INTERNATIONAL STANDARD

ISO
1832

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Indexable inserts for cutting tools — Designation

Plaquettes amovibles pour outils coupants — Désignation

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.

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 1832 was prepared by Technical Committee ISO/TC 29, *Small tools*, Sub-Committee SC 9, *Inserts in cutting material.*

This third edition cancels and replaces the second edition (ISO 1832 : 1985), which has been technically revised, and in particular, subclause 5.1 (letter symbols K and P for the cutting edge condition) have been included.

Annexes A and B of this International Standard are for information only.

Indexable inserts for cutting tools — Designation

1 Scope

This International Standard establishes a code for the designation of the usual types of indexable inserts for cutting tools, in hardmetal (carbide) or any other cutting materials, such as ceramics, etc., in order to simplify orders and specifications for such inserts.

2 Normative reference

The following standard contains provisions which, through reference in this text, constitute provisions of this International Standard. At the time of publication, the edition indicated was valid. All standards are subject to revision, and parties to agreements based on this International Standard are encouraged to investigate the possibility of applying the most recent edition of the standard indicated below. Members of IEC and ISO maintain registers of currently valid International Standards.

ISO 3002-1 : 1982, *Basic quantities in cutting and grinding — Part 1: Geometry of the active part of cutting tools — General terms, reference systems, tool and working angles, chip breakers.*

3 Explanation of designation code

The designation code comprises nine symbols for designating the dimensions and other characteristics of indexable inserts; the first seven symbols shall be used in every designation. One or both of the last two symbols may be used when necessary.

In addition to the standardized designation (symbols ① to ⑨), a supplementary symbol consisting of one or two characters may be added by the manufacturer for a better description of his products (for example, different chip breakers), provided that this symbol is separated from the standardized designation by a dash and that it does not contain letters specified for references ⑧ and ⑨ .

No addition to or extension of the designation specified in this International Standard shall be made without consulting Technical Committee ISO/TC 29 and receiving its agreement. Rather than adding symbols not provided for in this system, it is preferable to add to the designation in accordance with this International Standard all necessary explanations in the form of detailed sketches or specifications.

However, if the symbol "X" is used in position 4 of the designation, it is possible to use, in positions 5, 6 and 7, symbols representing values not appearing in this International Standard but which shall be described explicitly by the sketch or the detailed specifications given in 4.4.

The significance of the symbols constituting the designation is as follows:

(1)   Letter symbol identifying insert shape (see 4.1).

(2)   Letter symbol identifying normal clearance (see 4.2).

(3)   Letter symbol identifying tolerance class (see 4.3).

(4)   Letter symbol indicating fixing and/or chip-breakers (see 4.4).

(5)   Number symbol identifying insert size (see 4.5).

(6)   Number symbol identifying insert thickness (see 4.6).

(7)   Letter or number symbol identifying insert corner configuration (see 4.7).

(8)   Letter symbol indicating cutting edge condition (see 5.1).

(9)   Letter symbol identifying cutting direction (see 5.2).

Compulsory symbols

Optional symbols

(10)   Manufacturer's symbol, if desired

EXAMPLE

	(1)	(2)	(3)	(4)	(5)	(6)	(7)	(8)	(9)	–	(10)
Metric dimensions:	T	P	G	N	16	03	08	E	N	–	...
Inch dimensions:	T	P	G	N	3	2	2	E	N	–	...

NOTE — The designations and symbols of the different angles allowing geometrical definition of the indexable inserts are in conformity with ISO 3002-1, with the following conventions:

— the insert is considered in the tool-in-hand system;

— the reference plane P_r is parallel to the base of the insert;

— the assumed working plane P_f is perpendicular to the reference plane P_r and is parallel to the assumed direction of feed motion. This plane is defined only in the case of inserts having one or more wiper edges.

The assumed direction of feed motion is taken parallel to the considered wiper edge (see note 1 of table 9).

4 Symbols

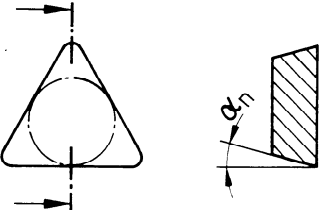## 4.1 Symbol for insert shape — Reference (1)

See table 1.

Table 1

Type		Letter symbol	Description of shape	Included angle, ε_r	Figure
I	Equilateral and equiangular inserts	H	Hexagonal inserts	120°	
		O	Octagonal inserts	135°	
		P	Pentagonal inserts	108°	
		S	Square inserts	90°	
		T	Triangular inserts	60°	
II	Equilateral but non-equiangular inserts	C	Rhombic inserts	80° [1]	
		D		55° [1]	
		E		75° [1]	
		M		86° [1]	
		V		35° [1]	
		W	Hexagonal inserts	80° [1]	
III	Non-equilateral but equiangular inserts	L	Rectangular inserts	90°	
IV	Non-equilateral and non-equiangular inserts	A	Parallelogram-shaped inserts	85° [1]	
		B		82° [1]	
		K		55° [1]	
V	Round inserts	R	Round inserts	—	

1) The included angle considered is always the smaller angle.

4.2 Symbol for normal clearance — Reference ②

See table 2.

Table 2

Letter symbol
For normal clearance, choose, from the symbols listed below, the one which corresponds to the major cutting edge (see the figure).
If (in spite of different normal clearances) all cutting edges have to be used as major cutting edges, the symbol to be used for the designation of the normal clearance shall be the symbol applicable to the normal clearance of the longer cutting edge, which is also considered as the major cutting edge for the indication of the insert size (see reference ⑤).

A — 3°
B — 5°
C — 7°
D — 15°
E — 20°
F — 25°
G — 30°
N — 0°
P — 11°
O — Other normal clearances requiring special specification

4.3 Symbol for tolerance class — Reference ③

See table 3.

The dimensions concerned are d (nominal diameter of the inscribed circle of the insert), s (thickness of the insert) and m. For this last dimension, the three cases represented in figures 1 to 3 are distinguished.
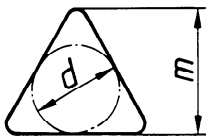
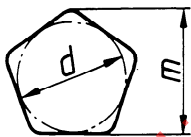**Figure 1 — Case 1: Inserts with odd numbers of sides and rounded corners**

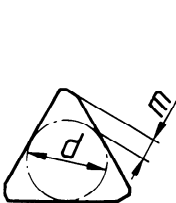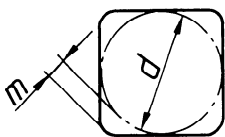**Figure 2 — Case 2: Inserts with even numbers of sides and rounded corners**

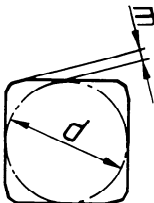**Figure 3 — Case 3: Inserts with wiper edges**
(see note 1 of table 9)

Table 3

Letter symbol	Tolerances in millimetres			Tolerances in inches		
	d	m	s	d	m	s
A [1]	± 0,025	± 0,005	± 0,025	± 0,001	± 0,000 2	± 0,001
F [1]	± 0,013	± 0,005	± 0,025	± 0,000 5	± 0,000 2	± 0,001
C [1]	± 0,025	± 0,013	± 0,025	± 0,001	± 0,000 5	± 0,001
H	± 0,013	± 0,013	± 0,025	± 0,000 5	± 0,000 5	± 0,001
E	± 0,025	± 0,025	± 0,025	± 0,001	± 0,001	± 0,001
G	± 0,025	± 0,025	± 0,13	± 0,001	± 0,001	± 0,005
J [1]	from ± 0,05 to ± 0,15 [2]	± 0,005	± 0,025	from ± 0,002 to ± 0,006 [2]	± 0,000 2	± 0,001
K [1]	from ± 0,05 to ± 0,15 [2]	± 0,013	± 0,025	from ± 0,002 to ± 0,006 [2]	± 0,000 5	± 0,001
L [1]	from ± 0,05 to ± 0,15 [2]	± 0,025	± 0,025	from ± 0,002 to ± 0,006 [2]	± 0,001	± 0,001
M	from ± 0,05 to ± 0,15 [2]	from ± 0,08 to ± 0,2 [2]	± 0,13	from ± 0,002 to ± 0,006 [2]	from ± 0,003 to ± 0,008 [2]	± 0,005
N	from ± 0,05 to ± 0,15 [2]	from ± 0,08 to ± 0,2 [2]	± 0,025	from ± 0,002 to ± 0,006 [2]	from ± 0,003 to ± 0,008 [2]	± 0,001
U	from ± 0,08 to ± 0,25 [2]	from ± 0,13 to ± 0,38 [2]	± 0,13	from ± 0,003 to ± 0,01 [2]	from ± 0,005 to ± 0,015 [2]	± 0,005

1) These tolerance classes normally apply to indexable inserts with wiper edges.

2) The tolerance is dependent upon the insert size (see also tables 4 and 5) and should be indicated for insert according to the corresponding dimensional standards.

Tolerances on d for tolerance classes, J, K, L, M, N and U for inserts of shapes H, O, P, S, T, C, E, M, W and R and tolerances on m for tolerance classes M, N and U for inserts with an included angle of 60° or more, of shapes H, O, P, S, T, C, E, M and W, are indicated in table 4.

Table 4

Diameter of inscribed circle d		Tolerances on d				Tolerances on m			
		Classes J, K, L, M, N		Class U		Classes M and N		Class U	
mm	in	mm	in	mm	in	mm	in	mm	in
4,76 5,56 6 [1] 6,35 7,94 8 [1] 9,525 10 [1]	3/16 7/32 — 1/4 5/16 — 3/8 —	± 0,05	± 0,002	± 0,08	± 0,003	± 0,08	± 0,003	± 0,13	± 0,005
12 [1] 12,7	— 1/2	± 0,08	± 0,003	± 0,13	± 0,005	± 0,13	± 0,005	± 0,2	± 0,008
15,875 16 [1] 19,05 20 [1]	5/8 — 3/4 —	± 0,1	± 0,004	± 0,18	± 0,007	± 0,15	± 0,006	± 0,27	± 0,011
25 [1] 25,4	— 1	± 0,13	± 0,005	± 0,25	± 0,01	± 0,18	± 0,007	± 0,38	± 0,015
31,75 32 [1]	1 1/4 —	± 0,15	± 0,006	± 0,25	± 0,01	± 0,2	± 0,008	± 0,38	± 0,015
		H	O	P	S	T	C, E, M	W	R (tolerance on d only)
Shape of the inserts concerned		⬡	⬢	⬠	▢	△	▱	◁	◯
1) Applies only for round inserts.									

In the case of rhombic inserts with an included angle of 55° (shape D), the values for tolerance classes M and N on d and m are indicated in table 5.

Table 5
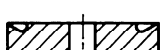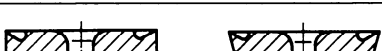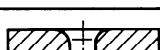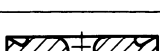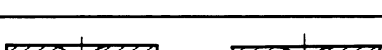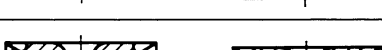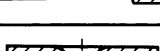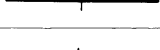
Diameter on inscribed circle d		Tolerances on d		Tolerances on m		Shape of the insert concerned
mm	in	mm	in	mm	in	
5,56 6,35 7,94 9,525	7/32 1/4 5/16 3/8	± 0,05	± 0,002	± 0,11	± 0,004	D ▱
12,7	1/2	± 0,08	± 0,003	± 0,15	± 0,006	
15,875 19,05	5/8 3/4	± 0,1	± 0,004	± 0,18	± 0,007	

The tolerance on m increases appreciably when the included angle is less than 55°.

4.4 Symbol for fixing and/or for chip breakers — Reference ④

See table 6.

Table 6

Letter symbol	Fixing	Chip breakers [1]	Figure
N	Without fixing hole	Without chip breakers	
R		Chip breakers on one face only	
F		Chip breakers on both faces	
A	With cylindrical fixing hole	Without chip breakers	
M		Chip breakers on one face only	
G		Chip breakers on both faces	
W	With partly cylindrical fixing hole, 40° to 60° countersink on one side only	Without chip breakers	
T		Chip breakers on one face only	
Q	With partly cylindrical fixing hole, 40° to 60° countersinks on both sides	Without chip breakers	
U		Chip breakers on both faces	
B	With partly cylindrical fixing hole, 70° to 90° countersink on one side only	Without chip breakers	
H		Chip breakers on one face only	
C	With partly cylindrical fixing hole, 70° to 90° countersinks on both sides	Without chip breakers	
J		Chip breakers on both faces	
X [2]	With dimensions or details requiring detailed explanation, a sketch or additional specifications		—

1) For the definition of chip breakers, see ISO 3002-1.

2) Non-equilateral inserts shall always be designated in reference ④ by X because the indication of width (measured perpendicularly on the major cutting edge or perpendicularly on the longer edge) and details concerning special features of construction are necessary.

The letter symbol X cannot be used for those insert shapes which are not defined under reference ① .

4.5 Symbol for insert size — Reference ⑤

See table 7.

Table 7

Type		Number symbol
I — II	Equilateral inserts	— In countries using the metric system, choose the value of the side length as the symbol of designation and disregard any decimals. If the resulting symbol has only one digit, it shall be preceded by a zero. EXAMPLES Edge length: 15,5 mm Symbol of designation: 15 Edge length: 9,525 mm Symbol of designation: 09 — In countries using the inch system, choose the value of the diameter of the inscribed circle as the symbol of designation. The symbol is the numerator of the fraction measured in 1/8 in. a) It is a one-digit symbol when the numerator is a whole number. EXAMPLE Diameter of inscribed circle: 1/2 in Symbol of designation: 4 (1/2 = 4/8) b) It is a two-digit symbol when the numerator is not a whole number. EXAMPLE Diameter of inscribed circle: 5/16 in Symbol of designation: 2.5 (5/16 = 2.5/8) NOTE — Annex A gives the symbols for insert size for the usually standardized diameters of the inscribed circle of equilateral inserts.
III — IV	Non-equilateral inserts	The symbol of designation for the insert size is always given for the major cutting edge or the longer cutting edge. The indication of other dimensions shall be made by means of a sketch or detailed explanation, indicated at position 4 by the symbol X. — In countries using the metric system, the symbol of designation is the length, disregarding any decimals. EXAMPLE Length of the main edge: 19,5 mm Symbol of designation: 19 — In countries using the inch system, the symbol of designation is the numerator of the fraction for the value in 1/4 in. EXAMPLE Length of the main edge: 3/4 in Symbol of designation: 3
V	Round inserts	— In countries using the metric system, choose the value of the diameter as the symbol of designation and disregard any decimals. EXAMPLE Insert diameter: 15,875 mm Symbol of designation: 15 For inserts having rounded metric diameters, the same rule is valid, combined with a special symbol at reference ⑦ (see 4.7). — In countries using the inch system, proceed as for equilateral inserts (type I —II).

4.6 Symbol for insert thickness — Reference ⑥

See table 8.

The thickness s of an insert is defined as the distance between the cutting edge of the corner and the opposing supporting surface of the insert; see figure 4 a), b) and c).
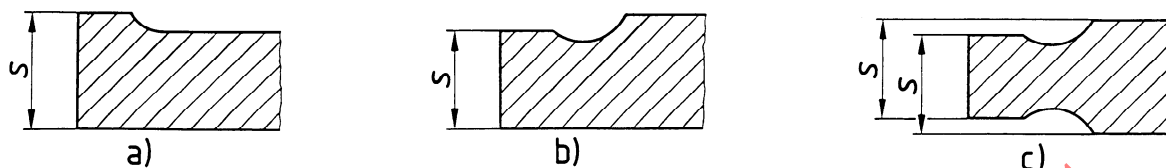

Figure 4 — Thickness of an insert

Rounded or chamfered cutting edges are considered as sharp cutting edges.
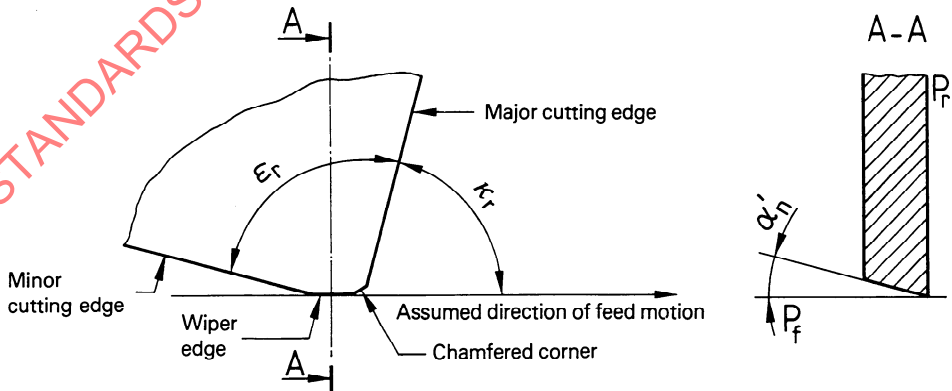
Table 8

Number symbol
— In countries using the metric system, take the numerical value of the thickness as the symbol of designation for the insert thickness, disregarding any decimals. If the resulting symbol has only one digit, it shall be preceded by 0 (zero).
EXAMPLE   Insert thickness :   3,18 mm   Symbol of designation :   03
As an exception for inserts having thicknesses of 1,98 mm and 3,97 mm, in order to distinguish them from those having thicknesses of 1,59 mm (symbol 01) and 3,18 mm (symbol 03), precede the digit by the letter T.
EXAMPLE   Insert thickness :   3,97 mm   Symbol of designation :   T3
— In countries using the inch system, the symbol of designation for the insert thickness is the numerator of the fraction measured in 1/16 in.
a)   It is a one-digit symbol when the numerator is a whole number.
EXAMPLE   Insert thickness :   1/8 in   Symbol of designation :   2 (1/8 = 2/16)
b)   It is a two-digit symbol when the numerator is not a whole number.
EXAMPLE   Insert thickness :   3/32 in   Symbol of designation :   1.5 (3/32 = 1.5/16)
NOTE — Annex B gives the symbols for standardized insert thicknesses.
1)   In order to determine the symbol of designation for rectangular or parallelogram-shaped inserts, use the width instead of the inscribed circle (see also 4.4).

4.7 Symbol for insert corner configuration — Reference ⑦

See table 9.

Table 9

Number or letter symbol

1) If the inserts have rounded corners, the symbol of designation is represented

    a) in countries using the metric system, by the value of the corner radius given in 0,1 mm ; if the number is less than 10, it should be preceded by 0 (zero).

       EXAMPLE   Corner radius :   0,8 mm

                       Designation symbol :   08

If the corner is not rounded, use the symbol of designation 00 (zero-zero).

    b) in countries using the inch system, by the following figures :

                    0 — Sharp corner (not rounded)
                    1 — Corner radius 1/64 in
                    2 — Corner radius 1/32 in
                    3 — Corner radius 3/64 in
                    4 — Corner radius 1/16 in
                    6 — Corner radius 3/32 in
                    8 — Corner radius 1/8 in
                    X — Any other corner radius

2) If inserts have wiper edges, use, in the order given, the following symbols of designation :

For cutting edge angle κ_r	For wiper edge normal clearance α'_n
A — 45°	**A** — 3°
D — 60°	**B** — 5°
E — 75°	**C** — 7°
F — 85°	**D** — 15°
P — 90°	**E** — 20°
Z — Any other	**F** — 25°
cutting edge angle	**G** — 30°
	N — 0°
	P — 11°
	Z — Any other wiper edge
	normal clearance

NOTES

1   The wiper edge is a part of the minor cutting edge.

2   Inserts with wiper edge may or may not have chamfered corners, depending on their type. The designation for indexable inserts gives no information as to whether the inserts have or do not have chamfered corners. For standardized inserts, this information is given in dimensional standards ; for non-standardized inserts, it is given in suppliers' catalogues.

3) To supplement the designation in position 7 for round inserts, countries using the metric system shall indicate

    —   00 (zero-zero) if the diameter is converted from an inch value;

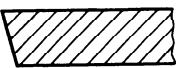   —   M0 if the diameter is a metric one.

5 Optional symbols
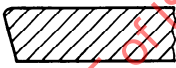
The compulsory designation comprises the seven symbols given in 4.1 to 4.7. As stated in clause 3, the symbols given in 5.1 and 5.2 may be used when necessary.

If only one symbol is needed (cutting edge condition or cutting direction), it shall occupy position 8. If both cutting edge condition and cutting direction are to be specified, the two symbols shall occupy positions 8 and 9, respectively.

5.1 Symbol for cutting edge condition — Reference ⑧

See table 10.

Table 10

Letter symbol	Cutting edge condition	Figure
F	Sharp cutting edges	
E	Rounded cutting edges	
T	Chamfered cutting edges	
S	Chamfered and rounded cutting edges	
K	Double chamfered cutting edge	
P	Double chamfered and rounded cutting edge	

5.2 Symbol for the corner type and the application of the insert (direction of feed motion) — Reference ⑨

See table 11.

Table 11

Letter symbol	Corner type	Application of the insert	Figure
R	Right-hand insert	For non-equilateral and non-equiangular inserts and for all inserts with asymmetrical corners and/or asymmetrical chip breaker, permitting the use of the insert in only one direction of the feed motion	
L	Left-hand insert		
N	Neutral insert	For all inserts with symmetrical corners and symmetrical chip breaker, permitting the use of the insert in both directions of the feed motion	

Annex A
(informative)

Symbols for insert size (reference ⑤) according to standardized inscribed circles for equilateral and round inserts

A.1 Equilateral and round inserts "non-metric"

See table A.1.

Table A.1

Diameter of inscribed circle d mm	in	Symbol for insert size (reference ⑤) for insert shape											
		H	O	P	S	T	C	D	E	M	V	W	R[1]
4,76		—	—	—	04	08	04	05	04	04	08	—	—
	3/16	1.5											
5,56		—	—	—	05	09	05	06	05	05	09	03	—
	7/32	1.8											
6,35		03	02	04	06	11	06	07	06	06	11	04	06
	1/4	2											
7,94		04	03	05	07	13	08	09	08	07	13	05	07
	5/16	2.5											
9,525		05	04	07	09	16	09	11	09	09	16	06	09
	3/8	3											
12,7		07	05	09	12	22	12	15	13	12	22	08	12
	1/2	4											
15,875		09	06	11	15	27	16	19	16	15	27	10	15
	5/8	5											
19,05		11	07	13	19	33	19	23	19	19	33	13	19
	3/4	6											
25,4		14	10	18	25	44	25	31	26	25	44	17	25
	1	8											
31,75		18	13	23	31	54	32	38	32	31	54	21	31
	1 1/4	10											

1) See 3) in 4.7. For "metric" round inserts, see clause A.2.

NOTE — The edge length l can be calculated by means of the following formulae :

— for equiangular inserts (shape H, O, P, S, T) :

$$l = d \cdot \tan \frac{180°}{n}$$

where n is the number of sides of the polygon;

— for the rhombic inserts (shape C, D, E, M, V) and for inserts shape W :

$$l = \frac{d}{2} \left(\cot \frac{\varepsilon_{r1}}{2} + \cot \frac{\varepsilon_{r2}}{2} \right)$$

where ε_{r1} and ε_{r2} are the included angles at the sharp and obtuse corners.

If these symbols are used with significance other than that given in table A.1, the symbol at reference ④ shall be X.

ISO 1832 : 1991 (E)

A.2 Round inserts "metric"

See table A.2.

Table A.2

Diameter of insert d		Symbol for insert size for "metric" round insert (shape R) [1]
mm	in	
6		06
	0,236	—
8		08
	0,315	—
10		10
	0,394	—
12		12
	0,472	—
16		16
	0,63	—
20		20
	0,787	—
25		25
	0,984	—
32		32
	1,26	—

1) See 3) in 4.7.

14