

# International gear notation — Symbols for geometrical data

ICS 01.075; 21.200

## National foreword

This British Standard reproduces verbatim ISO 701:1998 and implements it as the UK national standard.

The UK participation in its preparation was entrusted by Technical Committee MCE/5, Gears, to Subcommittee MCE/5/-/4, Vocabulary of gear terms, which has the responsibility to:

- aid enquirers to understand the text;
- present to the responsible international/European committee any enquiries on the interpretation, or proposals for change, and keep the UK interests informed;
- monitor related international and European developments and promulgate them in the UK.

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

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### Summary of pages

This document comprises a front cover, an inside front cover, the ISO title page, pages ii and iii, a blank page, pages 1 to 4, an inside back cover and a back cover.

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

*Notation internationale des engrenages — Symboles géométriques*



Reference number  
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## **Foreword**

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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.

International Standard ISO 701 was prepared by Technical Committee ISO/TC 60, *Gears*, Subcommittee SC 1, *Nomenclature and worm gears*.

This second edition of ISO 701 cancels and replaces the first edition (ISO 701:1976), which has been technically revised.

**Descriptors:** gears, notations, geometric characteristics, symbols.

## Introduction

The symbols in this International Standard are defined for use in relation to the principal geometrical terms defined in ISO 1122-1:1998, *Vocabulary of gear terms — Part 1: Definitions related to geometry*.

Consequently, it is important:

- that these symbols be used in national standards and, where appropriate, in other national documents in order to facilitate the understanding of documents which are exchanged between countries;
- to use for geometrical data only those combinations of letters which are given in the tables of this International Standard, in order to avoid any risk of confusion with symbols relating to other gear data, which may be determined later.

# International gear notation — Symbols for geometrical data

## 1 Scope

This International Standard specifies geometrical symbols for use in notation of gear data. It comprises two lists:

- the principal symbols, consisting of a single basic letter (see table 1); and
- subscripts to be used as necessary to qualify principal symbols (see tables 2, 3 and 4).

## 2 Symbols

### 2.1 Derivation of geometrical symbols

The principal rules are as follows:

- a) symbols consist of a principal symbol which can be followed by one or more subscripts and possibly a superscript;
- b) the principal symbol is either a single uppercase or lowercase letter. The letter should be a Latin or Greek letter in italics;
- c) a numerical subscript is an integer, a decimal number or a roman numeral, printed in roman characters. No symbol contains more than one numerical subscript;
- d) all subscripts are written on the same line below the line of the principal symbol;
- e) barred notations (barred above or below), superscripts other than exponents, pre-subscripts, pre-superscripts, second order subscripts, second order superscripts and dashes should be avoided.

### 2.2 Principal geometrical symbols

The most frequently used geometrical symbols are listed in table 1.

### 2.3 Principal subscripts

The same character as a subscript may have different meanings, each depending on the symbol to which the subscript is assigned. General subscripts are presented in table 2. Abbreviated subscripts of two or three letters are presented in table 3. Numerical subscripts are presented in table 4; their use with a principal symbol is for a reference value.

## 2.4 Sequence of subscripts

When more than one subscript is used, it is recommended to use the sequence given in table 5.

Table 1 — Principal geometrical symbols

Symbols	Designation
$a$	Centre distance
$b$	Facewidth
$c$	Tip and root clearance
$d$	Diameter, reference diameter
$e$	Space width
$g$	Length of path of contact
$h$	Tooth depth (total, addendum, dedendum)
$i$	Total transmission ratio
$j$	Backlash
$M$	Measurement over rolls or balls
$m$	Module
$p$	Pitch, lead
$q$	Diametral quotient of a worm
$R$	Cone distance
$r$	Radius
$s$	Tooth thickness
$u$	Gear ratio
$W$	Span measurement over $k$ teeth
$x$	Profile shift coefficient
$y$	Centre distance modification coefficient
$z$	Number of teeth
$\alpha$	(alpha) Pressure angle
$\beta$	(beta) Helix angle
$\gamma$	(gamma) Lead angle
$\delta$	(delta) Cone angle
$\varepsilon$	(epsilon) Contact or overlap ratio
$\eta$	(eta) Spacewidth half angle
$\theta$	(theta) Tooth angle of bevel gear
$\rho$	(rho) Radius of curvature
$\Sigma$	(sigma) Shaft angle
$\psi$	(psi) Tooth thickness half-angle

Table 2 — Principal subscripts

Subscript	Refers to
a	tip
b	base
e	external
f	root
i	internal
k	sector
m	mean
n	normal direction
P	basic rack tooth profile
r	radial
t	transverse plane
u	usable
w	operating configuration
x	axial direction
y	arbitrary point
z	lead
$\alpha$	(alpha) flank profile
$\beta$	(beta) helix direction
$\gamma$	(gamma) total

Table 3 — Abbreviated subscripts

Subscript	Refers to
act	actual
max	maximum
min	minimum
pr	protuberance



Table 4 — Numerical subscripts

Subscript	Refers to
0	tool
1	pinion
2	wheel
3	master gear
...	other gear

Table 5 — Sequence of subscripts

Subscript	Refers to
a, b, m, f	cylinder or cone
e, i	external, internal
pr	protuberance
n, r, t, x	plan or direction
max, min	abbreviation
0, 1, 2, 3,...	gear

### 3 Examples

Table 6 — Examples of symbols

Symbols	Designation
$u$	gear ratio
$m_n$	normal module
$\alpha_{w1}$	transverse operating angle
$d_1$	reference diameter of pinion
$d_{w2}$	operating diameter of wheel
$R_2$	cone distance of the wheel

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