
**Coated abrasives — Determination
and designation of grain size
distribution —**

**Part 2:
Macrogrit sizes P12 to P220**

*Abrasifs appliqués — Détermination et désignation de la distribution
granulométrique —*

Partie 2: Macrograins P12 à P220



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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.

The procedures used to develop this document and those intended for its further maintenance are described in the ISO/IEC Directives, Part 1. In particular the different approval criteria needed for the different types of ISO documents should be noted. This document was drafted in accordance with the editorial rules of the ISO/IEC Directives, Part 2 (see www.iso.org/directives).

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. Details of any patent rights identified during the development of the document will be in the Introduction and/or on the ISO list of patent declarations received (see www.iso.org/patents).

Any trade name used in this document is information given for the convenience of users and does not constitute an endorsement.

For an explanation on the voluntary nature of standards, the meaning of ISO specific terms and expressions related to conformity assessment, as well as information about ISO's adherence to the World Trade Organization (WTO) principles in the Technical Barriers to Trade (TBT) see www.iso.org/iso/foreword.html.

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

This second edition cancels and replaces ISO 6344-2:1998 and ISO 6344-1:1998, which have been technically revised.

The main changes compared to ISO 6344-2:1998 and ISO 6344-1:1998 are as follows:

- the title and the scope have been changed editorially;
- relevant content of ISO 6344-1:1998 has been updated and transferred to this document and ISO 6344-3;
- references to ISO 6344-1:1998 have been deleted;
- [Clause 3](#) "Terms and definitions" has been updated;
- a new [Clause 4](#) for macrogrit sizes has been added;
- [Table 1](#) (former Table 2) "Grain size distribution of macrogrit sizes P12 to P220" has been moved to the new [Clause 4](#);
- former [Table 1](#) with a summary of nominal sizes of openings of test sieves has been deleted;
- [Clause 5](#) (former [Clause 4](#)) "Test method of macrogrit sizes P12 to P220" has been revised in its content and order;
- [5.6](#) (former [5.3](#)) "Evaluation" has been revised by giving a normative description of the procedure for the determination of a sieving analysis and evaluation of the results;
- former [Clause 8](#) has been moved to a new [Annex A](#) "Template for recording results of sieving analysis of macrogrit P sizes";
- [Clause 8](#) (former [Clause 7](#)) "Marking" has been revised.

A list of all parts in the ISO 6344 series can be found on the ISO website.

Any feedback or questions on this document should be directed to the user's national standards body. A complete listing of these bodies can be found at www.iso.org/members.html.

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Coated abrasives — Determination and designation of grain size distribution —

Part 2: Macrogrit sizes P12 to P220

1 Scope

This document specifies a method for determining and testing the grain size distribution of electrofused aluminium oxide and silicon carbide macrogrit sizes P12 to P220 for coated abrasive products.

It is applicable to grits used in the manufacture of coated abrasive products and to grits extracted from coated abrasive products for test purposes.

2 Normative references

The following documents are referred to in the text in such a way that some or all of their content constitutes requirements 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 3310-1, *Test sieves — Technical requirements and testing — Part 1: Test sieves of metal wire cloth*

ISO 9138, *Abrasive grains — Sampling and splitting*

ISO 9284, *Abrasive grains — Test-sieving machines*

3 Terms and definitions

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

ISO and IEC maintain terminology databases for use in standardization at the following addresses:

- ISO Online browsing platform: available at <https://www.iso.org/obp>
- IEC Electropedia: available at <https://www.electropedia.org/>

3.1

macrogrit

abrasive grit having a diameter of 3,35 mm to 0,053 mm whose *grain size distribution* (3.2) is determined by sieving

3.2

grain size distribution

particle size distribution

PSD

percentage of grains of different sizes composing the *macrogrit* (3.1) or *microgrit*

4 Grain size distribution of macrogrit sizes P12 to P220

Macrogrit sizes (P12 to P220) are measured by a sieving analysis, using a set of sieves as specified in [Table 1](#). The test portion matches the P size in [Table 1](#) when the calculated relative amount fits into the limit values.

The testing of macrogrit sizes shall be carried out by a comparative sieving of Macro-P-Mastergrits (5.1.1) and the test portion on the same nest of sieves according to [Clause 5](#).

The grain size distribution of grits shall meet the following criteria:

- a) all material shall pass test sieve i.e. the residue $Q_1=0$;
- b) the residue Q_2 shall not exceed the maximum value specified for test sieve 2;
- c) the sum Q_3 of the residues on test sieves 1, 2 and 3 and the sum Q_4 of the residues on test sieves 1, 2, 3 and 4 shall be within the specified tolerances;
- d) the sum Q_5 of the residues on test sieves 1, 2, 3, 4 and 5 shall not be less than the specified minimum value;
- e) the remainder in the bottom pan shall not exceed the specified maximum value, $\Delta Q_{\max}$.

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Table 1 — Grain size distribution of macrogrit sizes P12 to P220

Grit designation	Test sieve 1		Test sieve 2			Test sieve 3			Test sieve 4			Test sieve 5		Remainder in bottom pan	
	Aperture size sieve 1	Residue on test sieve 1	Aperture size sieve 2	Residue on test sieves 1 and 2	Aperture size sieve 3	Residue on test sieves 1, 2 and 3	Aperture size sieve 4		Residue on test sieves 1, 2, 3 and 4	Aperture size sieve 5	Residue on test sieves 1, 2, 3, 4 and 5				
							w_1	Q_1				w_2	Q_2	w_3	Q_3
	mm	μm	%	mm	μm	%	mm	μm	%	mm	μm	%	mm	μm	%
P12	3,35	—	0	2,36	—	1	2,00	—	14 ± 4	—	61 ± 9	1,40	—	92	8
P16	2,36	—	0	1,70	—	3	1,40	—	26 ± 6	—	75 ± 9	1,00	—	96	4
P20	1,70	—	0	1,18	—	7	1,00	—	42 ± 8	—	86 ± 6	—	710	96	4
P24	1,40	—	0	1,00	—	1	—	850	14 ± 4	—	61 ± 9	—	600	92	8
P30	1,18	—	0	—	850	1	—	710	14 ± 4	—	61 ± 9	—	500	92	8
P36	1,00	—	0	—	710	1	—	600	14 ± 4	—	61 ± 9	—	425	92	8
P40	—	710	0	—	500	7	—	425	42 ± 8	—	86 ± 6	—	300	96	4
P50	—	600	0	—	425	3	—	355	26 ± 6	—	75 ± 9	—	250	96	4
P60	—	500	0	—	355	1	—	300	14 ± 4	—	61 ± 9	—	212	92	8
P80	—	355	0	—	250	3	—	212	26 ± 6	—	75 ± 9	—	150	96	4
P100	—	300	0	—	212	1	—	180	14 ± 4	—	61 ± 9	—	125	92	8
P120	—	212	0	—	150	7	—	125	42 ± 8	—	86 ± 6	—	90	96	4
P150	—	180	0	—	125	3	—	106	26 ± 6	—	75 ± 9	—	75	96	4
P180	—	150	0	—	106	2	—	90	15 ± 5	—	62 ± 12	—	63	90	10
P220	—	125	0	—	90	2	—	75	15 ± 5	—	62 ± 12	—	53	90	10

5 Test method of macrogrit sizes P12 to P220

5.1 Macro-P-Mastergrits

Macro-P-Mastergrits¹⁾ are well-defined reference grits, being associated with test reports of the grain size distribution. The test reports shall be determined in cooperative interlaboratory tests. These cooperative interlaboratory tests shall be supervised by an independent institution like for example the MPA¹⁾. This institution is responsible for defining the values in the test reports.

The apparatus for measuring the values of grain size distribution shall be a test sieving machine according to [5.2.1](#).

The Macro-P-Mastergrits are used for the comparative sieving procedure for testing for coated abrasive products.

The grain size distribution of the Macro-P-Mastergrits is specified in [Table 1](#), with the tolerances for Q_3 and Q_4 being only half of the indicated value in [Table 1](#) (e.g. for P20, the tolerance of Q_3 is ± 4). Each supply of Macro-P-Mastergrits shall be accompanied by a test report giving the sieving analysis and the respective date of test of the Macro-P-Mastergrits.

The Macro-P-Mastergrits are made of fused aluminium oxide. They shall be checked on a test sieving machine according to [5.2.1](#), with their precisely calibrated series of test sieves. These test sieves correspond to the nominal dimensions of the aperture sizes in accordance with the test sieve designation in [Table 1](#). They are optically measured and considered as reference basis for the testing of grain sizes for coated abrasive products.

5.2 Apparatus

5.2.1 Test sieving machine, shall be in accordance with ISO 9284 giving reproducible and comparable results.

EXAMPLE RO-TAP® test sieving machines are examples of a suitable product available commercially. This information is given for the convenience of users of this document and does not constitute an endorsement by ISO of these products.

5.2.2 Time switch, controlling the test sieving machine for a period of 5 min. The permissible accuracy shall be ± 5 s.

5.2.3 Balance, with an accuracy not less than $\pm 0,1$ g shall be used.

5.2.4 Utility test sieves, with openings specified in [Table 1](#). They shall be in accordance with ISO 3310-1.

5.3 Checking of the common use utility test sieves

Common use utility test sieves shall be free from visible defects such as textural flaws (gaps, broken wires etc.), insufficient tension of the fabric, distortions of the frame (out of roundness, leaks and soldering defects) and free from blinding as these will impair the sieving results.

Macro-P-Mastergrits shall be used for checking the serviceability of these test sieves within the meaning of this document. They shall achieve reproducible test results in the test with Macro-P-Mastergrits.

1) Macro-P-Mastergrits can be obtained by: State Materials Testing Institute Darmstadt (Staatliche Materialprüfungsanstalt Darmstadt, MPA), Grafenstraße 2, D-64283 Darmstadt, Germany. This information is given for the convenience of users of this document and does not constitute an endorsement by ISO of the product named. Equivalent products may be used if they can be shown to lead to the same results.

The utility test sieve to be tested shall be mounted into the respective nest of sieves as the 3rd sieve. The 1st sieve and the 2nd sieve shall be checked sieves. The sum of the residues on the 1st, 2nd and 3rd sieve shall not deviate from the Macro-P-Mastergrit value by more than 1,5 times the tolerance according to [Table 1](#).

Sieves which cannot be inserted as 3rd sieve when assembled in the nest of test sieves according to [Table 1](#), shall be tested as 4th sieve. In this case it shall be ensured that the 1st, 2nd and 3rd sieves are checked sieves. The sum of the residues on test sieves 1, 2, 3 and 4 shall not deviate from the Macro-P-Mastergrit value by more than 1,5 times the tolerance according to [Table 1](#).

After this test, a sieve is considered as not suitable if the sum of the residues on the 1st, 2nd, and 3rd or on the 1st, 2nd, 3rd and 4th sieve respectively exceeds the permissible deviations of [Table 1](#) by more than half the value.

The sieves marked with 3,35 mm, 2,36 mm and 53 µm shall be tested in accordance with ISO 3310-1.

5.4 Preparation

5.4.1 Preparation of the test portion

The test portion shall be dried at a temperature of 105 °C until its weight remains constant.

A test portion of 100 g of the dry abrasive grit shall be taken for test sieving.

If grains recovered from a coated abrasive product, the quantity of the test portion shall not be less than 20 g.

Sampling and splitting of abrasive grains shall be in accordance with ISO 9138.

5.4.2 Mounting of test sieves

The five utility test sieves (see [Table 1](#)) required for testing the respective grain size shall be assembled together with the bottom pan to form a nest of sieves taking into account the prescribed order. The test portion shall be poured onto the first test sieve and the cover shall be put on. Then the nest of sieves shall be mounted in the test sieving machine. The tapper shall be placed on the cover of the nest of test sieves.

5.4.3 Determination of the Macro-P-Mastergrit values for the utility test sieving

Because of the unavoidable deviations between test sieves of the same designation, it is necessary to carry out a first sieving with Macro-P-Mastergrits on the sieves to be used in order to determine the Q values of the Macro-P-Mastergrit, thus checking the test sieves, and to obtain the corrected values for these sieves.

For this purpose, 100 g of Macro-P-Mastergrit of the same grain size shall be taken and transferred to test sieve 1. The test sieving machine shall be run for 5 min by setting the time switch accordingly.

After the sieving is completed, the residues on the sieves shall be transferred cumulatively to the balance pan and weighed, beginning with the residue on the coarsest test sieve. The residues on the finer test sieves are added to the residue on the coarser test sieves. The residue on the bottom pan shall also be weighed.

The determined residues Q_1 to Q_5 are the Macro-P-Mastergrit values for the nest of utility test sieves used for the respective grain size.

The difference between the Q values in the test report of the Mastergrit and the results of the sieving on the nest of utility test sieves shall be calculated as shown in [Annex B](#).

5.5 Procedure

The sieving procedure shall be the same as described for the determination of the Macro-P-Mastergrit values shown in [5.4](#).

If grains recovered from the coated abrasive product are to be tested, the quantity of the test portion shall be not less than 20 g.

The sieving result shows the grain size distribution of the test portion.

5.6 Evaluation

The whole process for carrying out and evaluation of sieving analysis is described in [Figure 1](#). An example for processing and recording results is shown in [Table A.1](#). Examples for a complete sieving analysis are shown in [Annex B](#).

A sieving analysis requires five basic steps:

- determination of the Mastergrit values for the nest of test sieves for the dedicated P size (see [5.4.3](#));
- calculation of the correction values (difference) for the nest of test sieves by subtracting the Mastergrit values (measured) from the values given in the test report of the Mastergrit ([Table A.1](#), column 4);
- measuring the values of the test portion (see [5.5](#));
- calculation of the corrected sieving analysis for the test portion by arithmetic addition of the correction values to the results of the test portion ([Table A.1](#), column 6);
- evaluation of the results by comparison the corrected values to the values in [Table 1](#).

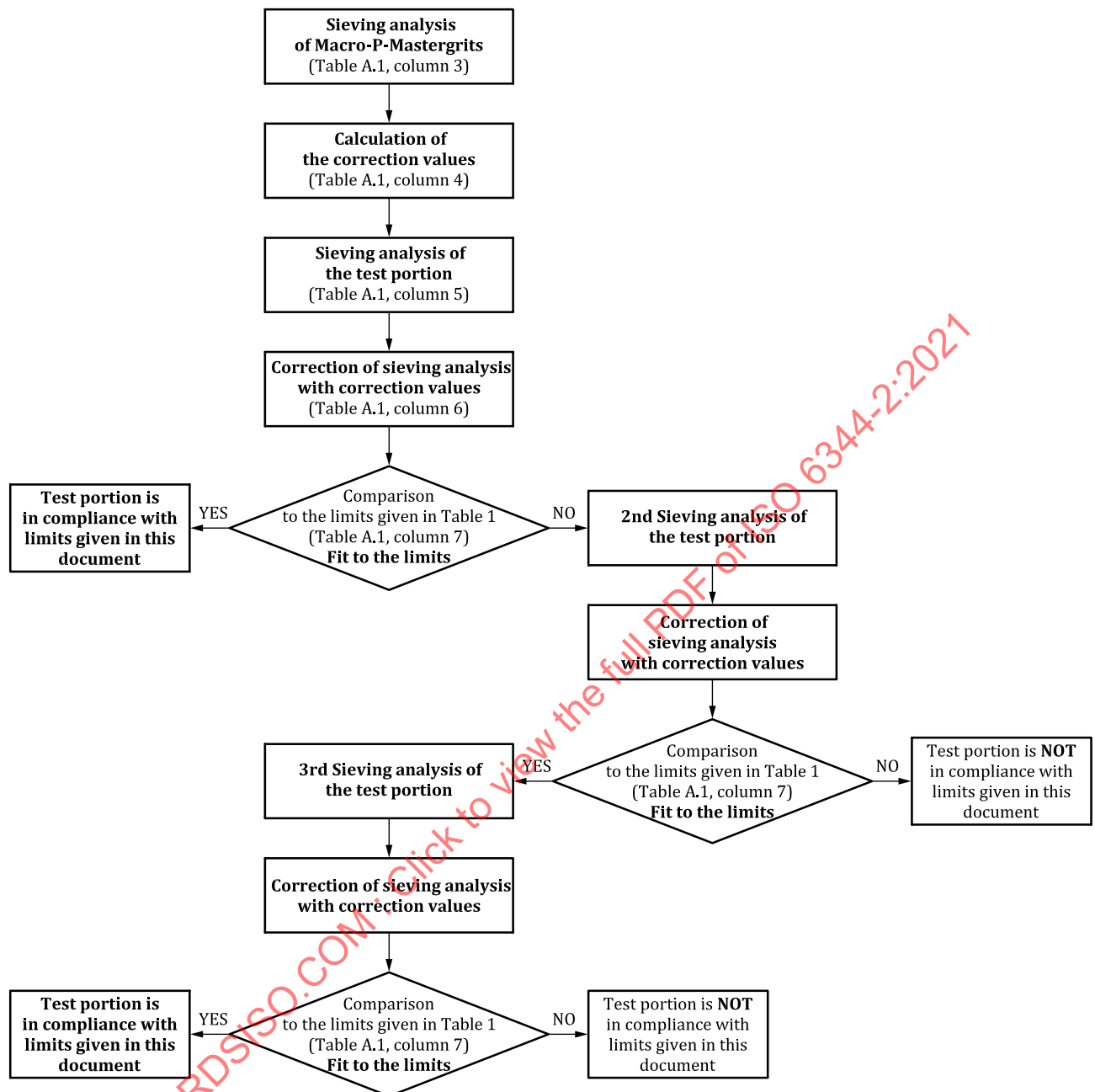


Figure 1 — Procedure for determination of a sieving analysis and evaluation of the results

6 Test report

The test report shall comprise at least the following information:

- the sample;
- the lot number;
- a reference to this document, i.e. ISO 6344-2:2021;
- the result(s);
- specified limits according to [Table 1](#).

7 Designation

The designation of macrogrit sizes for fused aluminium oxide or silicon carbide complying with the requirements of this document shall comprise the following:

- the type of abrasive or product name;
- the macrogrit size including the letter “P” for a coated abrasive product, followed by a characteristic number representing the grit size.

EXAMPLE A macrogrit size designation is as follows:



8 Marking

Each of the smallest packing units shall be marked comprising the following:

- the name of manufacturer;
- the type of abrasive or product name;
- the macrogrit size including the letter “P” for a coated abrasive product, followed by a characteristic number representing the grit size;
- the lot number;
- handling instructions, hazard warnings, if applicable.

The marking shall be indelible and legible as long as possible.

The product(s) shall be accompanied by the test report in accordance with [Clause 6](#).