INTERNATIONAL STANDARD

ISO 6344-3

Second edition
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Coated abrasives — Grain size analysis —

Part 3: Determination of grain size distribution of microgrits P240 to P2500

Abrasifs appliqués — Granulométrie —

Partie 3: Détermination de la distribution granulométrique des micrograins P240 à P2500

Reference number
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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 6344-3 was prepared by Technical Committee ISO/TC 29, *Small tools*, Subcommittee SC 5, *Grinding wheels and abrasives*.

This second edition cancels and replaces the first edition (ISO 6344-3:1998). It also incorporates the Technical Corrigendum ISO 6344-3:1998/Corr.1:1999. The significant changes against ISO 6344-3:1998 are the following:

a) new definitions have been included in Clause 3;

b) the test procedure in 4.3 has been completely updated; requirements for the use of the US sedimentation tube have replaced the reference to ISO 8486-2, in order to facilitate the use of this part of ISO 6344;

c) Bibliography has been added.

ISO 6344 consists of the following parts, under the general title *Coated abrasives — Grain size analysis*:

— *Part 1: Grain size distribution test*

— *Part 2: Determination of grain size distribution of macrogrits P12 to P220*

— *Part 3: Determination of grain size distribution of microgrits P240 to P2500*

Coated abrasives — Grain size analysis —

Part 3:
Determination of grain size distribution of microgrits P240 to P2500

1 Scope

This part of ISO 6344 specifies a method for determining or testing the grain size distribution of electro-fused aluminium oxide and silicon carbide microgrits P240 to P2500 for coated abrasives as defined in ISO 6344-1.

It applies both to those grits used in the manufacture of coated abrasive products and to those grits taken from products for testing purposes.

2 Normative references

The following documents, in whole or in part, are normatively referenced in this document and are indispensable for its application. For dated references, only the edition cited applies. For undated references, the latest edition of the referenced document (including any amendments) applies.

ISO 6344-1:1998, *Coated abrasives — Grain size analysis — Part 1: Grain size distribution test*

3 Terms and definitions

For the purposes of this document, the following terms and definitions apply.

3.1
microgrit
abrasive grit having a median equivalent diameter of 58,5 µm to 8,4 µm, whose grain size distribution is determined by sedimentation

3.2
grain size distribution
percentage of grains of different sizes composing the macrogrit or microgrit

4 Testing of microgrits P240 to P1200

4.1 General

The testing of microgrits P240 to P1200 by sedimentation shall be carried out using the US sedimentometer whereby the grain size distribution is determined; see 4.3.1.

The limits are specified in ISO 6344-1:1998, Table 2, which is reproduced as (the following) Table 1.

Table 1 — Grain size distribution of microgrits P240 to P1200 d_s-values for testing with the US sedimentometer

Grit designation	d_{s0} value max. µm	d_{s3} value max. µm	Median grain size d_{s50} values µm		d_{s95} value min. µm
P240	110	81,7	58,5	±2,0	44,5
P280	101	74,0	52,2	±2,0	39,2
P320	94	66,8	46,2	±1,5	34,2
P360	87	60,3	40,5	±1,5	29,6
P400	81	53,9	35,0	±1,5	25,2
P500	77	48,3	30,2	±1,5	21,5
P600	72	43,0	25,8	±1,0	18,0
P800	67	38,1	21,8	±1,0	15,1
P1000	63	33,7	18,3	±1,0	12,4
P1200	58	29,7	15,3	±1,0	10,2

The permissible deviations are given in Table 2.

Table 2 — Permissible deviations resulting from the variations due to the measuring technique (US sedimentometer)

Grit designation	Permissible deviation for		
	d_{s3} µm	d_{s50} µm	d_{s95} µm
P240	+1,5	±1,5	–1,5
P280			
P320			
P360	+1,5	±1,0	–1,5
P400			
P500			
P600	+1,5	±0,8	–1,5
P800			
P1000			
P1200			

4.2 Designation of the test method

The designation of the test method by means of the US sedimentometer for microgrits P240 to P1200 is as follows: **Test method – Micro P**

4.3 Test procedure using the US sedimentation tube

4.3.1 Testing by sedimentation

The testing of microgrits P240 to P1200 by sedimentation shall be carried out using the US sedimentation tube whereby the grain size distribution is determined.

The principle of measurement is to determine the volumes of a suspension of the grit sample settled in the collecting tube as a function of time, and to calculate the equivalent grain diameter using Stokes' law.

The grain size distribution of microgrits P240 to P1200 is determined using the following criteria:

a) the maximum grains diameter (theoretical grain diameter) of the first sedimented grain (d_{s0} value) shall not exceed the maximum permissible d_{s0} value;

b) the grain diameter (theoretical grain diameter) shall not exceed the maximum permissible d_{s3} value at the 3 % point of the grain size distribution curve;

c) the median grain diameter (theoretical grain diameter) shall be within the specified tolerances of the d_{s50} value at the 50 % point of the grain size distribution curve;

d) the grain diameter (theoretical grain diameter) shall at least attain the d_{s95} value at the 95 % point of the grain size distribution curve.

The four criteria shall be met at the same time. The values are specified in Table 1.

The permissible deviations are given in Table 2.

4.3.2 Test apparatus

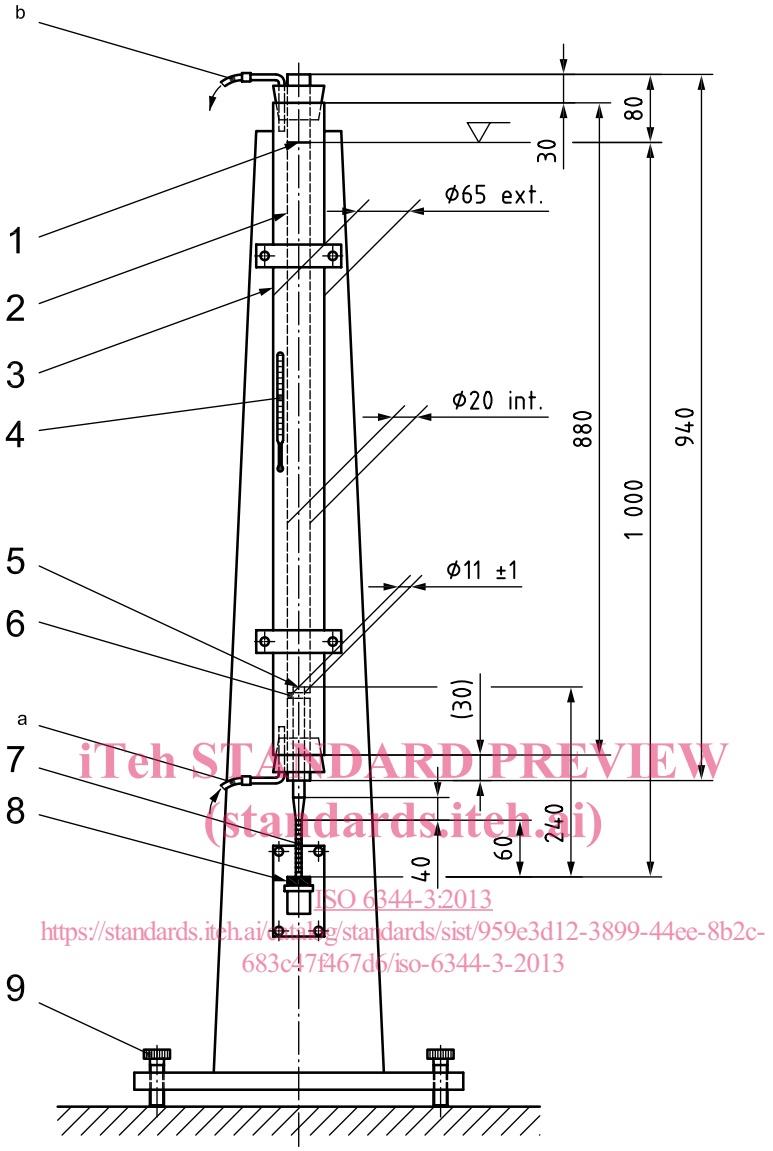
The US sedimentation tube consists of a vertical sedimentation tube of 940 mm in length and of 20 mm inside diameter. It is surrounded by a water jacket in which the water temperature is maintained at a constant level.

A graduated collecting tube is fixed at the bottom of the sedimentation tube. The whole assembly is mounted on a frame, the base plate of which is fitted with level adjusting screws for keeping the tube vertical (see Figure 1).

For the design and dimensions of the collecting tube, see Figure 2.

To improve the accuracy of sedimentation volume readings, it is recommended that a horizontal beam light source and a magnifying glass be used. A time printer renders the recording of the sedimentation times easier.

Dimensions in millimetres

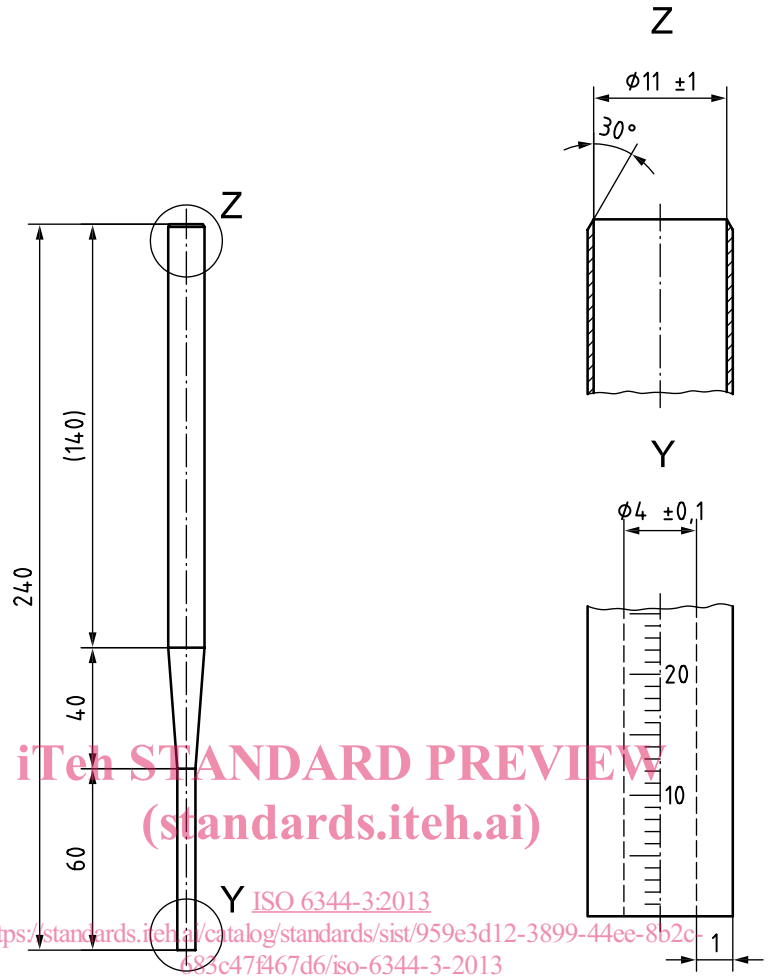


Key

1 methyl alcohol level (initial)
2 sedimentation tube
3 water jacket
4 thermometer
5 collecting tube (see Figure 5)
6 rubber centring spacer
7 scale for height of sedimentation
8 rubber gasket
9 vertical adjusting screws
a Water inlet.
b Water outlet.

Figure 1 — US sedimentation tube

Dimensions in millimetres



Key

Dial graduation and figures shall be in white.

50 division marks at equal intervals (graduation about 1 mm).

Length of division mark:	3 mm
Every fifth division mark:	4 mm
Thickness of division mark:	0,25 mm

Figure 2 — Collecting tube

4.3.3 Test equipment

4.3.3.1 Sedimentation medium

Use methyl alcohol of 95 % up to 99 % purity as the sedimentation medium.

Adjust the sedimentation medium using the checking minerals specified in 4.3.4.1.3.

4.3.3.2 Dispersing agent

In order to avoid grain agglomeration, a dispersing agent, such as EDTA (tetrasodium salt of ethylendiamine tetra-acetic acid), shall be added to the methyl alcohol, i.e. 4 ml of a 1 % aqueous EDTA-solution per litre of methyl alcohol.

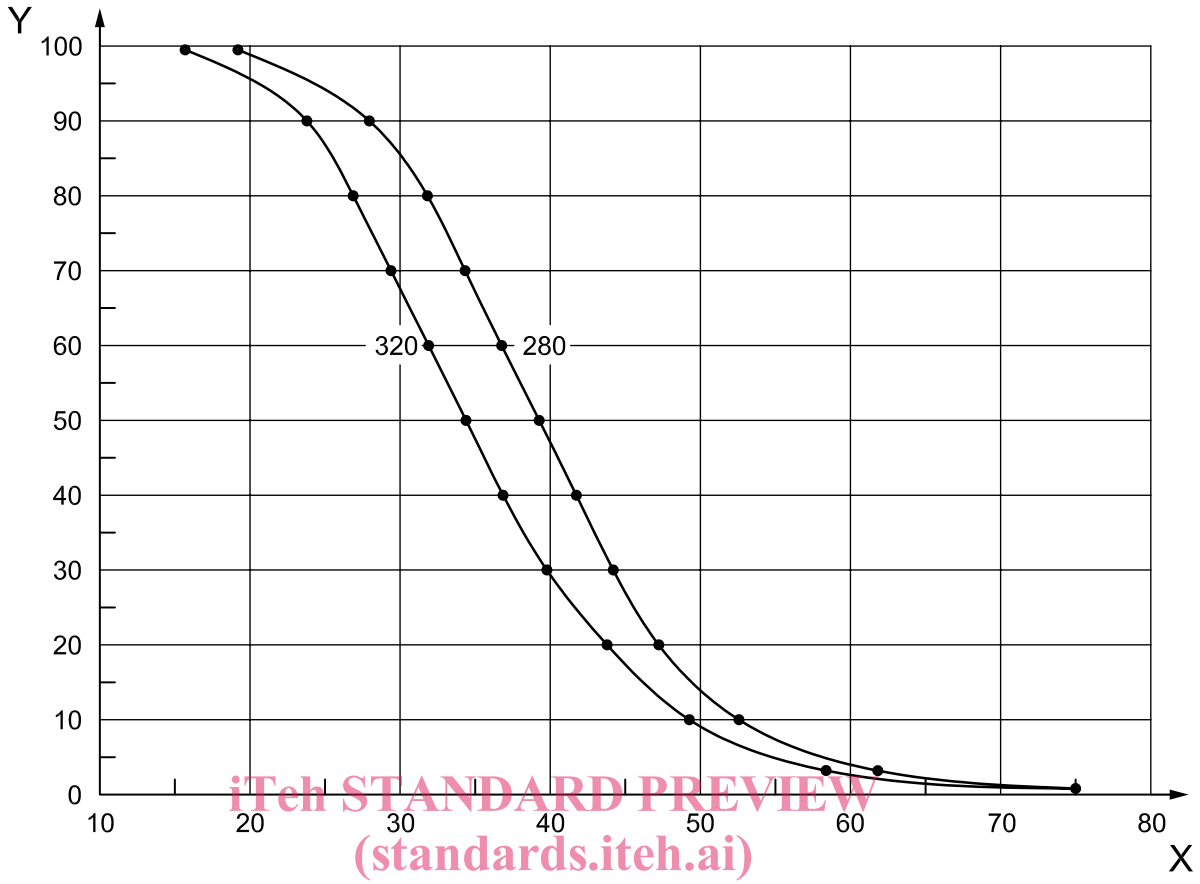
4.3.3.3 Checking minerals

The adjustment of the whole measuring procedure should be controlled by means of checking minerals 280 and 320. Each supply of checking minerals is accompanied by a cumulative volume grain size distribution curve (see Figure 3). The 10 %, 20 %, 30 %, 40 % and 50 % points shall not deviate by more than ± 0,5 micrometres (µm) from the sizes indicated in Table 3.

NOTE The grain size distributions of the checking minerals do not correspond to identical grain sizes of this part of ISO 6344.

Table 3 — Grain diameter of checking minerals

Volume fraction of the settled checking minerals %	**Grain diameter** *d* µm **Checking mineral**	
	280	320
0	74,7	75,1
3	62,1	58,7
10	52,9 ± 1,06	49,8 ± 1
20	47,9 ± 0,96	44,2 ± 0,88
30	44,7 ± 0,89	40,5 ± 0,81
40	42 ± 0,84	37,5 ± 0,75
50	39,7 ± 0,79	34,9 ± 0,7
60	37,4	32,5
70	35	30,1
80	32,3	27,5
90	28,8	24,4
100	20	16,5



Key

Y volume fraction, %

X grain diameter, *d*, µm

Figure 3 — Cumulative volume grain size distribution curve of checking minerals 280 and 320

4.3.4 Testing

4.3.4.1 Preparation for testing

4.3.4.1.1 Setting up test device

When setting up the US sedimentometer for use as the test device, check that the collecting tube is positioned centrally in the sedimentation tube. It is held in the vertical position by a rubber spacer located about 30 mm from the top of the collecting tube. Check this using a plumb line suspended from the top of the sedimentation tube and the collecting tube. The plumb line shall pass centrally through both the sedimentation tube and the collecting tube. The device is adjusted by means of the adjusting screws on the base plate.

After adjustment, fill the water jacket and connect it to a thermostat.

4.3.4.1.2 Test temperature

The testing of the grain size shall be carried out under constant temperature with a permissible deviation of ±0,1 °C.

It is convenient to use a test temperature of 25 °C. The grain diameters indicated in Tables 4 and 5 for the respective times of sedimentation apply to this temperature only.

For the determination of the grain diameters for other test temperatures, see 4.3.5.1.

4.3.4.1.3 Adjustment of the sedimentation medium

The methyl alcohol used for the test shall be adjusted by means of one of the two checking minerals, 280 or 320.

The grain sizes corresponding to 10 %, 20 %, 30 %, 40 % and 50 % points shall not deviate by more than ±0,5 µm from the values specified on the curves supplied with the checking minerals. The average of the algebraic sum of the deviations shall not exceed ±0,3 µm.

If agreement with the accompanying curves is not reached within the permissible tolerances, then the density and viscosity of the sedimentation medium shall be changed in such a way so that agreement is obtained.

4.3.4.2 Test procedure

4.3.4.2.1 Filling of sedimentation tube

Fill the sedimentation tube with the previously adjusted sedimentation liquid to a height of 1 000 mm ± 2 mm (measured from the bottom of the collecting tube). Then, allow it to stand until equilibrium is reached between the water jacket connected to the thermostat and the sedimentation tube temperatures.

4.3.4.2.2 Preparation of the sample

Prior to the test, the sample shall be heated to a temperature of 600 °C ± 20 °C for at least 10 min.

4.3.4.2.3 Dispersion of the sample

Place a sufficient amount of the sample in a test tube such that a height of 20 to 25 divisions in the collecting tube after sedimentation is obtained. For silicon carbide, this will be about 1,6 g; while for fused aluminium oxide it will be about 2,2 g.

It is recommended that the dispersed sample be submitted to ultrasonic treatment to remove agglomerates.

Transfer 15 ml of sedimentation medium containing the specified quantity of dispersing agent and the sample to be settled to a test tube and shake the test tube to achieve complete dispersion. Allow the grit to stand in the sedimentation medium for at least 30 min and then again shake the test tube vigorously several times during this period. The temperature of the medium shall be the same as the temperature of the medium in the sedimentation tube.

4.3.4.2.4 Transfer to sedimentation tube

Place a suitable funnel in the sedimentation tube. Shake the test-tube containing the sample and the sedimentation liquid vigorously for at least 30 s. Then, pour its contents onto the sedimentation liquid, down the slope of the funnel.

Subsequently, quickly remove the funnel from the sedimentation tube in order to prevent any residue from dropping into the tube as this would distort the results.

4.3.4.2.5 Start of measurement

Measurement shall begin at the time of transfer.