate the application of future knowledge and developments, as well as the exchange of information gained from experience.

Several methods for the calculation of load capacity and various factors are specified by ISO 10300, whose guidelines are complex, yet flexible. There could be differences of up to 20 % to 25 % between the results of calculations carried out using method B with method B1 and method B2 with method C. The combined use of methods B2 and C, considered the methods of greater simplification, provides a more conservative safety factor. Detailed or simplified methods can be included, as appropriate, in application standards derived from ISO 10300 in the fields of industrial and marine gears. However, it must be stressed that the methods' use for specific applications demands not only experience with combined calculation methods, but also a realistic and knowledgeable appraisal of all relevant considerations, as well as appropriate safety factors.

The more detailed calculation methods of ISO 10300 are intended for the recalculation of the load capacity limits of gears where all important data, such as existing gear sets and completed gear designs, is known. The approximate methods of ISO 10300 are to be used for preliminary estimates of gear capacity where the final details of the gear design are as yet unknown.

The procedures covered by ISO 10300 are based on both testing and theoretical studies. However, the results obtained from its rating calculations may not be in good agreement with certain, previously accepted, gear-calculation methods.

ISO 10300 provides methods by which different gear designs can be compared. It is not intended to ensure the performance of assembled gear-drive systems. Neither is it intended for use by the average engineer. Rather, it is aimed at the experienced gear designer capable of selecting reasonable values for the factors in these formulae, based on knowledge of similar designs and on awareness of the effects of the items discussed.

Calculation of load capacity of bevel gears —

Part 1:
Introduction and general influence factors

1 Scope

The formulae in ISO 10300 are intended to establish uniformly acceptable methods for calculating the pitting resistance and bending-strength capacity of straight and helical (skew), zerol and spiral bevel gears except hypoid gears. They are applicable equally to tapered depth and uniform depth teeth.

The formulae take into account the known major factors influencing gear-tooth pitting and fractures at the root fillet, as well as allowing for the inclusion of new factors at a later date. The rating formulae are not applicable to other types of gear-tooth deterioration such as plastic yielding, micropitting, case crushing, welding, and wear. The bending-strength formulae are applicable to fractures at the tooth fillet, but not to those on the tooth-working profile surfaces, nor to failure of the gear rim or of the gear blank through the web and hub. Pitting resistance and bending-strength capacity rating systems for a particular category of bevel gear can be established by selecting proper values for the factors used in the general formulae. ISO 10300 is not applicable to bevel gears which have an inadequate contact pattern.

ISO 10300 is restricted to bevel gears whose virtual cylindrical gears have transverse contact ratios of $\varepsilon_{v\alpha} < 2$. The given relations are valid for gears of which the sum of addendum modification factors of pinion and gear is zero, i.e. the normal operating pressure angle of the gear pair is the same as the normal pressure angle of the basic rack.

NOTE Methods for the calculation of the load capacity of hypoid gears are indicated by the manufacturers of gear-cutting machines.

CAUTION — The user is cautioned that when the methods are used for large spiral and pressure angles, and for large face width $b > 10\ m_{mn}$, the calculated results of ISO 10300 should be confirmed by experience.

2 Normative references

The following normative documents contain provisions which, through reference in this text, constitute provisions of this part of ISO 10300. For dated references, subsequent amendments to, or revisions of, any of these publications do not apply. However, parties to agreements based on this part of ISO 10300 are encouraged to investigate the possibility of applying the most recent editions of the normative documents indicated below. For undated references, the latest edition of the normative document referred to applies. Members of ISO and IEC maintain registers of currently valid International Standards.

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

ISO 1122-1:1998, *Vocabulary of gear terms — Part 1: Definitions related to geometry*.

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 6336-1, *Calculation of load capacity of spur and helical gears — Part 1: Basic principles, introduction and general influence factors*.