INTERNATIONAL STANDARD 701

INTERNATIONAL ORGANIZATION FOR STANDARDIZATION • МЕЖДУНАРОДНАЯ ОРГАНИЗАЦИЯ ПО СТАНДАРТИЗАЦИИ • ORGANISATION INTERNATIONALE DE NORMALISATION

International gear notation — Symbols for geometrical data

Notation internationale des engrenages — Symboles de données géométriques

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FOREWORD

ISO (the International Organization for Standardization) is a worldwide federation of national standards institutes (ISO Member Bodies). The work of developing International Standards is carried out through ISO Technical Committees. Every Member Body interested in a subject for which a Technical Committee has been set up 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.

Draft International Standards adopted by the Technical Committees are circulated to the Member Bodies for approval before their acceptance as International Standards by the ISO Council.

Prior to 1972, the results of the work of the Technical Committees were published as ISO Recommendations; these documents are now in the process of being transformed into International Standards. As part of this process, Technical Committee ISO/TC 60 has reviewed ISO Recommendation R 701 and found it technically suitable for transformation. International Standard ISO 701 therefore replaces ISO Recommendation R 701-1968 to which it is technically identical.

ISO Recommendation R 701 was approved by the Member Bodies of the following countries :

Australia	Israel	Spain
Austria	Italy	Sweden
Belgium	Japan	Switzerland
Chile	Netherlands	Turkey
France	New Zealand	United Kingdom
Germany	Norway	Yugoslavia
Hungary	Poland	
India	South Africa, Rep. of	

The Member Body of the following country expressed disapproval of the Recommendation on technical grounds :

Czechoslovakia

The Member Bodies of the following countries disapproved the transformation of ISO/R 701 into an International Standard :

Belgium
U.S.S.R.

International gear notation — Symbols for geometrical data

0 INTRODUCTION

This International Standard aims to unify the symbols used in different countries for the international notation of gears with regard to the principal geometrical data defined in ISO/R 1122, *Glossary of gears — Geometrical definitions.*

These symbols have been chosen after detailed comparative study, taking into account the necessity of retaining a certain number of letters for standardization of other notations at a later date, such as those dealing with gear accuracy.

Consequently it is important

— to bring national standards into line with this International Standard, so that in future a real international language of notations will facilitate the exchange of documents between one country and another;

— to use for geometrical data only combinations of letters or signs appearing in the alphabetical annex, in order to avoid any risk of confusion with notations to be determined later with regard to other gear data.

1 SCOPE AND FIELD OF APPLICATION

This International Standard specifies symbols for geometrical data for use in gear notation. It consists essentially of two parts :

— on the one hand, the *principal symbols,* composed either of a single basic letter, or of a basic letter and suffix or sign which are generally inseparable for the given term (see table 1);

— on the other hand, *additional suffixes* or *signs* which may be added if necessary to the principal symbols, in order to imply a particular qualification of the given term (see table 2).

The annex gives lists classified in alphabetical order according to the Roman and Greek alphabets, on the one hand of the basic letter symbols, and on the other hand of the suffixes and signs which have been used in the establishment of this International Standard and a combination of which may possibly be used for the notation of any other term of geometrical data not explicitly mentioned in this International Standard.

2 PRINCIPAL SYMBOLS AND ADDITIONAL SUFFIXES OR SIGNS

TABLE 1 — **Principal symbols**[1)]

No.	Term	Symbol
1	Centre distance	a
2	Shaft angle	Σ
3	Linear speed	v
4	Angular speed	ω
5	Number of revolutions	n
6	Gear ratio	u
7	Transmission ratio	i
8	Number of teeth	z
9	Facewidth	b
10	Cone distance	R
11	Radius	r
12	Diameter	d
13	Reference diameter	d
14[2)]	Pitch diameter	d'
15	Tip diameter	d_a
16	Root diameter	d_f
17	Reference cone angle	δ
18[2)]	Pitch angle	δ'
19	Tip angle	δ_a
20	Root angle	δ_f
21	Tooth depth	h
22	Addendum	h_a
23	Dedendum	h_f
24[3)]	Addendum angle	θ_a
25[3)]	Dedendum angle	θ_f
26	Helix angle	β
27	Lead angle	γ
28	Lead	p_z
29	Involute α ($= \mathrm{tg}\alpha - \alpha$)	inv α
30	Profile radius	ρ

No.	Term	Symbol
31	Pressure angle	α
32	Pitch	p
33	Module	m
34	Diametral pitch	P
35	Angular pitch of crown gear	τ
36	Tooth thickness	s
37	Spacewidth	e
38	Tooth thickness half-angle	ψ
39	Spacewidth half-angle	η
40	Chord	$\bar{s}$
41	Chordal height	$\bar{h}_a$
42	Constant chord	$\bar{s}_c$
43	Constant chord height	$\bar{h}_c$
44	Base tangent length (e.g. : W_3 for 3 teeth)	W
45	Bottom clearance	c
46	Circumferential backlash	j_t
47	Normal backlash	j_n
48	Addendum modification coefficient	x
49	Centre distance modification coefficient	y
50	Length of approach path	g_f
51	Length of recess path	g_a
52	Length of path of contact	g_α
53	Overlap length	g_β
54	Transverse angle of transmission	φ_α
55	Overlap angle	φ_β
56	Total angle of transmission	φ_γ
57	Transverse contact ratio	ϵ_α
58	Overlap ratio	ϵ_β
59	Contact ratio	ϵ_γ

1) To be completed if necessary by additional suffixes or signs from table 2.

2) The apostrophe may, if desired, be replaced by the suffix w.

3) Lower-case theta may be written θ or ϑ.

TABLE 2 **Additional suffixes or signs**

No.	Term	Suffix or sign
Suffixes		
1	Tip	a
2	Root	f
3	Transverse	t
4	Normal	n
5	Axial	x
6	Radial	r
7	Tangential	t
8	Mean	m
9	Base	b
10	On any cone or cylinder	y
11	On back cone (or virtual cylindrical gear)	v
12	External	e
13	Internal	i
14	Right hand; right	R
15	Left hand; left	L
16	Of approach	f
17	Of recess	a
18	Of transverse contact	α
19	Overlap	β
20	Total of contact	γ
21	Relating to the tool	0
22	Relating to the pinion	1
23	Relating to the wheel	2
Other signs		
24	Reference	(no sign)
25[1]	Working	' (apostrophe)
26	Coefficient (of a dimension other than addendum or centre distance modification)	* (asterisk)

1) The apostrophe may, if desired, be replaced by the suffix w.

ANNEX

RECAPITULATIVE INDEX OF LETTERS AND SIGNS USED IN THIS INTERNATIONAL STANDARD

TABLE 3 — **Basic italic letters**

ROMAN ALPHABET

Symbol	Term
Lower-case	
a	Centre distance
b	Facewidth
c	Bottom clearance
d	Diameter
e	Spacewidth
g	Length (of path of contact, overlap, etc.)
h	Tooth depth either addendum or dedendum
i	Transmission ratio
j	Backlash
m	Module
n	Number of revolutions
p	Pitch
r	Radius
s	Tooth thickness
u	Gear ratio
v	Linear speed
x	Addendum modification coefficient
y	Centre distance modification coefficient
z	Number of teeth
inv α	Involute α
Capitals	
P	Diametral pitch
R	Cone distance
W	Base tangent length

GREEK ALPHABET

Symbol	Term
Lower-case	
α	Pressure angle
β	Helix angle
γ	Lead angle
δ	Cone angle
ϵ	Ratio (contact, overlap, etc.)
η	Spacewidth half-angle
θ	Angle (addendum or dedendum) [1]
ρ	Profile radius
τ	Angular pitch of crown gear
φ	Angle (transmission, overlap, etc.)
ψ	Tooth thickness half-angle
ω	Angular speed
Capital	
Σ	Shaft angle

1) Lower-case theta may be written θ or ϑ.

TABLE 4 – **Suffixes and signs**

ROMAN ALPHABET

Suffix or sign	Term
Lower-case	
a	Tip; of recess
b	Base
c	Relating to constant chord
e	External
f	Root; of approach
i	Internal
m	Mean
n	Normal
r	Radial
t	Transverse; tangential
v	On back cone (or virtual cylindrical gear)
(w)	Working[1]
x	Axial
y	On any cone or cylinder
z	Of a helix (p_z = lead)
Capitals	
L	Left hand, left
R	Right hand, right

GREEK ALPHABET

Suffix or sign	Term
Lower-case	
α	Of transverse contact
β	Overlap
γ	Total of contact

FIGURES

0	Relating to the tool
1	Relating to the pinion
2	Relating to the wheel

VARIOUS SIGNS

* (asterisk)	Coefficient (of a dimension other than addendum or centre distance modification)
$\bar{}$ (overlined)	Relating to the chord (e.g. $\bar{s}$)
' (apostrophe)	Working

NEITHER SUFFIX NOR SIGN

(no sign)	Reference

1) This suffix may, if desired, replace the apostrophe indicating the word "working".