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INTERNATIONAL ORGANIZATION FOR STANDARDIZATION

ADDENDUM 2
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R 1122-1969

GLOSSARY OF GEARS

GEOMETRICAL DEFINITIONS
WORM GEARS

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FOREWORD

Addendum 2 (originally Draft No. 1415) to ISO Recommendation R 1122-1969 was drawn up by Technical Committee ISO/TC 60, *Gears.*

It was approved in August 1968 by the Member Bodies of the following countries :

Australia	Italy	Sweden
Belgium	Japan	Switzerland
Chile	Netherlands	Thailand
Czechoslovakia	New Zealand	Turkey
France	Poland	United Kingdom
India	South Africa, Rep. of	U.S.S.R.
Israel	Spain	

The Member Bodies of the following countries expressed disapproval of the document on technical grounds :

Germany
Hungary

Addendum 2 — March 1972 — to ISO Recommendation R 1122-1969

GLOSSARY OF GEARS

GEOMETRICAL DEFINITIONS

WORM GEARS

INTRODUCTION

This Addendum constitutes the fourth and last section of the "Geometrical definitions", of the International Vocabulary of Gears, the first three chapters of which are already the subject of ISO Recommendation R 1122.

SCOPE

This Addendum deals with worm gears which are gear pairs with non-parallel non-intersecting axes comprising a worm of cylindrical or toric form and a mating wheel, with *line contact* between flanks near to the line of centres (as opposed to crossed helical gear pairs which are gear pairs with point contact).

Except for terms and definitions associated with double enveloping worm gears (4.1.2.4 to 4.1.2.6), it is devoted to the terms appropriate to the case which occurs most frequently, that of *cylindrical worm* gear pairs with a shaft angle of 90°.

4. WORM GEAR PAIRS

4.1 *General*

4.1.1 *Toric surfaces and lines**

4.1.1.1 Toroid. Solid of revolution generated by the rotation of a circle around an axis external to this circle and situated in its plane.

4.1.1.2 Generant of the toroid. One of the two circles of intersection of the toroid with a plane containing its axis.

4.1.1.3 Mid-plane of the toroid. Plane of symmetry of the toroid, perpendicular to its axis.

4.1.1.4 Middle circle of the toroid. Circle described in the mid-plane of the toroid by the centre of its generant.

4.1.1.5 Inner circle of the toroid. The smaller of the two circles of intersection of the toroid and its mid-plane.

4.1.2 *Terminology for worm gear pairs and their wheels*

4.1.2.1 (Cylindrical) worm**. Cylindrical helical gear with one or more threads.

4.1.2.2 (Cylindrical) wormwheel**. Gear with flanks in such a way as to ensure curved line contact with the flanks of a worm forming with it a gear pair with non-parallel, non-intersecting axes.

4.1.2.3 (Cylindrical) worm gear pair**. Gear pair with non-parallel, non-intersecting axes consisting of a worm and a mating wormwheel.
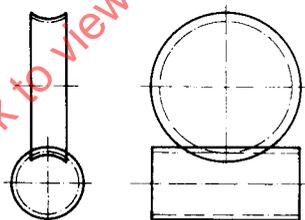
4.1.2.4 Enveloping worm. Gear with one or more helical threads having as tip and root surfaces portions of toroids co-axial with the gear and with the radius of the mid-circle equal to the centre distance of the gear pair with non-parallel, non-intersecting axes to which the worm is intended.

4.1.2.5 Enveloping wormwheel. Gear with flanks generated so as to ensure a curved line contact with the flanks of a enveloping worm forming with it a gear pair with non-parallel, non-intersecting axes.

4.1.2.6 Double enveloping worm gear pair. Gear pair with non-parallel, non-intersecting axes consisting of an enveloping worm and the mating enveloping wormwheel.
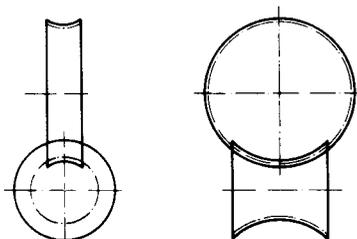
*   For the other geometrical surfaces or lines see section 1, clause 14.

**   The adjective "cylindrical" may be understood, except when expressly contrasted with "enveloping". (See clauses 4.1.2.4 to 4.1.2.6.)

4.2 *Worm (cylindrical)*

4.2.1 *Reference elements*

4.2.1.1 Thread. A tooth of the worm. Worms may have one or several threads.

4.2.1.2 Reference cylinder. Reference pitch surface of the worm, that is to say, a conventional cylinder which serves as the reference by which the nominal tooth dimensions, considered separately, are defined.
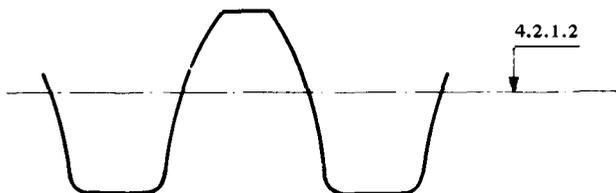
4.2.1.3 Reference diameter. Diameter of reference cylinder of the worm.

4.2.1.4 Reference helix. Helix of intersection of a flank with the reference cylinder of the worm.

4.2.1.5 Worm facewidth. Length of toothed part of a worm measured parallel to the axis and on the reference cylinder.
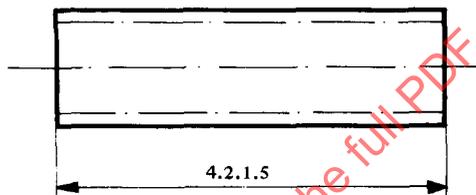
4.2.2 *Pitch, addendum, dedendum*

4.2.2.1 Axial profile. The trace of intersection of a tooth flank with an axial plane.

4.2.2.2 Lead. Axial distance between two consecutive corresponding profiles of the same worm thread.

4.2.2.3 Axial pitch. Axial distance between two consecutive corresponding profiles of a worm.

The axial pitch is equal to the quotient of the lead by the number of threads.
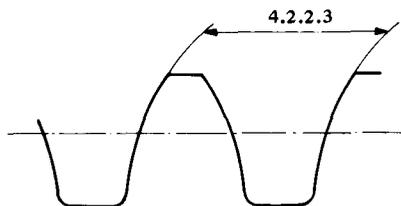
4.2.2.4 Axial module. Quotient of axial pitch expressed in millimetres by the number π.

4.2.2.5 Axial diametral pitch. Quotient of the number π by the axial pitch expressed in inches.

4.2.2.6 Diametral quotient. Quotient of reference diameter by axial module.

4.2.2.7 Tooth depth. Radial distance between tip cylinder and root cylinder.
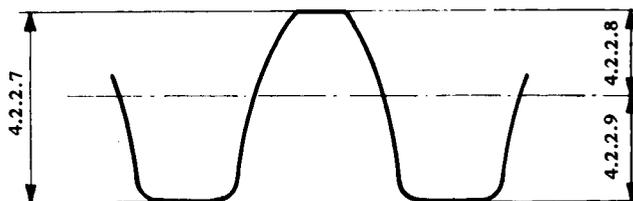
4.2.2.8 Addendum. Radial distance between tip cylinder and reference cylinder.

4.2.2.9 Dedendum. Radial distance between root cylinder and reference cylinder.

4.2.3 *Main form of the flanks*
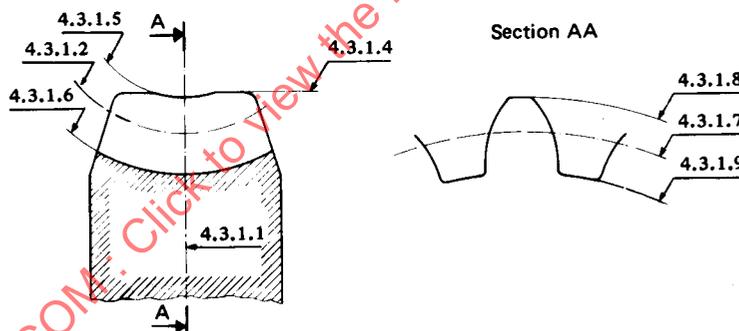
4.2.3.1 Straight sided axial worm (type ZA).

4.2.3.2 Straight sided normal worm (type ZN).

4.2.3.3 Involute helicoid worm (type ZK).

4.2.3.4 Milled helicoid worm (type ZI).

4.3 *Wormwheels (cylindrical) (for shaft angle 90°)*

4.3.1 *Reference elements*

4.3.1.1 Mid-plane. Plane perpendicular to the axis of the wheel and containing the axis of the mating worm.

4.3.1.2 Reference toroid. Conventional toroid having its mean circle radius equal to the centre distance of the wormwheel with its worm, its axis and mid-plane co-incident with those of the wheel and the generant being equal to the reference circle of the mating worm.

4.3.1.3 Tip surface. The surface limiting the teeth of the worm wheel at the side of the tip.

4.3.1.4 Tip cylinder. Cylindrical part of tip surface.

4.3.1.5 Gorge. Toric portion of tip surface.

**4.3.1.6 Root toroid.** Toric surface tangent to the bottom of the tooth spaces.

4.3.1.7 Reference circle. Inner circle of intersection of the reference toroid with the mid-plane.

4.3.1.8 [Circle at root of gorge].* Circle of intersection of the gorge with the mid-plane.

4.3.1.9 Root circle. Circle of intersection of root toroid with mid-plane.

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* Between brackets is a translation of the French term for which there is no corresponding special term in English.

4.3.2 *Reference and overall dimensions*

Section AA
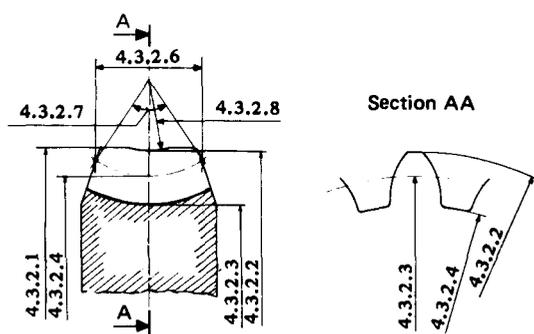
4.3.2.1 Tip diameter. Diameter of tip cylinder.

4.3.2.2 [Diameter at root of gorge].* Diameter of circle at root of gorge.

4.3.2.3 Root diameter. Diameter of root circle.

4.3.2.4 Reference diameter. Diameter of reference circle of gear.

4.3.2.5 Reference pitch. Length of the arc of the reference circle between two consecutive corresponding profiles.

4.3.2.6 Face width. Distance between the two planes perpendicular to the axis containing the circles of intersection of the reference toroid with the lateral faces of the teeth.

In the most usual case, where the teeth are symmetrical in relation to the mid-plane, this is the length of the chord (parallel to the axis), of the generant of the reference toroid included between the points of intersection of this circle with the lateral faces of the teeth.

4.3.2.7 [Width angle].* In the generant of the reference toroid the angle at the centre included between the points of intersection of this circle with the lateral faces of the teeth.

4.3.2.8 Gorge radius. Radius of the generant of the toric surface of the gorge.

4.3.3 *Working elements*
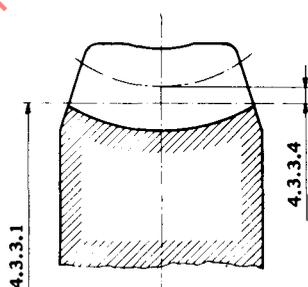
4.3.3.1 Pitch circle. In the mid-plane of the wormwheel, a circle having the same centre as the reference circle, and such a diameter that the arc included between two consecutive corresponding profiles has same length as the axial pitch of the worm.

4.3.3.2 Pitch diameter. Diameter of pitch circle.

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* Between brackets is a translation of the French term for which there is no corresponding special term in English.

4.3.3.3 Pitch. Abbreviation for "working pitch"; length of the arc of the pitch circle included between two consecutive corresponding profiles.

By definition, the pitch of the wheel is equal to the axial pitch of the mating worm.

4.3.3.4 Addendum modification. Half the algebraic difference between the pitch diameter and the reference diameter.

In the gear pair for which the wheel is intended, it is the difference, plus or minus, between the centre distance of the gear pair and half the sum of the reference diameter of the worm and the pitch diameter of the wheel.

4.3.3.5 Addendum modification coefficient. Quotient of addendum modification by the module or product of the addendum modification by the diametral pitch.

4.3.4 *Addendum, dedendum*
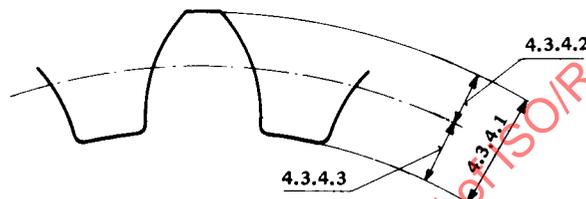
4.3.4.1 Tooth depth. Half the difference between the diameter at the root of the gorge and the root diameter.

4.3.4.2 Reference addendum. Half the difference between the diameter at the root of the gorge and the reference diameter.

4.3.4.3 Working addendum. Half the difference between the diameter at the root of the gorge and the pitch diameter.

4.3.4.4 Reference dedendum. Half the difference between the reference diameter and the root diameter.

4.3.4.5 Working dedendum. Half the difference between the pitch diameter and the root diameter.

4.4 *Worm gear pairs (cylindrical) (Shaft angle 90°)*

4.4.1 *Gear ratio, depth and clearance*
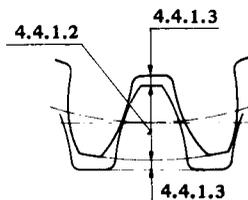
4.4.1.1 Gear ratio. Ratio of number of teeth on the wheel to the number of threads on the worm.

4.4.1.2 Working depth. Shortest distance, along the common perpendicular to both axes, between the circle at root of gorge of the wheel and the tip of the worm.

4.4.1.3 Bottom clearance. Shortest distance, along the common perpendicular to both axes, between the root circle of the wheel and the tip cylinder of the worm, or between the circle at root of gorge of the wheel and the root cylinder of the worm.

4.4.1.4 Circumferential backlash. Length of the arc of the pitch circle through which the wheel can be rotated before its non-working flanks come into contact with those of the mating worm, the latter remaining fixed.

4.4.1.5 Normal backlash. Shortest distance between the non-working flanks of the worm and the wormwheel when the working flanks are in contact.

4.4.2 *Equivalent basic rack of an open gear pair*

4.4.2.1 [Equivalent wheel gear pair].* Section of the worm gear pair by the mid-plane of the worm wheel.

The wheel of the rack open gear pair has as its reference and working pitch circles the reference and working circles of the worm wheel (identical or not, depending on whether the worm wheel has a modified addendum or not).

The rack has as its pitch reference line the generator of the reference cylinder of the worm and as its pitch working line the line tangential to the working circle and parallel to the axis of the worm.

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*   Between brackets is a translation of the French term for which there is no corresponding special term in English.