भारतीय मानक
Indian Standard

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नियत कर्तन धार से धातु हटाने के लिए कठोर कर्तन सामग्री का वर्गीकरण और अनुप्रयोग — मुख्य समूहों और अनुप्रयोग के समूहों का अभिनाम

(तीसरा पुनरीक्षण)

Classification and Application of Hard Cutting Materials for Metal Removal with Defined Cutting Edges — Designation of the Main Groups and Groups of Application

(Third Revision)

ICS 25.100.01

भारतीय मानक ब्यूरो
BUREAU OF INDIAN STANDARDS
मानक भवन, 9 बहादुर शाह ज़फर मार्ग, नई दिल्ली - 110002
MANAK BHAVAN, 9 BAHADUR SHAH ZAFAR MARG
NEW DELHI - 110002
www.bis.gov.in www.standardsbis.in

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NATIONAL FOREWORD

This Indian Standard (Third Revision) which is identical to ISO 513 : 2012 ‘Classification and application of hard cutting materials for metal removal with defined cutting edges — Designation of the main groups and groups of application’ issued by the International Organization for Standardization (ISO) was adopted by the Bureau of Indian Standards on recommendation of the Cutting Tools Sectional Committee and approval of the Production and General Engineering Division Council.

This standard was first published in 1975 and subsequently revised in 1999 and 2007. First revision of this standard was identical to ISO 513 : 1991. Second revision of this standard was identical to ISO 513 : 2004. This revision has been brought out to align it with latest version of ISO 513.

The major changes have been incorporated in this revision are as follows:

a) Table 3 has been revised by providing separate identification letters for polycrystalline diamond, with and without binder; and

b) Table 6 ‘Area of use chart’ has been added’.

The text of ISO standard has been approved as suitable for publication as an Indian Standard without deviations. Certain conventions are, however, not identical to those used in Indian Standards. Attention is particularly drawn to the following:

a) Wherever the words ‘International Standard’ appear referring to this standard, they should be read as ‘Indian Standard’; and

b) Comma (,) has been used as a decimal marker while in Indian Standards, the current practice is to use a point (.) as the decimal marker.

For the purpose of deciding whether a particular requirement of this standard is complied with the final value, observed or calculated, expressing the result of a test or analysis shall be rounded off in accordance with IS 2 : 2022 ‘Rules for rounding off numerical values (*second revision*)’. The number of significant places retained in the rounded off value should be same as that of the specified value in this standard.

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Introduction

The variety of ways in which different manufacturers produce hard cutting materials with differing characteristics makes it impossible at the time of publication to standardize hard cutting materials graded in accordance with these characteristics.

This International Standard is, therefore, limited to a classification of hard cutting materials based on their application and to a method of designation (colour marking and distinguishing symbols) for the main groups of application and the groups of application which constitute this classification.

Indian Standard

CLASSIFICATION AND APPLICATION OF HARD CUTTING MATERIALS FOR METAL REMOVAL WITH DEFINED CUTTING EDGES — DESIGNATION OF THE MAIN GROUPS AND GROUPS OF APPLICATION

1 Scope

This International Standard specifies the classification and application of hard cutting materials, including hardmetals, ceramics, diamond and boron nitride, for machining by chip removal, and establishes their application.

It is not applicable to other uses (mining and other percussion tools, wire drawing dies, tools operating by deformation of the metal and comparator contact tips, etc.).

2 Designation

The designation of groups of application for hard cutting materials includes the letter symbols in accordance with Tables 1 to 4, followed by a dash and the designation of the main group of chip removal and of the group of application, as specified in Clause 4.

Table 1 — Carbides

Identification letters	Material group
HW	Uncoated carbide, main content tungsten carbide (WC) with grain size ≥ 1 µm
HF	Uncoated carbide, main content tungsten carbide (WC) with grain size < 1 µm
HT[a]	Uncoated carbide, main content TiC or TiN or both
HC	Carbides as above-mentioned, but coated

[a] These grades are also called “Cermets”.

Table 2 — Ceramics

Identification letters	Material group
CA	Ceramic, main content Al_2O_3
CR	Ceramic, main content Al_2O_3, reinforced
CM	Mixed ceramic, main content Al_2O_3 plus components other than oxides
CN	Silicon nitride ceramic, main content Si_3N_4
CC	Ceramics as above-mentioned, but coated

Table 3 — Diamond

Identification letters	Material group
DM	Monocrystalline diamond
DD	Polycrystalline diamond without binder
DP	Polycrystalline diamond with binder

Table 4 — Boron nitride

Identification letters	Material group
BL	Cubic crystalline boron nitride with low content of cubic boron nitride
BH	Cubic crystalline boron nitride with high content of cubic boron nitride
BC	Cubic crystalline boron nitride as above-mentioned, but coated

EXAMPLE HW – P10

HC – K20

CA – K10

Table 5 — Application and classification of hard cutting materials

Main groups of application			Group of application			
Identification letter	Identification colour	Materials to be machined	Hard cutting materials		–	
P	blue	**Steel:** all kinds of steel and cast steel except stainless steel with an austenitic structure.	P01 P10 P20 P30 P40 P50	P05 P15 P25 P35 P45	↑ a	↓ b
M	yellow	**Stainless steel:** stainless austenitic and austenitic/ferritic steel and cast steel.	M01 M10 M20 M30 M40	M05 M15 M25 M35	↑ a	↓ b
K	red	**Cast iron:** grey cast iron, cast iron with spheroidal graphite, malleable cast iron.	K01 K10 K20 K30 K40	K05 K15 K25 K35	↑ a	↓ b
N	green	**Non-ferrous metals:** aluminium and other non-ferrous metals, non-metallic materials.	N01 N10 N20 N30	N05 N15 N25	↑ a	↓ b
S	brown	**Superalloys and titanium:** heat-resistant special alloys based on iron, nickel and cobalt, titanium and titanium alloys.	S01 S10 S20 S30	S05 S15 S25	↑ a	↓ b
H	grey	**Hard materials:** hardened steel, hardened cast iron materials, chilled cast iron.	H01 H10 H20 H30	H05 H15 H25	↑ a	↓ b

a Increasing speed, increasing wear resistance of cutting material (see Table 6).

b Increasing feed, increasing toughness of cutting material (see Table 6).

Table 6 — Area of use chart

Wear resistance ← → Toughness											
	01	05	10	15	20	25	30	35	40	45	50
P											
M										**X**	**X**
K										**X**	**X**
N								**X**	**X**	**X**	**X**
S								**X**	**X**	**X**	**X**
H								**X**	**X**	**X**	**X**

3 Classification

3.1 Main groups of application

There are six main groups of application (see Table 5). They are divided according to the different workpiece materials which are to be machined. They are identified by a capital letter and an identifying colour.

3.2 Groups of application

Each main group of application is divided into application groups. The application groups are designated by the letter for the main group and a classification number.

The manufacturers of cutting material arrange in proper order their grades into the application group system according to the relative wear resistance and toughness of the grades (see Table 6).

Table 6 shows that, according to this International Standard, only "P" grades are thought to operate under conditions sufficiently arduous as to justify wear/toughness classification numbers 45 and 50. "M" and "K" grades may have classification numbers up to 40 and the remaining groups (N, S and H) may be allocated wear/toughness classification numbers no greater than 30. Manufacturers may assign any available application code to a specified cutting tool material with qualifying composition.

4 Important remarks

A group of application is not identical to a cutting material grade. Grades from different manufacturers which are in the same application group could be different as far as application range and performance level are concerned. Within an application group, a designation (eg "P01") is not identical to a cutting material grade. Grades from different manufacturers with the same designation within an application group can be different as far as composition, properties, application range and performance level are concerned. This International Standard, consequently, does not provide data for grade comparison charts.

Bureau of Indian Standards

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Amendments are issued to standards as the need arises on the basis of comments. Standards are also reviewed periodically; a standard along with amendments is reaffirmed when such review indicates that no changes are needed; if the review indicates that changes are needed, it is taken up for revision. Users of Indian Standards should ascertain that they are in possession of the latest amendments or edition by referring to the website-www.bis.gov.in or www.standardsbis.in.

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Amendments Issued Since Publication

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BUREAU OF INDIAN STANDARDS

Headquarters:

Manak Bhavan, 9 Bahadur Shah Zafar Marg, New Delhi 110002
Telephones: 2323 0131, 2323 3375, 2323 9402 *Website*: www.bis.gov.in

Regional Offices:		*Telephones*
Central	: 601/A, Konnectus Tower -1, 6th Floor, DMRC Building, Bhavbhuti Marg, New Delhi 110002	2323 7617
Eastern	: 8th Floor, Plot No 7/7 & 7/8, CP Block, Sector V, Salt Lake, Kolkata, West Bengal 700091	2367 0012 2320 9474
Northern	: Plot No. 4-A, Sector 27-B, Madhya Marg, Chandigarh 160019	265 9930
Southern	: C.I.T. Campus, IV Cross Road, Taramani, Chennai 600113	2254 1442 2254 1216
Western	: Manakalya, 4th Floor, NTH Complex (W Sector), F-10, MIDC, Andheri (East), Mumbai 400093	283 25838

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