भारतीय मानक
Indian Standard

IS 4005 : 2025

खनन औजारों के लिए टंगस्टन कार्बाइड – विशिष्टि

(पहला पुनरीक्षण)

Tungsten Carbide for Mining Tools — Specification

(First Revision)

ICS 73.100

भारतीय मानक ब्यूरो
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Price Group 3

Mining Techniques and Equipment Sectional Committee, MED 08

FOREWORD

This Indian Standard (First Revision) was adopted by the Bureau of Indian Standards, after the draft finalized by the Mining Techniques and Equipment Sectional Committee had been approved by the Mechanical Engineering Division Council.

This standard was first published in 1967. This revision has been brought out to incorporate the modification found necessary as a result of experience gained in the use of this standard. Also, in this revision, the standard has been brought into the latest style and format of Indian Standards, and references to Indian Standards, wherever applicable have been updated. BIS certification marking clause has been added to align with the revised *Bureau of Indian Standards Act*, 2016.

The composition of the Committee responsible for the revision of this standard is given in Annex A.

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 the same as that of the specified value in this standard.

Indian Standard

TUNGSTEN CARBIDE FOR MINING TOOLS — SPECIFICATION

(First Revision)

1 SCOPE

This specification covers four grades of tungsten carbide for use with mining tools, such as drilling bits and coal cutter picks.

2 REFERENCE

The standards given below contain provisions which, through reference in this text, constitute provision of this standard. At the time of publication, the editions indicated were valid. All standards are subject to revision, and parties to agreements based on this standard are encouraged to investigate the possibility of applying the most recent edition of these standard:

IS No.	*Title*
IS 5 : 2007	Colours for ready mixed paints and enamels (*sixth revision*)
IS 1501 (Part 1) : 2025/ISO 6507-1 : 2023	Metallic materials — Vickers hardness test: Part 1 Test method (*sixth revision*)

3 DESIGNATION AND COLOUR

The grades of tungsten carbide shall be designated as hard (H), medium (M), tough (T) and extra tough (XT) and tools on which these grades are used and which are required to be painted shall be coloured red (signal red shade 537), yellow (canary yellow shade 309), blue (french blue shade 166) and white respectively (*see* IS 5).

4 COMPOSITION AND GRAIN SIZE

The composition of the various grades of tungsten carbide shall be as specified in Table 1 and the grain size should lie within the limits specified (*see* Note 3 in Table 1).

5 HARDNESS TESTING

The hardness test shall be carried out in accordance with IS 1501 (Part 1)/ISO 6507-1 using a load of not less than 30 nor more than 50 kgf. The tests shall be carried out on the surface of the tip after removing 0.2 mm to 0.4 mm of material. The finish of the surface shall be fine enough to give a distinct impression for accurate measurement. To allow for variations in hardness measurement between different test centre's, a range of 25 points above or below the specified hardness ranges (*see* Table 1) shall be permitted, provided that any grade supplied by a given manufacturer does not have a range of hardness greater than 100 points HV.

6 DEFECTS

Tips shall be free from an undue amount of porosity, uncombined carbon and cobalt segregation. The tips shall be free from eta-phase.

The surface of the tips shall be free from pitting.

7 IMPURITIES

The total impurities shall not exceed one percent and individually not exceeding the following:

Iron	0.5 percent
Titanium or other carbides (excluding tungsten carbide)	0.25 percent

Table 1 Tungsten Carbide-Grade, Hardness and Composition For Mining Tools

(*Clauses* 4 *and* 5)

Sl No.	Designation, Colour and Grade	Application	Hardness Range	Composition and Predominating Grain Size
(1)	(2)	(3)	(4)	(5)
i)	H-red hard grade	Rotary drill bits	1 450 HV to 1 550 HV	7.0 percent to 8.0 percent cobalt, 1 µm to 3 µm.
ii)	M-yellow medium grade	Rotary drill bits	1 350 HV to 1 450 HV	9.0 percent to 10.0 percent cobalt, 1 µm to 3 µm.
iii)	T-blue tough grade	Cutter picks percussive bits and rotary drill bits	1 250 HV to 1 350 HV	8.5 percent to 9.5 percent cobalt, 3 µm to 5 µm. For percussive bits the cobalt content may be reduced to 8 percent.
iv)	XT-white extra tough grade	Cutter picks percussive bits and rotary drill bits	1 150 HV to 1 250 HV	8.5 percent to 11.0 percent cobalt. The grain size shall be between 3 µm and 6 µm so as to give the specified hardness.

NOTES

1 The hard and medium grade carbides shall not contain an undue amount of recrystallized grains of length greater than 5 microns.

2 By predominating grain size is meant the range of grain sizes of at least 60 percent of the area of the microscopic field.

3 The grain size figures are given for guidance only. The manufacturer is expected to produce grades having suitable grain-size distribution to give a hardness within the specified ranges. For grain-size measurement a convenient method is the use of the miller diagram (*see* Fig. 1).

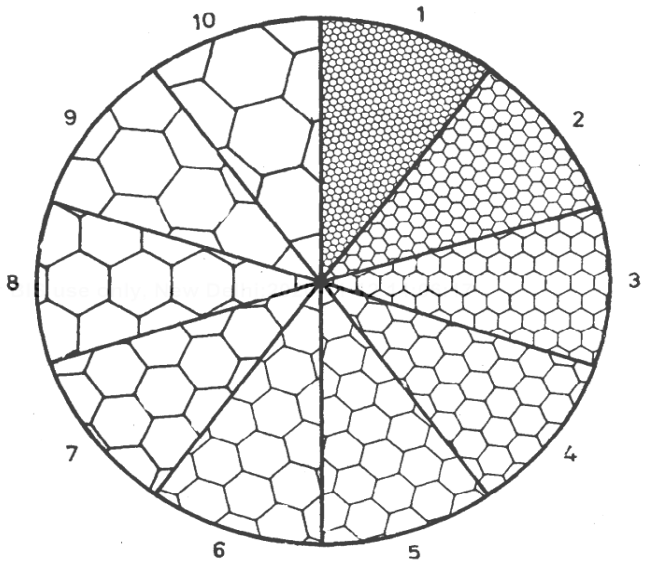

FIG. 1 CARBIDE GRAIN SIZE CHART FOR 1 MICRONS TO 10 MICRONS AT 1 500 DIAMETER

8 MARKING

8.1 Each coil of the packing shall be marked with the following:

a) Manufacturer's name or trade-mark;

b) Dimension of packing; and

c) Month and year of manufacture.

8.2 BIS Certification Marking

The product(s) conforming to the requirements of this standard may be certified as per the conformity assessment schemes under the provisions of the *Bureau of Indian Standards Act*, 2016 and the Rules and Regulations framed thereunder, and the product(s) may be marked with the Standard Mark.

ANNEX A

(*Foreword*)

COMMITTEE COMPOSITION

Mining Techniques and Equipment Sectional Committee, MED 08

Organization	*Representative*(*s*)
Directorate General of Mines Safety, Dhanbad	SHRI SAIFULLAH ANSARI **(*Chairperson*)**
Automotive Research Association of India, Pune	SHRI MILIND KANDALKAR SHRI DHONDIRAM MOLE (*Alternate*)
CSIR - Central Institute for Mining and Fuel Research, Dhanbad	DR MANOJ KUMAR SINGH SHRI SURAJIT DEY (*Alternate* I) PROF S. K. KASHYAP (*Alternate* II)
Directorate General of Mines Safety, Dhanbad	SHRI M. ARUMUGAM
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Eimco Elecon (India) Limited, Vallabh Vidyanagar	SHRI RAM RAMESH KALE SHRI VINAY JAYNARAYAN SHARMA (*Alternate*)
Hutti Gold Mines Company Limited, Bengaluru	DR PRABHAKAR SANGOORMATH SHRI MALLIKARJUN SARAPUR (*Alternate* I) MS MEGA HIREMATH (*Alternate* II)
Indian Institute of Technology (ISM), Dhanbad	SHRI L. A. KUMARASWAMIDHAS
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Metso Outotec India Private Limited, Vadodara	SHRI SANDEEP DEOKISAN BHATTAD
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Tata Steel Limited, Dhanbad	SHRI SOUMENDHU MANJHI SHRI ABINASH JHA (*Alternate*)
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SCIENTIST 'D'/JOINT DIRECTOR
(MECHANICAL ENGINEERING), BIS

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

Amend No.	Date of Issue	Text Affected

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