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## Paints, varnishes and printing inks — Determination of fineness of grind

*Peintures, vernis et encres d'imprimerie — Détermination de la  
finesse de broyage*

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## 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.

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 1524 was prepared by Technical Committee ISO/TC 35, *Paints and varnishes*, Subcommittee SC 9, *General test methods for paints and varnishes*.

This fourth edition cancels and replaces the third edition (ISO 1524:2000), which has been technically revised. The main changes are as follows:

- a) products containing pigments in flake form (e.g. glass flakes, micaceous iron oxides, zinc flakes) have been excluded from the scope;
- b) [Figure 1](#) has been revised to show two examples of a typical gauge rather than one, and corrected to show the gauge scale in micrometres instead of millimetres;
- c) Figures 3 and 4 have been replaced by a new figure which indicates more clearly the reading on the gauge.

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# Paints, varnishes and printing inks — Determination of fineness of grind

## 1 Scope

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

It is applicable to all types of liquid paints and related products, except products containing pigments in flake form (e.g. glass flakes, micaceous iron oxides, zinc flakes).

Of the three gauges referred to in [4.1](#), the 100  $\mu\text{m}$  gauge is suitable for general use, but the 50  $\mu\text{m}$  and especially the 25  $\mu\text{m}$  gauge will only provide reliable results in the hands of skilled laboratory personnel. Particular caution is necessary in interpreting readings of less than 10  $\mu\text{m}$ .

## 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 1513, *Paints and varnishes — Examination and preparation of test samples*

ISO 4618, *Paints and varnishes — Terms and definitions*

ISO 15528, *Paints, varnishes and raw materials for paints and varnishes — Sampling*

## 3 Terms and definitions

For the purposes of this document, the terms and definitions given in ISO 4618 and the following apply.

### 3.1

#### **fineness of grind**

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

## 4 Apparatus

**4.1 Gauge**, consisting of a block of a hardened steel e.g. 175 mm long, 65 mm wide and 13 mm thick.

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 25  $\mu\text{m}$ , 50  $\mu\text{m}$  or 100  $\mu\text{m}$ ) at one end to zero at the other end and shall be graduated as specified in [Table 1](#). A diagram showing two typical gauges is given in [Figure 1](#).

Table 1 — Graduation of typical gauges and recommended ranges

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

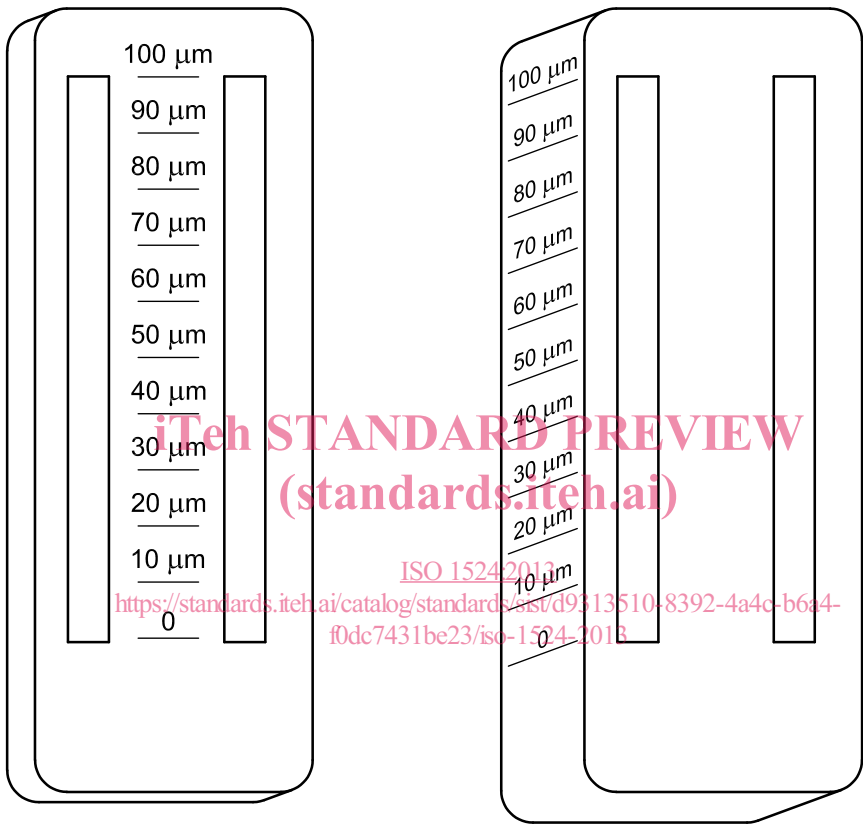


Figure 1 — Two examples of a 100  $\mu\text{m}$  gauge

The depth of the groove at any position along its length shall not depart from its nominal value at any position across the groove depth by more than 2,5  $\mu\text{m}$ .

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  $\mu\text{m}$  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  $\mu\text{m}$  apart. The top and bottom surfaces of the block shall be parallel within 25  $\mu\text{m}$ .

Steel gauges of the approximate dimensions stated are suitable for the test, but other gauges giving similar results may be used.

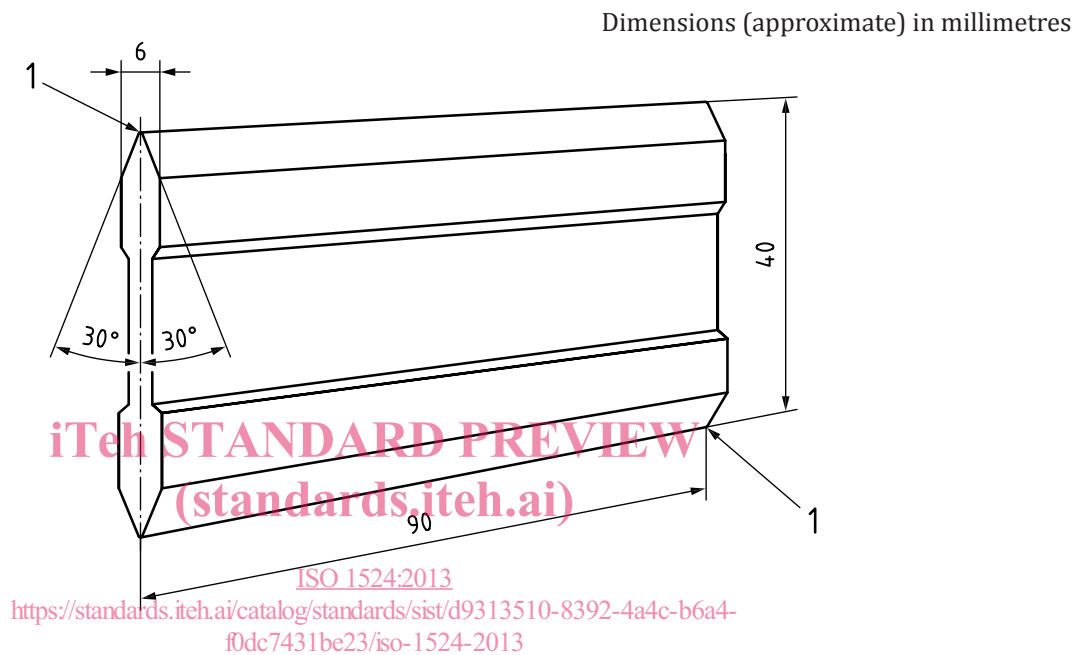
The precision of the fineness-of-grind determination depends in part on which gauge is used (see [Clause 6](#)). Therefore it is essential to identify the gauge (100  $\mu\text{m}$ , 50  $\mu\text{m}$  or 25  $\mu\text{m}$ ) when reporting results or specifying requirements.

**4.2 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. Reject the scraper if inspection reveals damage.

The top surface of the gauge may be used for routine checking of the scraper, provided it itself is not worn or warped.

The scraper shall be handled and stored with particular care.



#### Key

- 1 scraping edge, radius 0,25 mm

**Figure 2 — Suitable scraper**

## 5 Sampling

Take a representative sample of the product to be tested, as described in ISO 15528.

Examine and prepare each sample for testing, as described in ISO 1513.

## 6 Procedure

**6.1** 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 [Table 1](#) and the second paragraph in [6.5](#)). This approximate determination shall not be included in the results of the test.

Then carry out the test in triplicate.

**6.2** Place the gauge ([4.1](#)), which shall be thoroughly clean and dry, on a flat, horizontal surface.

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

**6.4** Grasp the scraper (4.2) 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 s to 2 s. In the case of lithographic inks, or fluids of similar consistency, the time required to draw the scraper over the length of the groove shall be not less than 5 s, in order to avoid too low a result. Apply sufficient downward pressure on the scraper to ensure that the groove is filled with the sample and that any surplus is removed.

**6.5** As quickly as possible (within seconds) after the completion of the drawdown, and while the paint is still wet, 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.

If the flow behaviour of the sample is such that a smooth pattern is not obtainable 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 shall be stated in the test report. In some instances, the dilution of the sample might lead to flocculation and the fineness of grind might be affected.

**6.6** Observe the point where the product first shows a predominately speckled appearance, that is, where a 3 mm wide band across the groove contains five to ten particles (see Figure 3). Disregard any scattered specks that might appear prior to the point where the predominately 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.

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

## 7 Expression of results

Calculate the mean of the three determinations and record the result to the same accuracy as the original readings (see 6.6).

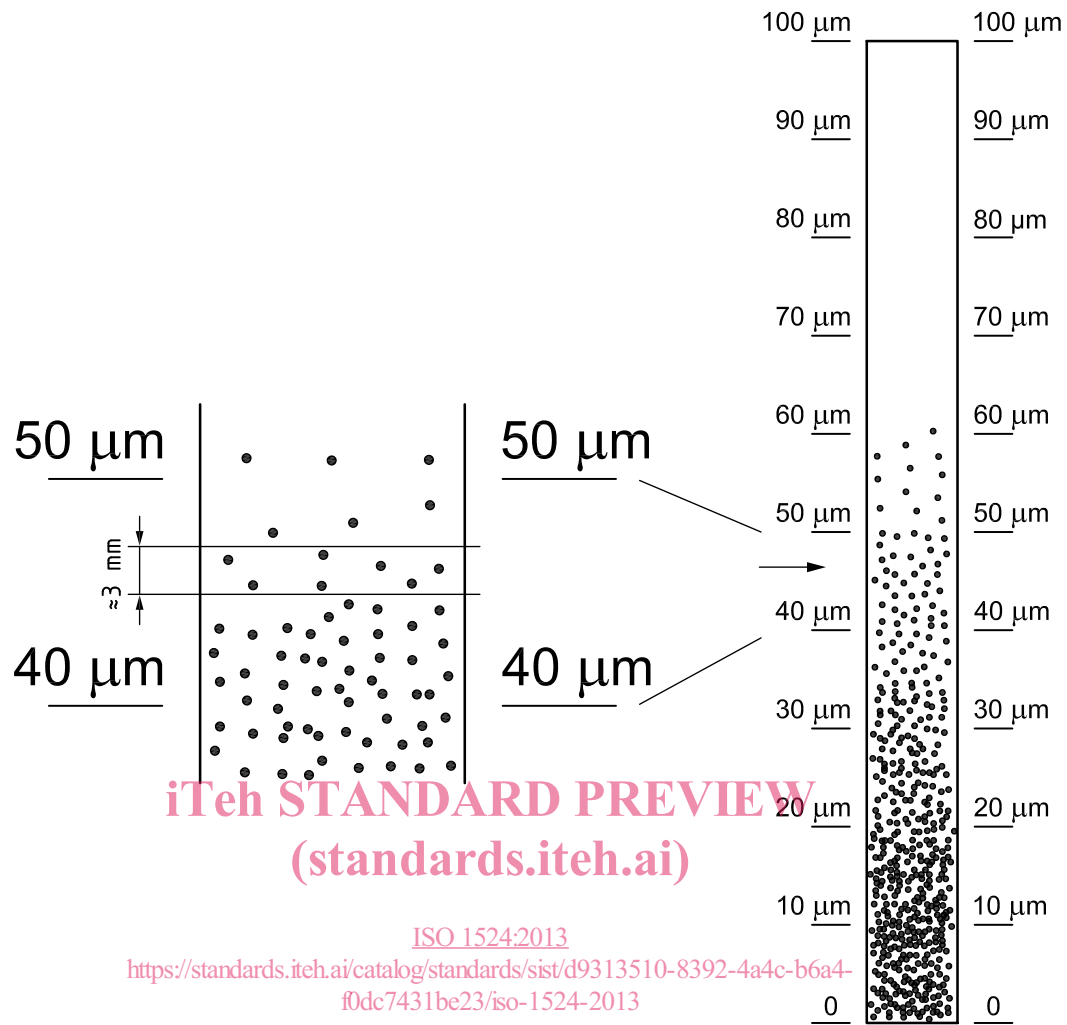
## 8 Precision

### 8.1 Repeatability limit, $r$

The value below which the absolute difference between two single test results, obtained on identical material by one operator, using the same equipment, in one laboratory 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 Reproducibility limit, $R$

The value below which the absolute difference between two single test results, obtained on identical material 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.



**Figure 3 — Example of a gauge reading 45 µm**

## 9 Test report

The test report shall contain at least the following information:

- all details necessary for complete identification of the product tested;
- a reference to this International Standard (ISO 1524);
- the designation of the gauge used;
- details of any dilution (see 6.5);
- the result of the test, expressed in micrometres, as indicated in Clause 7;
- any deviation, by agreement or otherwise, from the procedure specified;
- any unusual features (anomalies) observed during the test;
- the date of the test.