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BSI Standards Publication

Tests for geometrical properties of aggregates

Part 5: Determination of percentage of crushed particles
in coarse and all-in natural aggregates

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National foreword

This British Standard is the UK implementation of EN 933-5:2022. It supersedes BS EN 933-5:1998, which is withdrawn.

The UK participation in its preparation was entrusted to Technical Committee B/502/6, Test methods.

A list of organizations represented on this committee can be obtained on request to its committee manager.

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English Version

Tests for geometrical properties of aggregates - Part 5: Determination of percentage of crushed particles in coarse and all-in natural aggregates

Essais pour déterminer les caractéristiques
géométriques des granulats - Partie 5 : Détermination
du pourcentage de surfaces cassées dans les gravillons
et cailloux

Prüfverfahren für geometrische Eigenschaften von
Gesteinskörnungen - Teil 5: Bestimmung des
prozentualen Anteils an gebrochenen Körnern in
groben Gesteinskörnungen und
Gesteinskörnungsgemischen

This European Standard was approved by CEN on 26 September 2022.

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This European Standard exists in three official versions (English, French, German). A version in any other language made by translation under the responsibility of a CEN member into its own language and notified to the CEN-CENELEC Management Centre has the same status as the official versions.

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EUROPEAN COMMITTEE FOR STANDARDIZATION
COMITÉ EUROPÉEN DE NORMALISATION
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CEN-CENELEC Management Centre: Rue de la Science 23, B-1040 Brussels

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European foreword

This document (EN 933-5:2022) has been prepared by Technical Committee CEN/TC 154 "Aggregates", the secretariat of which is held by BSI.

This European Standard shall be given the status of a national standard, either by publication of an identical text or by endorsement, at the latest by May 2023, and conflicting national standards shall be withdrawn at the latest by May 2023.

Attention is drawn to the possibility that some of the elements of this document may be the subject of patent rights. CEN shall not be held responsible for identifying any or all such patent rights.

This document supersedes EN 933-5:1998.

This document has been prepared under a Standardization Request given to CEN by the European Commission and the European Free Trade Association.

In comparison with the previous edition, the following technical modifications have been made:

- a) The title has been revised to better reflect the scope;
- b) Clause 1: Scope has been clarified to show that the standard applies to coarse and all-in natural aggregates, but not to lightweight aggregates.
- c) Clause 3: The definition of a crushed surface has been changed. The definitions of aggregate size and a rounded particle have been deleted. The definition of a rounded surface has been added;
- d) Clause 4: Principle has been amended;
- e) Clause 5: Coloured pencil has been added as optional apparatus to facilitate the procedure of estimating crushed and rounded parts of a particle surface;
- f) Clause 6: Preparation of test portion has been revised;
- g) Clause 7: Procedure has been amended and an illustrating figure has been added;
- h) Clause 8: Calculation and expression of results has been amended;
- i) Clause 9: The lists of required and optional data have been updated;
- j) New informative Annex A, with guidance for estimated mass of various size fractions with about 100 particles, has been added;
- k) New informative Annex B, with example of application of the test procedure, has been added;
- l) Previous Annex A, with example of a test data sheet, has been revised and moved to Annex C.

This document forms part of a series of tests for geometrical properties of aggregates. Test methods for other properties of aggregates are covered by the following European Standards:

- EN 932 (all parts), *Tests for general properties of aggregates*
- EN 1097 (all parts), *Tests for mechanical and physical properties of aggregates*

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- EN 1367 (all parts), *Tests for thermal and weathering properties of aggregates*
- EN 1744 (all parts), *Tests for chemical properties of aggregates*
- EN 13179 (all parts), *Tests for filler aggregate used in bituminous mixtures*

The other parts of the EN 933 series include:

- *Part 1: Determination of particle size distribution - Sieving method*
- *Part 2: Determination of particle size distribution - Test sieves, nominal size of apertures*
- *Part 3: Determination of particle shape - Flakiness index*
- *Part 4: Determination of particle shape - Shape index*
- *Part 6: Assessment of surface characteristics - Flow coefficient of aggregates*
- *Part 7: Determination of shell content - Percentage of shells in coarse aggregates*
- *Part 8: Assessment of fines - Sand equivalent test*
- *Part 9: Assessment of fines - Methylene blue test*
- *Part 10: Assessment of fines - Grading of filler aggregates (air jet sieving)*
- *Part 11: Classification test for the constituents of coarse recycled aggregate*

Any feedback and questions on this document should be directed to the users' national standards body. A complete listing of these bodies can be found on the CEN website.

According to the CEN-CENELEC Internal Regulations, the national standards organisations of the following countries are bound to implement this European Standard: Austria, Belgium, Bulgaria, Croatia, Cyprus, Czech Republic, Denmark, Estonia, Finland, France, Germany, Greece, Hungary, Iceland, Ireland, Italy, Latvia, Lithuania, Luxembourg, Malta, Netherlands, Norway, Poland, Portugal, Republic of North Macedonia, Romania, Serbia, Slovakia, Slovenia, Spain, Sweden, Switzerland, Türkiye and the United Kingdom.

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1 Scope

This document specifies the reference method, used for type testing and in case of dispute, for the determination of the percentages of crushed particles, totally crushed particles and totally rounded particles in coarse and all-in natural aggregates. Other methods can be used for other purposes, such as factory production control, provided that an appropriate working relationship with the reference method has been established.

NOTE 1 Examples of advanced test methods can be found in the Bibliography.

This document applies to coarse aggregates comprising particles within size fraction 4/63 mm. It does not apply to lightweight aggregates.

NOTE 2 For coarse aggregate between 4 mm and 20 mm the percentages of crushed surfaces are linked to the flow coefficient and can therefore be used in association with the test method specified in EN 933-6.

Clause 7.1 specifies the procedure for test portions consisting of one size fraction and Clause 7.2 specifies the procedure for test portions consisting of two or more size fractions.

Guidance for the estimated mass of various size fractions with about 100 particles is given in informative Annex A.

Examples of application of the test procedure and an example of a test data sheet are given in informative Annexes B and C.

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.

EN 932-2, *Tests for general properties of aggregates - Part 2: Methods for reducing laboratory samples*

EN 932-5, *Tests for general properties of aggregates - Part 5: Common equipment and calibration*

EN 933-1, *Tests for geometrical properties of aggregates - Part 1: Determination of particle size distribution - Sieving method*

EN 933-2, *Tests for geometrical properties of aggregates - Part 2: Determination of particle size distribution - Test sieves, nominal size of apertures*

3 Terms and definitions

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

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

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

3.1

size fraction

d_i/D_i

fraction of an aggregate passing the larger (D_i) of two sieves and retained on the smaller (d_i)