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Worm gears — Worm profiles and gear mesh geometry

Engrenage à vis cylindriques — Géométrie des profils de vis et de l'engrènement

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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 document 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).

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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 1, *Nomenclature and wormgearing*.

This first edition of ISO 10828 cancels and replaces the second edition of ISO/TR 10828:2015.

The main changes are as follows:

— conversion from a Technical Report to an International Standard and implementation of necessary editorial changes;

— incorporation of a new Annex H on interface for geometry for involute worms defined as cylindrical gear with ISO 21771-1.

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

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Introduction

This document includes the formulation for the geometrical dimensions of the worm and worm wheel, and that for the determination of gear mesh geometry (path of contact, zone and lines of contact) with the details to determine the non-dimensional parameters used to apply load capacity calculations (radius of curvature, sliding velocities). Thread forms of the worms of worm gear pairs are commonly related to the following machining processes:

— the type of machining process (turning, milling, grinding, metal forming);

— the shapes of edges or surfaces of the cutting tools used;

— the tool position relative to an axial plane of the worm;

— where relevant, the diameters of disc type tools (grinding wheel diameter).

The calculations developed in this document are relatively complex as they involved primary and secondary derivatives of mathematical expression. In order to facilitate the writing of equations, the numerators in the left part of formulae are often omitted; this is why several formulae have special symbols and are not written in a mathematical way:

Example in Formula (B.12) $\frac{d}{dy_G}\alpha_G(y_G)$ is written $\mathrm{d}\alpha_G(y_G)$

Example in Formula (B.14) $\frac{d^2}{dy_G{}^2}\alpha_G(y_G)$ is written $\mathrm{d}2\alpha_G(y_G)$

In this document, the figures show a generic representation of worm profile types A, I, N, K, C. For the influence of different worm profile types, see Annex E.

This document introduces all the aspects concerning the gear mesh geometry to define conjugate worm wheel, path of contact, lines of contact and other associated geometrical characteristics.

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Worm gears — Worm profiles and gear mesh geometry

1 Scope

This document describes the thread profiles of the five most common worm profile types and provides formulae of their axial profiles.

The five worm profile types covered in this document are designated by the letters A, C, I, K and N.

This document provides the formulae to calculate the path of contact, the conjugate profile of the worm wheel, the lines of contact, the radius of curvature and the velocities at points of contact. The application of those formulae to calculate parameters used in load capacity calculations are provided in 11.11.

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

ISO 1122-2, *Vocabulary of gear terms — Part 2: Definitions related to worm gear geometry*

3 Terms and definitions

For the purposes of this document, the terms and definitions given in ISO 701 and ISO 1122-2 and the following apply.

ISO and IEC maintain terminology 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/

3.1
mid plane of worm wheel
plane perpendicular to its datum axis containing the centre of virtual major torus radius generating tooth flanks

Note 1 to entry: See Figure 26.

Note 2 to entry: It can be axially located by measuring the position of inflection point along the helix of the cylinder of the worm wheel defined by the measurement diameter for worm wheel. In hobbed worm wheel, the number of flutes can influence the tooth flank surface and consequently the mid plane detection.

3.2
axial plane of worm
plane containing the line of axis of the worm defined by its datum axis

Note 1 to entry: Diameters can be measured in this plane, but thread surfaces would require a theoretical sharpened edge measurement probe or correction in order to keep the contact point between the probe and the flank in this plane.

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