PD ISO/TR 6336-31:2018

BSI Standards Publication

Calculation of load capacity of spur and helical gears

Part 31: Calculation examples of micropitting load capacity

bsi.

National foreword

This Published Document is the UK implementation of ISO/TR 6336-31:2018. It supersedes PD ISO/TR 15144-2:2014, which is withdrawn.

The UK participation in its preparation was entrusted to Technical Committee MCE/5/-/6, Calculation of gear performance.

A list of organizations represented on this committee can be obtained on request to its secretary.

This publication does not purport to include all the necessary provisions of a contract. Users are responsible for its correct application.

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Compliance with a British Standard cannot confer immunity from legal obligations.

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TECHNICAL REPORT

ISO/TR 6336-31

First edition
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Calculation of load capacity of spur and helical gears —

Part 31: Calculation examples of micropitting load capacity

Calcul de la capacité de charge des engrenages cylindriques à dentures droite et hélicoïdale —

Partie 31: Exemples de calcul de la capacité de charge aux micropiqûres

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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.

The procedures used to develop this document and those intended for its further maintenance are described in the ISO/IEC Directives, Part 1. In particular, the different approval criteria needed for the different types of ISO documents should be noted. This document was drafted in accordance with the editorial rules of the ISO/IEC Directives, Part 2 (see www.iso.org/directives).

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. Details of any patent rights identified during the development of the document will be in the Introduction and/or on the ISO list of patent declarations received (see www.iso.org/patents).

Any trade name used in this document is information given for the convenience of users and does not constitute an endorsement.

For an explanation of the voluntary nature of standards, the meaning of ISO specific terms and expressions related to conformity assessment, as well as information about ISO's adherence to the World Trade Organization (WTO) principles in the Technical Barriers to Trade (TBT) see www.iso.org/iso/foreword.html.

This document was prepared by Technical Committee ISO/TC 60, *Gears*, Subcommittee SC 2, *Gear capacity calculation*.

Any feedback or questions on this document should be directed to the user's national standards body. A complete listing of these bodies can be found at www.iso.org/members.html.

This document cancels and replaces ISO/TR 15144-2:2014.

Introduction

The ISO 6336 series consists of International Standards, Technical Specifications (TS) and Technical Reports (TR) under the general title *Calculation of load capacity of spur and helical gears* (see Table 1).

— International Standards contain calculation methods that are based on widely accepted practices and have been validated.

— TS contain calculation methods that are still subject to further development.

— TR contain data that is informative, such as example calculations.

The procedures specified in ISO 6336-1 to ISO 6336-19 cover fatigue analyses for gear rating. The procedures described in ISO 6336-20 to ISO 6336-29 are predominantly related to the tribological behaviour of the lubricated flank surface contact. ISO 6336-30 to ISO 6336-39 include example calculations. The ISO 6336 series allows the addition of new parts under appropriate numbers to reflect knowledge gained in the future.

Requesting standardized calculations according to ISO 6336 without referring to specific parts requires the use of only those parts that are currently designated as International Standards (see Table 1 for listing). When requesting further calculations, the relevant part or parts of ISO 6336 need to be specified. Use of a Technical Specification as acceptance criteria for a specific design needs to be agreed in advance between manufacturer and purchaser.

Table 1 — Overview of ISO 6336

Calculation of load capacity of spur and helical gears	International Standard	Technical Specification	Technical Report
Part 1: Basic principles, introduction and general influence factors	X		
Part 2: Calculation of surface durability (pitting)	X		
Part 3: Calculation of tooth bending strength	X		
Part 4: Calculation of tooth flank fracture load capacity		X	
Part 5: Strength and quality of materials	X		
Part 6: Calculation of service life under variable load	X		
Part 20: Calculation of scuffing load capacity (also applicable to bevel and hypoid gears) — Flash temperature method (Replaces ISO/TR 13989-1)		X	
Part 21: Calculation of scuffing load capacity (also applicable to bevel and hypoid gears) — Integral temperature method (Replaces ISO/TR 13989-2)		X	
Part 22: Calculation of micropitting load capacity (Replaces ISO/TR 15144-1)		X	
Part 30: Calculation examples for the application of ISO 6336-1, 2, 3, 5			X
Part 31: Calculation examples of micropitting load capacity (Replaces: ISO/TR 15144-2)			X
At the time of publication of this document, some of the parts listed here were under development. Consult the ISO website.			

This document provides worked examples for the application of the calculation procedures defined in ISO/TS 6336-22. The example calculations cover the application to spur and helical cylindrical involute gears for both high-speed and low-speed operating conditions, determining the micropitting safety factor for each gear pair. The calculation procedures used are consistent with those presented in ISO/TS 6336-22. No additional calculations are presented in this document that are outside of ISO/TS 6336-22.

Four worked examples are presented with the necessary input data for each gear set provided at the beginning of the calculation. The worked examples are based on real gear pairs where either laboratory

or operational field performance data has been established, with the examples covering several applications. When available, pictures and measurements are provided of the micropitting wear, experienced on the gear sets when run under the conditions used in the worked examples. Calculation details are presented in full for several of the initial calculations after which only summarized results data are included. For better applicability, the numbering of the formulae follows ISO/TS 6336-22. Several of the worked examples are presented with the calculation procedures performed in accordance with the application of both methods A and B.

TECHNICAL REPORT **ISO/TR 6336-31:2018**

Calculation of load capacity of spur and helical gears —

Part 31:
Calculation examples of micropitting load capacity

1 Scope

The example calculations presented here are provided for guidance on the application of the technical specification ISO/TS 6336-22 only. Any of the values or the data presented should not be used as material or lubricant allowables or as recommendations for micro-geometry in real applications when applying this procedure. The necessary parameters and allowable film thickness values, λ_{GFP}, should be determined for a given application in accordance with the procedures defined in ISO/TS 6336-22.

2 Normative references

The following documents are referred to in the text in such a way that some or all of their content constitutes requirements 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 1122-1, *Vocabulary of gear terms — Part 1: Definitions related to geometry*

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

ISO 6336-2, *Calculation of load capacity of spur and helical gears — Part 2: Calculation of surface durability (pitting)*

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

ISO/TS 6336-22:2018, *Calculation of load capacity of spur and helical gears — Part 22: Calculation of micropitting load capacity*

3 Terms and definitions

For the purposes of this document, the terms and definitions given in ISO 1122-1, ISO 6336-1 and ISO 6336-2 apply.

ISO and IEC maintain terminological databases for use in standardization at the following addresses:

— ISO Online browsing platform: available at https://www.iso.org/obp

— IEC Electropedia: available at https://www.electropedia.org/

4 Symbols and units

The symbols used in this document are given in Table 2. The units of length metre, millimetre, and micrometre are chosen in accordance with common practice. The conversions of the units are already included in the given formulae.