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**Calculation of load capacity of spur and
helical gears —**

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

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

Partie 2: Calcul de la résistance à la pression de contact (piqûre)



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Contents

Page

| | |
|--|----|
| Foreword..... | iv |
| Introduction..... | v |
| 1 Scope..... | 1 |
| 2 Normative references..... | 1 |
| 3 Terms, definitions, symbols and abbreviated terms..... | 2 |
| 4 Pitting damage and safety factors..... | 2 |
| 5 Basic formulæ..... | 3 |
| 5.1 General..... | 3 |
| 5.2 Safety factor for surface durability (against pitting), S_H | 3 |
| 5.3 Contact stress, σ_H | 3 |
| 5.4 Permissible contact stress, σ_{HP} | 5 |
| 6 Zone factor, Z_H , and single pair tooth contact factors, Z_B and Z_D | 9 |
| 6.1 Zone factor, Z_H | 9 |
| 6.2 Single pair tooth contact factors, Z_B and Z_D , for $\varepsilon_\alpha \leq 2$ | 10 |
| 6.3 Single pair tooth contact factors, Z_B and Z_D , for $\varepsilon_\alpha > 2$ | 11 |
| 7 Elasticity factor, Z_E | 11 |
| 8 Contact ratio factor, Z_ε | 12 |
| 8.1 Determination of contact ratio factor, Z_ε | 13 |
| 8.2 Calculation of transverse contact ratio, ε_α and overlap ratio, ε_β | 14 |
| 9 Helix angle factor, Z_β | 15 |
| 10 Strength for contact stress..... | 16 |
| 10.1 Allowable stress numbers (contact), $\sigma_{H \text{ lim}}$, for Method B..... | 16 |
| 10.2 Allowable stress number values for Method B _R | 16 |
| 11 Life factor, Z_{NT} (for flanks)..... | 16 |
| 11.1 Life factor Z_{NT} : Method A..... | 17 |
| 11.2 Life factor Z_{NT} : Method B..... | 17 |
| 12 Influence of lubricant film, factors Z_L , Z_V and Z_R | 18 |
| 12.1 General..... | 18 |
| 12.2 Influence of lubricant film: Method A..... | 19 |
| 12.3 Influence of lubricant film, factors Z_L , Z_V and Z_R : Method B..... | 19 |
| 13 Work hardening factor, Z_W | 24 |
| 13.1 Work hardening factor, Z_W : Method A..... | 24 |
| 13.2 Work hardening factor, Z_W : Method B..... | 25 |
| 14 Size factor, Z_X | 29 |
| Annex A (informative) Start of involute..... | 30 |
| Bibliography..... | 33 |

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 6336-2 was prepared by Technical Committee ISO/TC 60, *Gears*, Subcommittee SC 2, *Gear capacity calculation*.

This second edition cancels and replaces the first edition (ISO 6336-2:1996), Clause 13 of which has been technically revised. It also incorporates the Technical Corrigenda ISO 6336-2:1996/Cor.1:1998 and ISO 6336-2:1996/Cor.2:1999.

ISO 6336 consists of the following parts, under the general title *Calculation of load capacity of spur and helical gears*:

- *Part 1: Basic principles, introduction and general influence factors*
- *Part 2: Calculation of surface durability (pitting)*
- *Part 3: Calculation of tooth bending strength*
- *Part 5: Strength and quality of materials*
- *Part 6: Calculation of service life under variable load*

This corrected version incorporates the following corrections:

- the key to Figure 2 has been inverted, so that the descriptions of the axes now correspond correctly with the figure;
- in Figure 7, the description of the Y axis in the key has been given in English;
- Equation (46) has been corrected;
- the wording of 12.3.1.3.2 has been changed such that it now refers to roughness.

Introduction

Hertzian pressure, which serves as a basis for the calculation of contact stress, is the basic principle used in this part of ISO 6336 for the assessment of the surface durability of cylindrical gears. It is a significant indicator of the stress generated during tooth flank engagement. However, it is not the sole cause of pitting, and nor are the corresponding subsurface shear stresses. There are other contributory influences, for example, coefficient of friction, direction and magnitude of sliding and the influence of lubricant on distribution of pressure. Development has not yet advanced to the stage of directly including these in calculations of load-bearing capacity; however, allowance is made for them to some degree in the derating factors and choice of material property values.

In spite of shortcomings, Hertzian pressure is useful as a working hypothesis. This is attributable to the fact that, for a given material, limiting values of Hertzian pressure are preferably derived from fatigue tests on gear specimens; thus, additional relevant influences are included in the values. Therefore, if the reference datum is located in the application range, Hertzian pressure is acceptable as a design basis for extrapolating from experimental data to values for gears of different dimensions.

Several methods have been approved for the calculation of the permissible contact stress and the determination of a number of factors (see ISO 6336-1).

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Calculation of load capacity of spur and helical gears —

Part 2:

Calculation of surface durability (pitting)

IMPORTANT — The user of this part of ISO 6336 is cautioned that when the method specified is used for large helix angles and large pressure angles, the calculated results should be confirmed by experience as by Method A. In addition, it is important to note that best correlation has been obtained for helical gears when high accuracy and optimum modifications are employed.

1 Scope

This part of ISO 6336 specifies the fundamental formulæ for use in the determination of the surface load capacity of cylindrical gears with involute external or internal teeth. It includes formulæ for all influences on surface durability for which quantitative assessments can be made. It applies primarily to oil-lubricated transmissions, but can also be used to obtain approximate values for (slow-running) grease-lubricated transmissions, as long as sufficient lubricant is present in the mesh at all times.

The given formulæ are valid for cylindrical gears with tooth profiles in accordance with the basic rack standardized in ISO 53. They may also be used for teeth conjugate to other basic racks where the actual transverse contact ratio is less than $\varepsilon_{\alpha n} = 2,5$. The results are in good agreement with other methods for the range, as indicated in the scope of ISO 6336-1.

These formulæ cannot be directly applied for the assessment of types of gear tooth surface damage such as plastic yielding, scratching, scuffing or any other than that described in Clause 4.

The load capacity determined by way of the permissible contact stress is called the “surface load capacity” or “surface durability”.

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

ISO 6336-1:2006, *Calculation of load capacity of spur and helical gears — Part 1: Basic principles, introduction and general influence factors*

ISO 6336-5:2003, *Calculation of load capacity of spur and helical gears — Part 5: Strength and quality of material*