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# International Standard



# 1524

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INTERNATIONAL ORGANIZATION FOR STANDARDIZATION • МЕЖДУНАРОДНАЯ ОРГАНИЗАЦИЯ ПО СТАНДАРТИЗАЦИИ • ORGANISATION INTERNATIONALE DE NORMALISATION

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## Paints and varnishes — Determination of fineness of grind

*Peintures et vernis — Détermination de la finesse de broyage*

Second edition — 1983-05-01

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Descriptors : paints, varnishes, tests, fineness.

## Foreword

ISO (the International Organization for Standardization) is a worldwide federation of national standards bodies (ISO member bodies). The work of developing International Standards is carried out through ISO technical committees. Every member body interested in a subject for which a technical committee has been authorized 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.

Draft International Standards adopted by the technical committees are circulated to the member bodies for approval before their acceptance as International Standards by the ISO Council.

International Standard ISO 1524 was developed by Technical Committee ISO/TC 35, *Paints and varnishes*, and was circulated to the member bodies in June 1980.

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It has been approved by the member bodies of the following countries:

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Australia	India	Norway
Austria	Iraq	Poland
Canada	Ireland	Romania
China	Israel	South Africa, Rep. of
Czechoslovakia	Italy	Sri Lanka
Egypt, Arab Rep. of	Kenya	Sweden
France	Korea, Rep. of	Switzerland
Germany, F.R.	Mexico	United Kingdom
Hungary	Netherlands	USSR

No member body expressed disapproval of the document.

This second edition cancels and replaces the first edition (i.e. ISO 1524-1973).

# Paints and varnishes — Determination of fineness of grind

## 0 Introduction

This International Standard is one of a series of standards dealing with the sampling and testing of paints, varnishes and related products.

## 1 Scope

This International Standard specifies a method for determining the fineness of grind of paints and related products by the use of a suitable gauge, graduated in micrometres.

NOTE — Certain fineness-of-grind gauges that are used in industry are graduated in non-SI units (see annex A). Use of these units is not recommended.

## 2 Field of application

This International Standard is applicable to all types of liquid paints and related products. Of the four gauges referred to in 5.1, the 100  $\mu\text{m}$  gauge is suitable for general use, but the 50  $\mu\text{m}$  gauge and especially the 15 and 25  $\mu\text{m}$  gauges will only provide reliable results in the hands of skilled laboratory personnel.

Particular caution is necessary in interpreting readings of less than 10  $\mu\text{m}$ .

## 3 References

ISO 1512, *Paints and varnishes — Sampling*.

ISO 1513, *Paints and varnishes — Examination and preparation of samples for testing*.

## 4 Definition

**fineness of grind:** The reading obtained on a standard gauge under specified conditions of test, indicating the depth of the groove(s) of the gauge at which discrete solid particles in the product are readily discernible.

## 5 Apparatus

**5.1 Gauge,** consisting of a block of hardened steel approximately 175 mm long, 65 mm wide and 13 mm thick.

NOTE — It is recommended that, at least for use with water-dilutable paints, a block of stainless steel should be used.

The top surface of the block shall be both plane and ground smooth and shall contain one or two grooves approximately 140 mm long and 12,5 mm wide parallel to the longer sides of the block. The depth of each groove shall be uniformly tapered along its length from a suitable depth (for example 15, 25, 50 or 100  $\mu\text{m}$ ) at one end to zero depth at the other end and shall be graduated as specified in the table. Diagrams of typical gauges are given in figure 1.

The depth of the groove at any position along its length shall not depart from its nominal value at any position across the groove by more than 2,5  $\mu\text{m}$ . A method for checking the groove depth is described in annex B.

Table — Graduation of typical gauges and the ranges for which gauges are recommended

Maximum depth of groove	Interval of graduations	Recommended range
$\mu\text{m}$	$\mu\text{m}$	$\mu\text{m}$
100	10	40 to 90
50	5	15 to 40
25	2,5	5 to 15
15	1,5	1,5 to 12

The top surface of the block shall be finished by fine grinding or lapping; it shall be flat so that all points lie between two parallel planes 12 µm apart and, in addition, at every position along the surface, the transverse generator shall be straight so that all points along it lie between two parallel straight lines 1 µm apart. The top and bottom surfaces of the block shall be parallel within 25 µm.

#### NOTES

1 Steel gauges of the approximate dimensions stated are suitable for the test, but other gauges giving similar results may be used (see annex A).

2 The precision of the fineness-of-grind determination depends in part on which gauge is used (see clause 7). Therefore it is essential to identify the gauge (100, 50, 25, or 15 µm) when reporting results or specifying requirements.

**5.2 Scraper**, consisting of a single- or double-edged steel blade approximately 90 mm long, 40 mm wide and 6 mm thick. The edge(s) on the long side(s) shall be straight and rounded to a radius of approximately 0,25 mm. A drawing of a suitable scraper is shown in figure 2.

The scraper shall be periodically checked for wear, damage or warpage by placing the edge of the scraper on the reference plane surface (see B.2.3) and inspecting the contact edge against a strong light.

Reject the scraper if poor contact between the edge of the scraper and the reference plane surface is revealed when the scraper is rocked backwards and forwards.

#### NOTES

1 The top surface of the gauge may be used for routine checking of the scraper, provided that it itself is not worn or warped as verified by use of the reference plane surface.

2 When not in use, the scraper should be stored in a container lined with velvet or similar soft material.

## 6 Sampling

Take a representative sample of the product to be tested as specified in ISO 1512.

Examine and prepare the sample for testing as specified in ISO 1513.

## 7 Procedure

**7.1** Carry out a preliminary determination to establish the size of gauge most suitable for the test and the approximate fineness of grind of the test sample (see the table and the note to 7.5). This approximate determination shall not be included in the results of the test.

Then carry out the determination in triplicate.

**7.2** Place the gauge (5.1), which shall be thoroughly clean and dry, on a flat, horizontal, non-slip surface.

**7.3** Pour a sufficient amount of sample into the deep end of the groove so that it overflows the groove slightly. Take care that during pouring the sample does not trap any air.

**7.4** Grasp the scraper (5.2) between the thumbs and fingers of both hands and place it edgewise in contact with the surface of the gauge at the extreme deep end of the groove with the length of the scraper parallel to the width of the gauge. While holding the scraper perpendicular to the surface of the gauge and at right angles to the length of the groove, draw it at a uniform rate over the surface of the gauge to a point beyond the zero depth of the groove in 1 to 2 s. Apply sufficient downward pressure on the scraper to ensure that the groove is filled with the sample and that any surplus is removed.

**7.5** In a time not exceeding 3 s from the completion of the drawdown, view the gauge from the side in such a manner that the line of vision is at right angles to the long dimension of the groove and at an angle of not more than 30° nor less than 20° to the surface of the gauge while it is in a light that will make the pattern of the sample in the groove readily visible.

**NOTE** — If the rheology of the sample is such that a smooth pattern is not obtained after drawdown, a minimal quantity of an appropriate thinner or binder solution may be added to the sample by hand stirring, and the test repeated. Any dilution should be stated in the test report. In some instances, the dilution of the sample may lead to flocculation and the fineness of grind may be affected.

**7.6** Observe the point where the product first shows a predominantly speckled appearance and, in particular, where a 3 mm wide band across the groove contains five to ten particles (see figures 3 and 4). Disregard any scattered specks that may appear prior to the point where the predominantly speckled appearance begins. Estimate the position of the upper limit of the band to the nearest:

5 µm for the 100 µm gauge;

2 µm for the 50 µm gauge;

1 µm for the 25 µm gauge;

0,5 µm for the 15 µm gauge.

**7.7** Clean the gauge and scraper carefully with a suitable solvent immediately after each reading.

## 8 Expression of results

### 8.1 Calculation

Calculate the mean of the three determinations and record the result to the same precision as the original readings (see 7.6).

## 8.2 Precision

### 8.2.1 Repeatability (*r*)

The value below which the absolute difference between two single test results on identical material, obtained by one operator in one laboratory using the same equipment within a short interval of time using the standardized test method, may be expected to lie with a 95 % probability, is 10 % of the range of the gauge.

### 8.2.2 Reproducibility (*R*)

The value below which the absolute difference between two single test results on identical material, obtained by operators in different laboratories, using the standardized test method, may

be expected to lie with a 95 % probability, is 20 % of the range of the gauge.

## 9 Test report

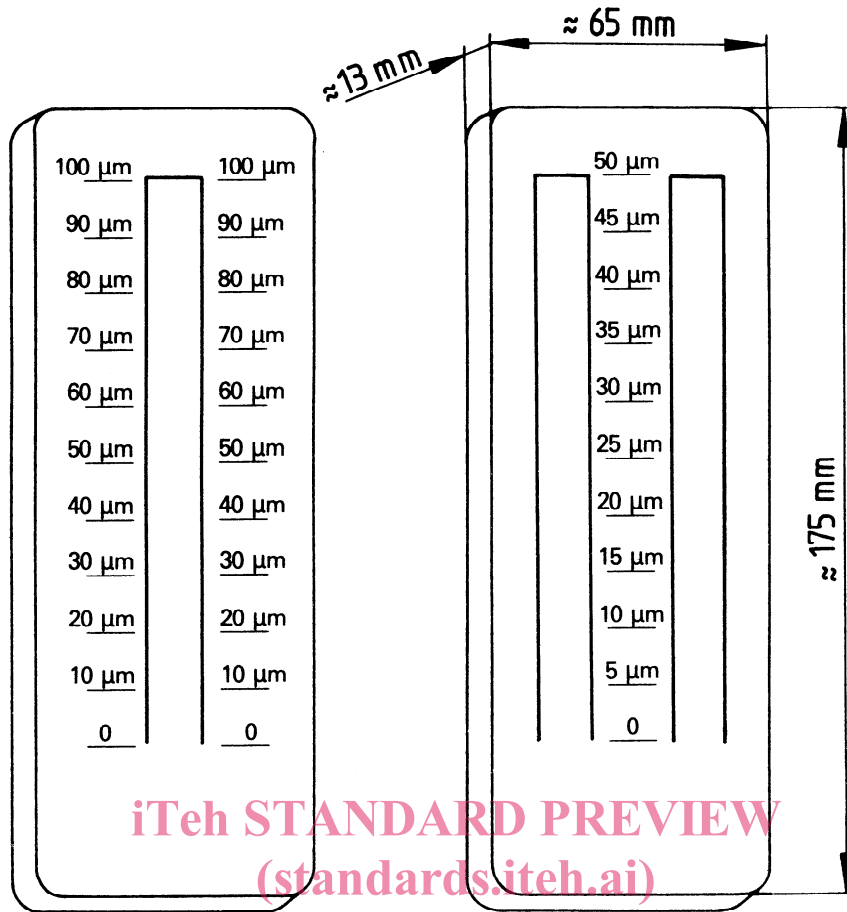
The test report shall contain at least the following information:

- a) the type and identification of the product tested;
- b) a reference to this International Standard (ISO 1524);
- c) designation of the gauge used;
- d) details of any dilution (see note to 7.5);
- e) the results of the test, expressed in micrometres;
- f) any deviation, by agreement or otherwise, from the test procedure specified;
- g) the date of the test.

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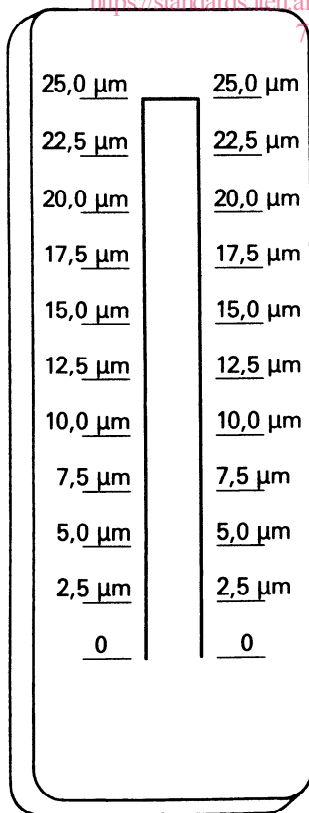
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A

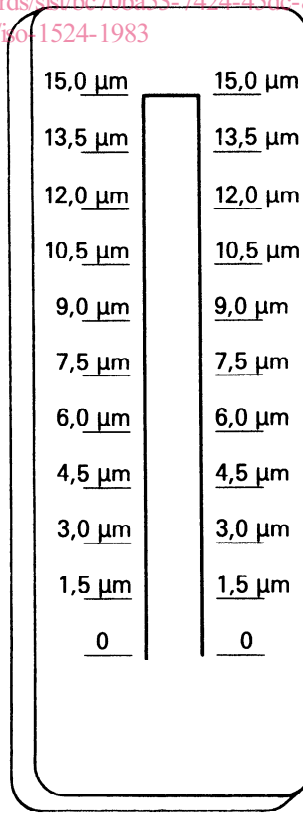
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C



D

Figure 1 – Typical gauges

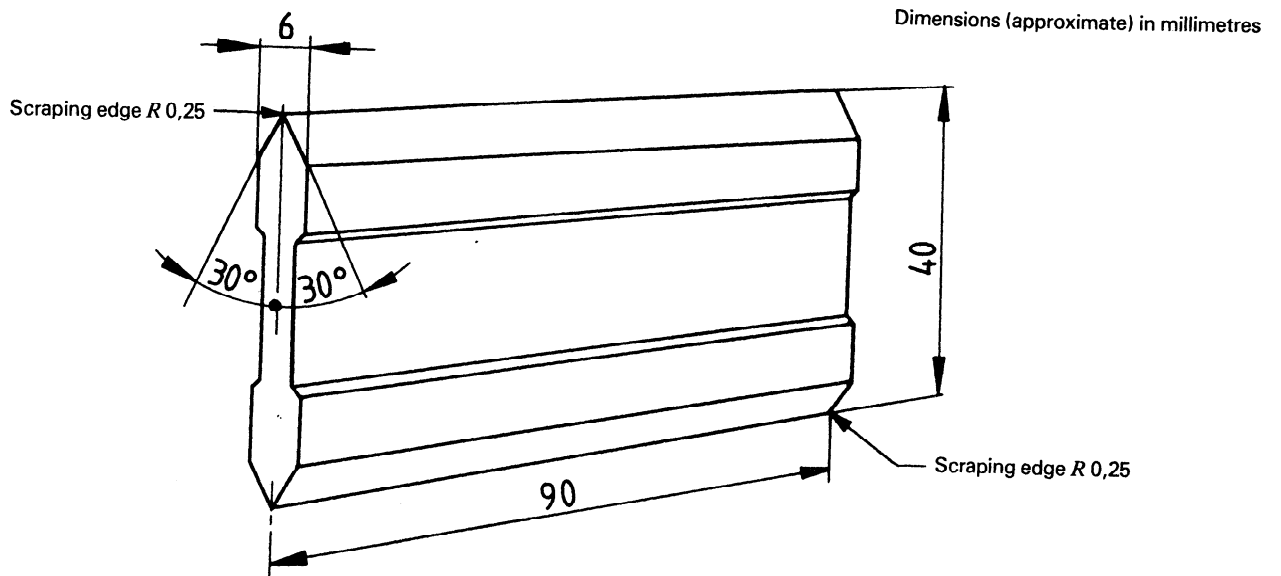


Figure 2 — Suitable scraper

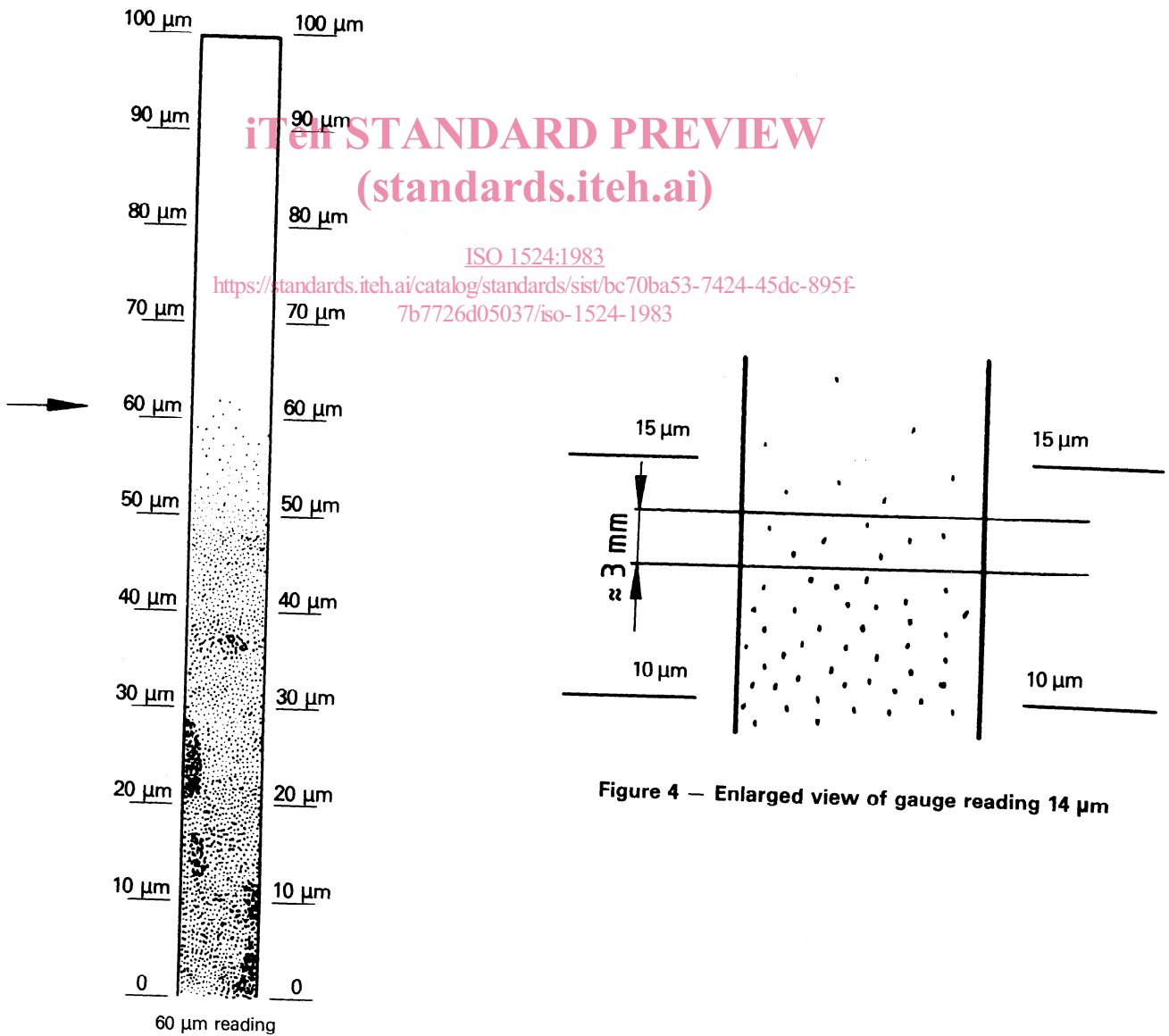


Figure 3 — Typical reading on gauge

Figure 4 — Enlarged view of gauge reading 14  $\mu\text{m}$

## Annex A

### Gauges marked in non-SI units

In industrial practice in some countries, gauges are used with scales marked in non-SI units of depth. Figure 5 indicates the nominal dimensions from which these scales are derived, but it appears that slight variations occur in practice; for example some "Hegman" gauges are graduated with the zero line at 100  $\mu\text{m}$  and some "FSPT" gauges are graduated with the zero line at 101,6  $\mu\text{m}$ .

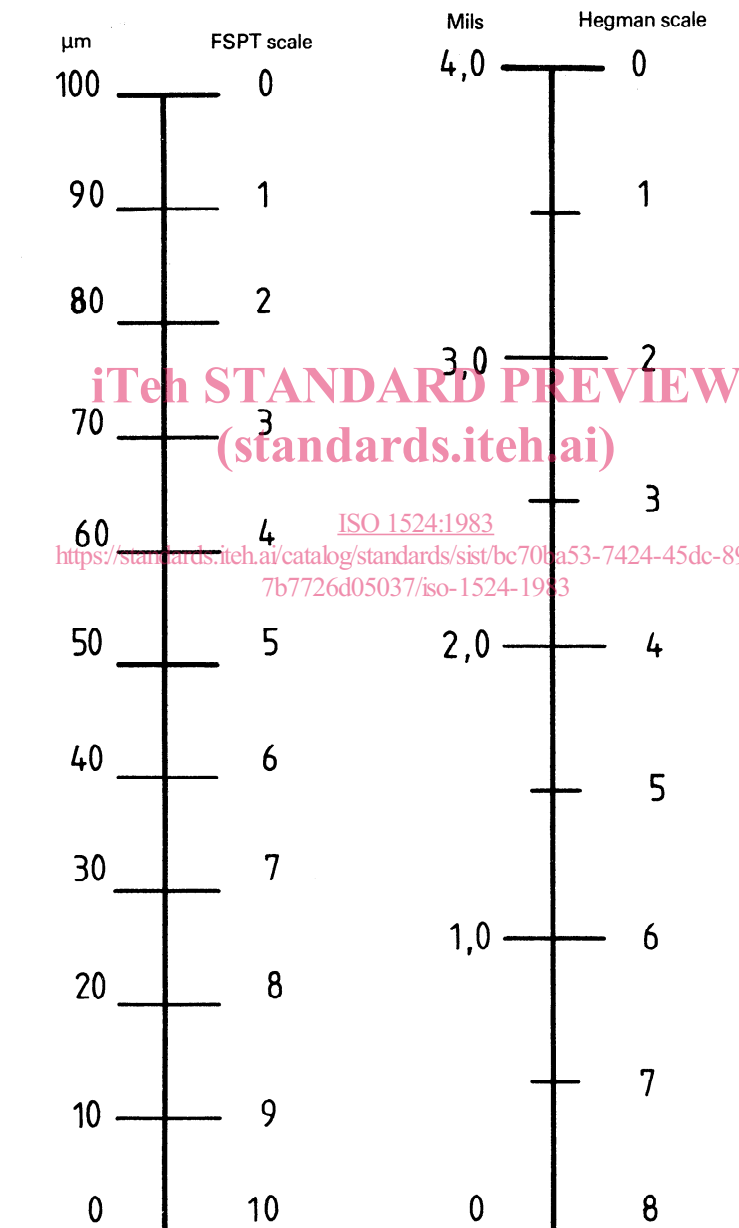


Figure 5 — Examples of scales graduated in non-SI units



## Annex B

### Method of checking groove depth

#### B.1 Introduction

Prolonged use may cause wear of the top surface of a gauge, thereby altering the effective groove depth. Thus the groove depth shall be periodically checked, and a suitable method is described below.

#### B.2 Apparatus

**B.2.1 Dial indicator gauge**, plunger type, reading to 2  $\mu\text{m}$  or better and fitted with a stylus having a radius of less than 0,25 mm.

**B.2.2 Dial gauge mounting block**, of length approximately 60 mm and of similar section to the working edge of the scraper (5.2), i.e. with an edge of diameter 0,25 mm and with an included angle of 60° (see figure 6). The block shall provide means of rigidly holding the dial gauge so that its plunger can pass perpendicularly through the centre of the block. A vertical line shall be scribed or machined on the end faces of the block. It is recommended that the block be fitted with heat insulating pads.

**B.2.3 Reference plane surface**, consisting of an accurately lapped surface or a rigid plate of optically plane glass to the accuracy of a toolmakers flat.

**B.2.4 Set square**, 100 mm side or greater.

#### B.3 Procedure

**B.3.1** Extend the graduations of the fineness-of-grind gauge using the set square (B.2.4) and a pencil or lightweight marker.

**B.3.2** Mount the dial indicator (B.2.1) in the mounting block (B.2.2) such that its plunger or stylus protrudes at least 0,1 mm from the contact edge of the block. Set the pointer of the gauge to zero when the mounting block is placed on the reference plane surface (B.2.3).

**B.3.3** Align the mounting block on the fineness-of-grind gauge such that scribed lines correspond with the extensions of a graduation mark (see B.3.1) and so that the plunger rests in the groove of the fineness-of-grind gauge. Rock the mounting block about its contact edge and record the minimum dial gauge readings.

**B.3.4** Repeat the procedure B.3.2 and B.3.3 at the chosen graduation and calculate the mean of three readings.

Perform the test at a number of graduations, calculating mean readings for each test position chosen.

**B.3.5** If the mean value differs from the nominal value at any graduation by more than 3  $\mu\text{m}$ , the fineness-of-grind gauge shall be returned to the manufacturer for checking and rectification.