INTERNATIONAL STANDARD

ISO 6106

Third edition
2013-04-15

Abrasive products — Checking the grain size of superabrasives

Produits abrasifs — Vérification de la dimension des grains de superabrasifs

Reference number
ISO 6106:2013(E)

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Published in Switzerland

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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 6106 was prepared by Technical Committee ISO/TC 29, *Small tools*, Subcommittee SC 5, *Grinding wheels and abrasives*.

This third edition cancels and replaces the second edition (ISO 6106:2005), which has been technically revised.

Significant changes against the previous edition are the following:

a) the English title has been editorially improved;

b) the requirements for the sampling techniques in 4.3 have been specified in more detail;

c) there has been a minor technical change in the requirements for the sieving procedure in 6.3;

d) an editorial error in Table 2 and Table 3 was corrected;

e) in Table 2, smaller grain designations, i.e. 39 and 33, have been included;

f) in Table 3, larger grain designations, i.e. 302, 357 and 712, have been included;

g) in Table 2, undersize limiting sieves have been changed for grain designations 46 and 54.

Abrasive products — Checking the grain size of superabrasives

1 Scope

This International Standard specifies a method for determining or checking the grain size of superabrasives (diamond or cubic boron nitride) as used for the manufacture of industrial products, such as grinding wheels and saws. It is applicable to grain size designations as defined in Tables 2 and 3.

This International Standard describes the grain size designations, the size limits, the sieves for use in determining them and the procedure to be adopted for checking the grain size exclusive of any coating.

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 554, *Standard atmospheres for conditioning and/or testing — Specifications*

3 Terms and definitions

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

3.1
grain
product whose size is defined by sieving

3.2
grain size
designated on-size fraction located between the upper and a lower control sieve as specified

Note 1 to entry: The grain may include oversize and undersize factors as specified.

4 Apparatus

4.1 Sieving machine

The test shall only be carried out with test-sieving machines giving reproducible and comparable results, e.g. test-sieving machines in accordance with ISO 9284.

4.2 Sieves

Electroformed sieves with standard 200 mm or 75 mm diameter stainless frame nested sieves, half-height (nominal 25 mm) shall be used. A cover and pan are required. The precision electroformed sieves with square apertures, which shall be used in the size checking procedure described in this International Standard, shall have a supporting grid of 2,2 lines per centimetre bonded to the top surface of the sieve. Unless this is done, the superabrasive slides over the smooth top surface of the sieve and sieving efficiency is drastically reduced. It is the user's responsibility to ensure continuous compliance of the test sieve to the aperture sizes which shall be in accordance with Table 1.

Table 1 — Aperture sizes and ruling lines of electroformed sieves

Aperture size	Ruling line		Aperture size	Ruling line
µm	cm		µm	cm
1 830	4,97		227	30,3
1 530	5,8		213	30,3
1 280	6,5		197	35,8
1 080	7,9		181	35,8
915	8,5		165	39,4
850	9,2		151	43,7
770	10,9		139	46,3
710	11,8		127	49,2
645	12,2		116	49,2
600	13,4		107	59,1
541	15,0		97	65,6
505	15,7		90	65,6
455	16,4		85	71,6
425	17,9		75	78,7
384	18,7		65	78,7
360	20,3		57	87,5
322	21,9		49	98,4
302	24,6		41	98,4
271	26,2		32	98,4
255	26,2		28	98,4

4.3 Sampling the batch

Appropriate sampling techniques shall be used to ensure that the sample taken is representative of the batch tested.

CAUTION — Care should be taken not to pour or scoop sample the material without first ensuring that the material is thoroughly blended. Sample splitters like riffling may be used for small samples, but this might not always be viable for very large batches as the entire would need to be riffled (numerous times) before the required sample size is obtained.

4.4 Balance

A laboratory balance shall be used which has a precision of at least 0,01 g if using 200 mm sieves or at least 0,001 g if using 75 mm sieves.

4.5 Timer

A timer with an accuracy of ± 1 % in 15 min shall be used.

5 Test conditions

The test shall be performed under the following conditions:

Temperature: 23 °C ± 2 °C
Relative humidity: 50 % ± 5 % } in accordance with ISO 554.

6 Test sieving

6.1 Sampling

The material under test should be blended and divided utilizing a sample splitter (4.3) so as to obtain a representative sample.

The resulting sample shall be spread out on a pan and allowed to acclimatize at a relative humidity and temperature as specified in Clause 5.

The mass of the sample, measured with the precision specified in 4.4, shall fall within the required range indicated in Tables 2 and 3.

6.2 Preparation for sieving

Assemble the desired stack of sieves (4.2) in the order of aperture sizes, with the coarsest sieve on top and with a receiver pan on the bottom. Pour the test sample on to the top sieve and place a lid over it. Place the entire unit into the sieving machine (4.1). The sieve stack shall be free to rotate during the sieving cycle; otherwise, incomplete sieving and erratic results can occur. To facilitate rotation, maintain a clearance of 3 mm between the sieve stack lid and head yoke of the machine, and ensure that the receiver spring clip does not bind on the bottom pan.

Adaptors for 75 mm sieves are specified in Annex A.

6.3 Sieving procedure

Set the timer (4.5) controlling the sieve shaker to 15 min and turn on the shaker. At the completion of the cycle, remove the stack of sieves from the shaker. Beginning with the top (coarsest) sieve, empty the portion of the superabrasive retained on to a clean piece of glossy paper or another appropriate container and tap the frame lightly to aid particle removal. This procedure should be repeated with each subsequent sieve, care being taken not to damage the sieves. Electroformed sieves should not require brushing, but should be cleaned periodically by ultrasonic methods.

7 Evaluation

7.1 Weighing sieved fractions

Oversize, on-size and undersize shall be weighed to the precision specified in 4.4.

If the sum of the masses of all fractions is less than 99 % of the original mass, this procedure shall be repeated on a new sample.

7.2 Calculation of results

Calculate the percentage retained on each sieve and the pan, relative to the cumulative final mass of the sample.

8 Designation and grading limits

8.1 General

The standard grain size designation and allowable limits for each size of superabrasive labelled, designated or otherwise represented as complying with this International Standard are given in Tables 2 and 3 in accordance with Clauses 4 to 6.

8.2 Grain sizes

Tables 2 and 3 present the ISO designations of the superabrasive grain sizes together with the allowable limits for the particle size distribution of each grain size. The numerical designation in Tables 2 and 3 are based upon the requirements specified in Table 1.

8.3 Designation

Superabrasives conforming to this International Standard shall be designated by

a) "Superabrasives",

b) reference to this International Standard, i.e. ISO 6106,

c) the type of superabrasive, D (diamond) or B (cubic boron nitride), and

d) the ISO grain designation according to Table 2 or 3.

EXAMPLE Superabrasive with D and grain size 151 is designated as follows:

Superabrasive ISO 6106 - D 151

9 Example showing the use of Table 2

The following is an example of the use of this International Standard. Consider ISO size D 151. At least 99,9 % of superabrasive shall pass through the oversize limiting sieve, in this case, 227 µm. All superabrasive may pass through the upper control sieve (in this case, the 165 µm sieve), but not more than 7 % is permitted to be retained on it. It is permissible to have 100 % pass through the upper control sieve and remain on the lower control sieve (127 µm), the requirement being that the grain passing through the upper control sieve, and retained on the lower control sieve shall be at least 90 %. No more than 7 % shall pass through the lower control sieve, and not more than 0,5 % is permitted to pass through the undersize limiting sieve (90 µm). As further clarification, if 100 % of a superabrasive claimed to be D 151 passes both the oversize limiting and upper control sieves, and 90 % is retained on the lower control sieve, the superabrasive shall be rejected because 10 % of the superabrasive passing through the lower nominal sieve exceeds the maximum 7 % allowed for this grain size.

Table 2 — Narrow range grain sizes

ISO[a] grain designation	Equivalent mesh sizes[b]	Test mass according to 6.1		Sieve through which 99,9 % has to pass (oversize limiting sieve)	Upper control sieve	Max. on sieve	Lower control sieve	Min. on sieve	Max. through sieve	0,5 % max. through undersize limiting sieve
		for 200 mm sieves	for 75 mm sieves							
		g	g	µm	µm	%	µm	%	%	µm
1 181	16/18	80 to 120	9,6 to 14,5	1 830	1 280	5	1 010	93	5	710
1 001	18/20			1 530	1 080		850			600
851	20/25	80 to 120	9,6 to 14,5	1 280	915	5	710	93	5	505
711	25/30			1 080	770		600			425
601	30/35	80 to 120	9,6 to 14,5	915	645	5	505	93	5	360
501	35/40	80 to 120	9,6 to 14,5	770	541	5	425	93	5	302
426	40/45			645	455		360			255
356	45/50	80 to 120	9,6 to 14,5	541	384	5	302	93	5	213
301	50/60			455	322		255			181
251	60/70	80 to 120	9,6 to 14,5	384	271	5	213	93	5	151
213	70/80			322	227		181			127
181	80/100	40 to 60	4,8 to 7,2	271	197	7	151	90	7	107
151	100/120			227	165		127			90
126	120/140			197	139		107			75
107	140/170	40 to 60	4,8 to 7,2	165	116	8	90	88	8	65
91	170/200			139	97		75			57
76	200/230	20 to 30	2,4 to 3,6	116	85		65			49
64	230/270			97	75		57			41
54	270/325			85	65	12	49	83	12	32
46	325/400			75	57		41			28
39	400/500	20 to 30	2,4 to 3,6	65	49	15	32	80	15	25
33	500/600	20 to 30	2,4 to 3,6	57	41	15	28	80	15	20

[a] To add D or B depending on the abrasive type (D for diamond) or (B for cubic boron nitride); see 8.3.

[b] These mesh size designations are not part of this International Standard. They are shown for easy reference only.

The manufacturers of superabrasive grain shall ensure that the size distribution within any of their grain products is maintained at a reasonably consistent proportional degree.