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Indexable inserts for cutting tools — Designation

Plaquettes amovibles pour outils coupants — Désignation

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ISO copyright office
Ch. de Blandonnet 8 • CP 401
CH-1214 Vernier, Geneva, Switzerland
Tel. +41 22 749 01 11
Fax +41 22 749 09 47
copyright@iso.org
www.iso.org

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Foreword

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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 documents 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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This document was prepared by Technical Committee ISO/TC 29, *Small tools*, Subcommittee SC 9, *Tools with defined cutting edges, cutting items*.

This sixth edition cancels and replaces the fifth edition (ISO 1832:2012), which has been technically revised.

Indexable inserts for cutting tools — Designation

1 Scope

This document establishes a code for the designation of the usual types of indexable inserts for cutting tools in hard cutting materials or any other cutting materials, in order to simplify orders and specifications for such inserts.

It also specifies the designations for cubic boron nitride (BL, BH, BC) inserts, tipped and solid, as well as polycrystalline diamond (DP) inserts, tipped.

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 513, *Classification and application of hard cutting materials for metal removal with defined cutting edges — Designation of the main groups and groups of application*

ISO 3002-1, *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*

ISO 16462, *Cubic boron nitride inserts, tipped or solid — Dimensions, types*

ISO 16463, *Polycristalline diamond inserts, tipped — Dimensions, types*

3 Terms and definitions

No terms and definitions are listed in this document.

ISO and IEC maintain terminological databases for use in standardization at the following addresses:

— IEC Electropedia: available at http://www.electropedia.org/

— ISO Online browsing platform: available at http://www.iso.org/obp

4 Explanation of designation code

For indexable inserts, the designation code comprises nine symbols for designating the dimensions and other characteristics; the first seven symbols (symbols ① to ⑦) shall be used in every designation. Symbols ⑧ and ⑨ may be used when necessary.

For tipped inserts in accordance with ISO 16462 and ISO 16463, the designation code comprises 12 symbols for designating the dimensions and other characteristics; symbols ① to ⑦ as well as ⑪ and ⑫ shall be used in every designation. Symbols ⑧, ⑨ and ⑩ may be used when necessary. Symbols ⑪ and ⑫ shall be separated by a dash as shown in Clause 4, example 2.

In addition to the standardized designation for indexable inserts and tipped inserts, a supplementary symbol ⑬ consisting of one or two characters may be added by the manufacturer for a better description of his/her product (for example, different chip breakers), provided this symbol is separated from the standardized designation by a dash and that it does not contain letters specific to references ⑧, ⑨ and ⑩.

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

However, if the letter symbol "X" is used in position 4 of the designation, it is allowed to use, in positions 5, 6 and 7, symbols representing values not appearing in this document, but which shall be described explicitly using the sketch or the detailed specifications given in 5.4.

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

①	Letter symbol identifying	**insert shape (see 5.1)**	Compulsory symbols for indexable inserts	Compulsory symbols for tipped inserts according to ISO 16462 and ISO 16463, except as noted
②	Letter symbol identifying	**normal clearance (see 5.2)**		
③	Letter symbol identifying	**tolerance class (see 5.3)**		
④	Letter symbol indicating	**fixing and/or chip breakers (see 5.4)**		
⑤	Number symbol identifying	**insert size (see 5.5)**		
⑥	Number symbol identifying	**insert thickness (see 5.6)**		
⑦	Letter or number symbol identifying	**insert corner configuration (see 5.7)**		
⑧	Letter symbol indicating (optional symbol for indexable and tipped inserts)	**cutting edge condition (see 6.2)**		
⑨	Letter symbol identifying (optional symbol for indexable and tipped inserts)	**cutting direction (see 6.3)**		
⑩	Number symbol identifying (optional symbol for tipped inserts)	**size of cutting edge condition (see 7.2)**		
⑪	Letter symbol identifying	**style of tipped or solid cutting edge and number of tipped corners (see 7.3)**		
⑫	Letter or number symbol identifying	**length of tipped cutting edge (see 7.4)**		
⑬	Manufacturer's symbol or cutting material designation according to ISO 513 (optional symbol for indexable and tipped inserts)			

EXAMPLE 1 General designation

	①	②	③	④	⑤	⑥	⑦	⑧	⑨		⑬
Metric dimensions:	**T**	**P**	**G**	**N**	**16**	**03**	**08**	**E**	**N**	**—**	...
Inch dimensions:	**T**	**P**	**G**	**N**	**3**	**2**	**2**	**E**	**N**	**—**	...

EXAMPLE 2 Designation of inserts according to ISO 16462 and ISO 16463

	①	②	③	④	⑤	⑥	⑦	⑧	⑩	⑨		⑪	⑫		⑬
Designation of insert for turning	**S**	**N**	**M**	**A**	**15**	**06**	**08**	**E**		**(N)**	**—**	**B**	**L**	**—**	...
Designation of insert for milling	**T**	**P**	**G**	**T**	**16**	**T3**	**AP**	**S**	**01520**	**R**	**—**	**M**	**028**	**—**	...

The designations and symbols of the different angles allowing geometrical definition of the indexable inserts shall conform 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 to Table 9).

For the relationship between designations in this document and the ISO 13399 series, see Annex C.

5 Symbols

5.1 Symbol for insert shape — Reference ①

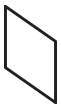
See Table 1.

Table 1

Type		Letter symbol	Description of shape	Included angle, ε_r	Illustration
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°	

[a] The smaller angle is always the included angle that is considered.

Table 1 *(continued)*

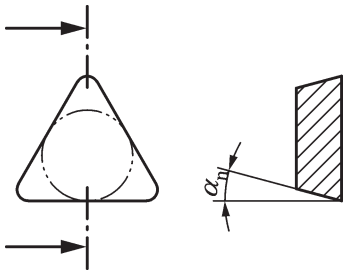
Type		Letter symbol	Description of shape	Included angle, ε_r	Illustration
II	Equilateral but non-equiangular inserts	C	Rhombic inserts	80°[a]	
		D		55°[a]	
		E		75°[a]	
		M		86°[a]	
		V		35°[a]	
		W	Trigon inserts	80°[a]	
III	Non-equilateral but equiangular inserts	L	Rectangular inserts	90°	
IV	Non-equilateral and non-equiangular inserts	A	Parallelogram-shaped inserts	85°[a]	
		B		82°[a]	
		K		55°[a]	
V	Round inserts	R	Round inserts	—	

[a] The smaller angle is always the included angle that is considered.

5.2 Symbol for normal clearance — Reference ②

See Table 2.

Table 2

Letter symbol	
For normal clearance, choose, from the letter symbols listed below, the one that corresponds to the major cutting edge (see the figure below). If (in spite of different 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 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

5.3 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.

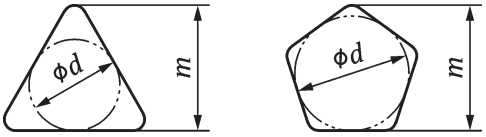


Figure 1 — Case 1: inserts with odd numbers of sides and rounded corners

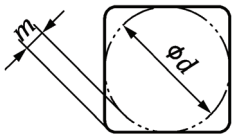


Figure 2 — Case 2: inserts with even numbers of sides and rounded corners

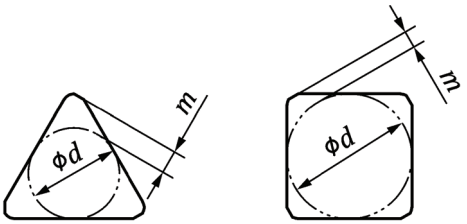


Figure 3 — Case 3: inserts with wiper edges (see Note 1 in Table 9)

Table 3

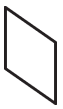
Letter	Tolerance in millimetres			Tolerance in inches		
	d	*m*	*s*	*d*	*m*	*s*
A[a]	±0,025	±0,005	±0,025	±0,001	±0,000 2	±0,001
F[a]	±0,013	±0,005	±0,025	±0,000 5	±0,000 2	±0,001
C[a]	±0,025	±0,013	±0,025	±0,001	±0,000 5	±0,001
H	±0,013	±0,013	±0,025	±0,000 5	±0,000 5	±0,001
E	±0,025	±0,025	±0,025	±0,001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

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

b The tolerance is dependent upon the insert size (see 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.

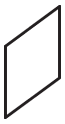
Table 4

Diameter of inscribed circle *d*		**Tolerance on** *d*				**Tolerance 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	3/16	±0,05	±0,002	±0,08	±0,003	±0,08	±0,003	±0,13	±0,005
5,56	7/32								
6[a]	—								
6,35	1/4								
7,94	5/16								
8[a]	—								
9,525	3/8								
10[a]	—								
12[a]	—	±0,08	±0,003	±0,13	±0,005	±0,13	±0,005	±0,2	±0,008
12,7	1/2								
15,875	5/8	±0,1	±0,004	±0,18	±0,007	±0,15	±0,006	±0,27	±0,011
16[a]	—								
19,05	3/4								
20[a]	—								
25[a]	—	±0,13	±0,005	±0,25	±0,01	±0,18	±0,007	±0,38	±0,015
25,4	1								
31,75	1 1/4	±0,15	±0,006	±0,25	±0,01	±0,2	±0,008	±0,38	±0,15
32[a]	—								
		H	**O**	**P**	**S**	**T**	**C, E, M**	**W**	**R** (tolerance on *d* only)
Shape of the inserts concerned									

[a] Applies only to round inserts.

In the case of rhombic inserts with an included angle of 55° (shape D) and of 35° (shape V), the values for tolerance classes M and N on *d* and *m* are indicated in Table 5.

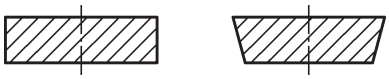
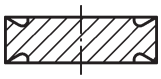
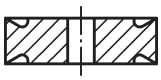
Table 5

Diameter of inscribed circle *d*		Tolerance on *d*		Tolerance on *m*		Shape of the inserts concerned
		Classes M and N		Classes M and N		
mm	in	mm	in	mm	in	
5,56	7/32	± 0,05	± 0,002	± 0,11	± 0,004	*D* 
6,35	1/4					
7,94	5/16					
9,525	3/8					
12,7	1/2	± 0,08	± 0,003	± 0,15	± 0,006	
15,875	5/8	± 0,1	± 0,004	± 0,18	± 0,007	
19,05	3/4					
6,35	1/4	± 0,05	± 0,002	± 0,16	± 0,006	*V* 
7,94	5/16					
9,525	3/8					
12,7	1/2	± 0,08	± 0,003	± 0,25	± 0,010	

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

See Table 6.

Table 6

Letter symbol	Fixing	Chip breakers[a]	Illustration
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	

[a] The definition of chip breakers is given in ISO 3002-1.

[b] 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 or construction are necessary.

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