

Hardmetals — Knoop hardness test

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National foreword

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A list of organizations represented on this committee can be obtained on request to its secretary.

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Contents

Page

Foreword	iv
Introduction.....	v
1 Scope	1
2 Normative references	1
3 Principle.....	1
4 Symbols and designations	1
5 Apparatus	3
6 Test pieces	3
7 Procedure	3
8 Expression of results	4
9 Test report.....	4
10 Significance	4
Annex A (informative) Investigation regarding the demand of an International Standard for a Knoop hardness test for hardmetals.....	5
Annex B (informative) Comparison of important test procedures in Vickers and Knoop hardness tests	15
Bibliography.....	16

Foreword

ISO (the International Organization for Standardization) is a worldwide federation of national standards bodies (ISO member bodies). The work of preparing International Standards is normally carried out through ISO technical committees. Each member body interested in a subject for which a technical committee has been established has the right to be represented on that committee. International organizations, governmental and non-governmental, in liaison with ISO, also take part in the work. ISO collaborates closely with the International Electrotechnical Commission (IEC) on all matters of electrotechnical standardization.

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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 22394 was prepared by Technical Committee ISO/TC 119, *Powder metallurgy*, Subcommittee SC 4, *Sampling and testing methods for hardmetals*.

Introduction

Many metallurgical problems require the determination of hardness over very small areas. The special shape of the Knoop indenter makes it possible to place indentations much closer together than with a square Vickers indentation, e.g. to measure a steep hardness gradient. For a given long diagonal length, the depth and area of the Knoop indentation are known to be only 15 % of what they would be for a Vickers indentation with the same diagonal length.

Both Vickers and Knoop hardness tests were performed for a range of hardmetals, in order to investigate whether a specific International Standard is really required and if it compensates the limitations of the Vickers hardness test currently used. Knoop hardness tests were carried out independently in three institutes (KATS, Jinil Co., Seoul University) over a period of four months. The results of this test (see Annex A) show that this new International Standard regarding the Knoop hardness test is necessary.

Hardmetals — Knoop hardness test

1 Scope

This International Standard specifies the method of the Knoop hardness test for hardmetals.

2 Normative references

The following referenced documents are indispensable for the application 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 4545-1, *Metallic materials — Knoop hardness test — Part 1: Test method*

ISO 4545-2, *Metallic materials — Knoop hardness test — Part 2: Verification and calibration of testing machines*

ISO 4545-4, *Metallic materials — Knoop hardness test — Part 4: Table of hardness values*

3 Principle

Forcing a diamond indenter, in the form of a rhombic-based pyramid with specified angles between opposite faces at the vertex, into the surface of a test piece and measuring the long diagonal of the indentation left in the surface after removal of the test force, F , in accordance with ISO 4545-1.

4 Symbols and designations

4.1 The Knoop hardness, HK, is given by the quotient obtained by dividing the test force F by the projected area A_p of the indentation as represented by numerical value Equation (1):

$$HK = \frac{1}{g} \cdot \frac{F}{A_p} = 0,102 \cdot \frac{F}{c \cdot d^2} = 0,102 \cdot \frac{F}{\left(\frac{\tan\left(\frac{\beta}{2}\right)}{2 \cdot \tan\left(\frac{\alpha}{2}\right)} \right) \cdot d^2} = 0,102 \cdot \frac{F}{0,07028 \cdot d^2} = 1,451 \cdot \frac{F}{d^2} \quad (1)$$

where

g is the acceleration due to gravity, in metres per second squared (m/s²), with a constant of 9,806 65;

F is the test force, in newtons(N);

A_p is the projected area of the permanent indentation, in square millimetres (mm²);