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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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Contents

Page

Foreword

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International Standards are drafted in accordance with the rules given in the ISO/IEC Directives, Part 2.

The main task of technical committees is to prepare International Standards. 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.

Attention is drawn to the possibility that some of the elements of this document may be the subject of patent rights. ISO shall not be held responsible for identifying any or all such patent rights.

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 fourth edition cancels and replaces the third edition (ISO 513:2004), which has been technically revised.

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.

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**