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

Classification et application des matériaux durs de coupe pour enlèvement de métal avec arêtes coupantes définies — Définition des groupes principaux et des groupes d'application

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Foreword

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ISO 513 was prepared by Technical Committee ISO/TC 29, *Small tools*, Subcommittee SC 9, *Tools with cutting edges made of hard cutting materials*.

This third edition cancels and replaces the second edition (ISO 513:1991) as well as ISO/TR 11255:1994 of which it consitutes a technical revision. It also incorporates the Technical Corrigendum ISO 513:1991/Cor. 1:1994.

Introduction

The variety of ways in which different manufacturers produce hard cutting materials having differing characteristics makes it currently impossible to standardize hard cutting materials graded in accordance with those 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.

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 hard metals (carbides), ceramics, diamond and boron nitride, for machining by chip removal, and establishes their application.

It is not applicable for other uses (e.g., mining and other percussion tools, wire-drawing dies, tools operating by deformation of the metal, 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 3.

Table 1 — Carbides

Identification letters	Material group
HW	Uncoated carbide, main content tungsten carbide (WC) with grain size $\geqslant$ 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, but coated

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

Table 2 — Ceramics

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

Table 3 — Diamond

Identification letters	Material group
DP	Polycrystalline diamond
DM	Monocrystalline diamond

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, but coated

EXAMPLE HW — P10, HC — K20, CA — K10

Table 5 — Application and classification of hard cutting materials

Main groups of application			Groups 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.

[b] Increasing feed, increasing toughness of cutting material.

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 that are to be machined. They are identified by a capital letter and an identifying colour.