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Tests for general properties of aggregates - Part 5: Common equipment and calibration

Prüfverfahren für allgemeine Eigenschaften von Gesteinskörnungen - Teil 5: Allgemeine Prüfeinrichtungen und Kalibrierung

Essais pour déterminer les propriétés générales des granulats - Partie 5: Equipments communs et étalonnage

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Tests for general properties of aggregates - Part 5: Common equipment and calibration

Essais pour déterminer les propriétés générales des granulats - Partie 5: Equipements communs et étalonnage

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This European Standard was approved by CEN on 30 December 2011.

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EUROPEAN COMMITTEE FOR STANDARDIZATION
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Foreword

This document (EN 932-5:2012) 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of an identical text or by endorsement, at the latest by August 2012, and conflicting national standards shall be withdrawn at the latest by August 2012.

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

This document supersedes EN 932-5:1999.

This standard forms part of a series of standards for general properties of aggregates. Test methods for other properties of aggregates are covered by the following European Standards:

EN 933, *Tests for geometrical properties of aggregates;*

EN 1097, *Tests for mechanical and physical properties of aggregates;*

EN 1367, *Tests for thermal and weathering properties of aggregates;*

EN 1744, *Tests for chemical properties of aggregates;*

EN 13179, *Tests for filler aggregate used in bituminous mixtures.*

The other parts of EN 932, Tests for general properties of aggregates are:

— *Part 1: Methods for sampling;*

— *Part 2: Methods for reducing laboratory samples;*

— *Part 3: Procedure and terminology for simplified petrographic description;*

— *Part 6: Definitions of repeatability and reproducibility.*

In the bibliography, reference is made to the International Organization for Legal Metrology (OIML) classification, which this standard has adopted for the purposes of establishing a frequency of calibration for balance weights.

According to the CEN/CENELEC Internal Regulations, the national standards organizations 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, Romania, Slovakia, Slovenia, Spain, Sweden, Switzerland, Turkey and the United Kingdom.

1 Scope

This European Standard specifies general requirements for common equipment, calibration and checking procedures and reagents for the testing of the properties of aggregates.

In the case of checking, other procedures than the ones described in this standard may be used provided that appropriate working relationships with the corresponding methods described in this standard have been established. In case of dispute, the checking methods described in this standard shall be used.

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.

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*

EN 933-3, *Tests for geometrical properties of aggregates — Part 3: Determination of particle shape — Flakiness index*

EN 933-8, *Tests for geometrical properties of aggregates — Part 8: Assessment of fines — Sand equivalent test*

EN ISO 3650, *Geometrical product specifications (GPS) — Length standards — Gauge blocks (ISO 3650:1998)*

ISO 384, *Laboratory glassware — Principles of design and construction of volumetric glassware*

ISO 386, *Liquid-in-glass laboratory thermometers — Principles of design, construction and use*

ISO 649-1, *Laboratory glassware — Density hydrometers for general purposes — Part 1: Specification*

ISO 3310-1, *Test sieves — Technical requirements and testing — Part 1: Test sieves of metal wire cloth*

ISO 3310-2, *Test sieves — Technical requirements and testing — Part 2: Test sieves of perforated metal plate*

ISO 4788, *Laboratory glassware — Graduated measuring cylinders*

ISO 6353-2, *Reagents for chemical analysis — Part 2: Specifications —- First series*

ISO 6353-3, *Reagents for chemical analysis — Part 3: Specifications — Second series*

3 Terms and definitions

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

3.1
calibration
operation that, under specified conditions, in a first step, establishes a relation between the quantity values with measurement uncertainties provided by measurement standards and corresponding indications with associated measurement uncertainties and, in a second step, uses this information to establish a relation for obtaining a measurement result from an indication.

Note 1 to entry: A calibration may be expressed by a statement, calibration function, calibration diagram, calibration curve, or calibration table. In some cases, it may consist of an additive or multiplicative correction of the indication with associated measurement uncertainty.

Note 2 to entry: For more information, see VIM – International vocabulary of basic and general terms in metrology (available on http://www.bipm.org/).

3.2
checking
operation of assuring either:

— that the results of measurements of a property (such as length, mass, temperature or time) at selected values made by a measuring instrument, or a set of them, have not deviated from that which was measured when the equipment was last calibrated within a pre-defined tolerance; or

— that a property (such as rotation speed, vibration frequency) of an item, or a set of items, of equipment complies with the relevant requirements for that equipment.

3.3
verification scale interval (e) for balances
value, expressed in units of mass, used for the classification and verification of a balance

3.4
actual scale interval (d)
value, expressed as:

— the difference between the values corresponding to two consecutive scale marks, for analogue indication, or

— the difference between two consecutive indicated values, for digital indication.

3.5
tolerance
maximum permissible deviation from the nominal value of a measurable characteristic

Note 1 to entry: In the present standard, tolerances may be expressed either as an absolute quantity without sign or as a percentage of the nominal value of a measurable characteristic.

4 Common equipment

4.1 Tolerances

4.1.1 Manufacturing tolerances

NOTE By convention, the tolerances (or limits) indicated in the aggregate test standards are manufacturing tolerances (or limits), if not otherwise stated.

4.1.1.1 Linear dimensions

Where a dimension is specified with manufacturing tolerances or limits, it shall be an essential dimension.

NOTE Dimensions stated without tolerances are given for guidance.

4.1.1.2 Mass

Where mass is specified, the manufacturing tolerance shall be ± 1 % of the specified mass unless otherwise stated.

4.1.2 Working tolerances

Working tolerances apply to equipment (e.g. apparatus) after being subjected to wear in use, and shall be not more than twice the manufacturing tolerance unless otherwise specified.

4.2 Measuring instruments

4.2.1 General

Measuring instruments shall have greater measurement accuracy than the corresponding tolerance defined in the test method.

NOTE Unless stated otherwise, the measurement accuracy of the instrument used should be at least five times better than the corresponding tolerance.

4.2.2 Balances and weights

Balances and weights shall be calibrated. Calibration and checking of balances and weights shall comply with 5.2.3.2 and 5.2.3.3 respectively.

NOTE 1 Balances can incorporate an analogue or a digital display.

The balance (and weights if required) selected for a weighing shall enable the mass to be determined to the accuracy required by the test method. If calibration determines that the balance is not suitable for use across its full working range, it shall be labelled to show the upper and lower limits of usable capacity.

NOTE 2 Examples of categories of balances are given in Table 1. Annex C relates these categories to most aggregate standard test methods.

Table 1 — Examples of categories of balances, their accuracy classes and corresponding tolerances for intermediate checks

Balance accuracy class	Balance category	Verification scale interval e (g)	Actual scale interval d (g)	Tolerance for intermediate checks (g)	Minimum capacity (g)	Maximum capacity (kg)
I (special)	1	0,001	0,0001 [a]	0,0005	0,01 [a]	-
II (high)	2	0,01	0,001 [a]	0,003	0,02 [a]	1
	3	0,1	0,01 [a]	0,03	0,5 [a]	10
	4	1	0,1 [a]	0,3	5 [a]	100
III (medium)	5	1	1	2	20	10
	6	2	2	4	40	20
	7	200	200	400	4000	2000

NOTE This table is based on OIML (2006).

[a] Balances fitted with an auxiliary indicating device.

4.2.3 Thermometers

Thermometers shall be selected as appropriate to the test method. Actual scale interval shall not be greater than half of the required accuracy.

For liquid-in-glass thermometers the form of graduations shall be as specified in ISO 386. The calibration of thermometers shall comply with 5.2.3.4.

4.2.4 Dimensional measurement instruments

4.2.4.1 Steel rules

Steel rules shall have scale divisions at least every 1 mm and shall be checked in accordance with 5.2.3.5.

4.2.4.2 Callipers

Digital, dial and vernier callipers for internal and external measurements shall have an actual scale interval of 0,1 mm or better and shall be calibrated in accordance with 5.2.3.5.

4.2.4.3 Micrometers

Micrometer measuring devices shall have an actual scale interval of 0,01 mm or better, or 0,002 mm or better, depending upon the accuracy specified in the test method. Calibration shall be in accordance with 5.2.3.5.

4.2.4.4 Dial gauges

Dial gauges shall have an actual scale interval of 0,01 mm or better, or 0,002 mm or better, depending upon the accuracy and range of scale required by the test method. Dial gauges shall be calibrated in accordance with 5.2.3.5.

4.2.5 Timers

Timers shall be calibrated in accordance with 5.2.3.6.

NOTE 1 Timers having an actual scale interval of 1 s are suitable.

NOTE 2 A suitably placed wallclock with seconds hand, and large enough to read from the work station is an acceptable alternative.

4.2.6 Volumetric glassware

Volumetric glassware complying with class A or B of ISO 384 shall be used. Class B volumetric glassware shall be checked before initial use in accordance with 5.2.3.7.

Where certified volumetric glassware complying with class A of ISO 384 is used, the check is not required.

4.2.7 Density hydrometers

Density hydrometers shall comply with ISO 649-1, with a range and scale interval that is appropriate to the test method. The scale interval shall not be greater than half of the required accuracy of reading. Density hydrometers shall be calibrated in accordance with 5.2.3.8.

4.3 Other instruments

4.3.1 Ovens

Ovens shall incorporate a thermostatic temperature control which can be set to maintain the specified working temperature to within ± 5 °C, unless a different tolerance is specified in the test method.

Each oven shall have a temperature-indicating device of the required range and accuracy.

Ovens shall be checked in accordance with 5.2.4.2.

4.3.2 Constant temperature bath

Constant temperature water baths shall incorporate a thermostatic temperature control which can be set to maintain the specified working temperature to within a tolerance appropriate to the test method requirements.

Each constant temperature bath shall have a temperature-indicating device of the required range and accuracy.

Constant temperature water baths shall be checked in accordance with 5.2.4.3.

4.3.3 Test sieves and bar sieves

Test sieves shall comply with EN 933-2. Bar sieves shall comply with EN 933-3. Perforated plate square hole test sieves conforming to ISO 3310-2 shall have an aperture size of at least 4 mm. Woven wire test sieves conforming to ISO 3310-1 shall have an aperture size of less than 4 mm.

Each sieve shall be separately identified. Checks on sieves shall be carried out in accordance with 5.2.4.4.

4.3.4 Moulds and drums

Items of equipment such as moulds and drums shall be checked in accordance with 5.2.4.5.

4.3.5 Sieve shakers

Mechanical sieve shakers shall hold a nest of sieves securely with their lid and receiver. Their design shall ensure that the test material on any given sieve progresses over the surface of the sieve when it is agitated.

4.3.6 Desiccators and desiccator cabinets

Desiccators shall be provided with a lid which forms an airtight seal. Desiccator cabinets shall be fitted with a door which forms an airtight seal. Where shelves are fitted they shall permit free vertical circulation of air when the desiccator is in use.

NOTE 1 The most frequently used desiccant is self-indicating silica gel crystals.

NOTE 2 Glass vacuum desiccators should be covered by a safety cage during evacuation, while under vacuum and during vacuum release.

4.3.7 Bottle shakers and rollers

A motorised unit for shaking and/or rotating containers shall be capable of rotating or agitating the containers continuously at the specified speed.

Motorised bottle shakers and rollers shall be checked in accordance with 5.2.4.8.

4.3.8 Heaters

An electric hotplate shall be fitted with an adjustable control to provide boiling and/or simmering at specified temperatures.

NOTE A Bunsen burner, with tripod and gauze, can be used as an alternative controllable source of heat.

4.3.9 Rotating machinery

Where the speed of rotation of an item of machinery is critical to the test method, it shall be checked according to 5.2.4.9.

4.3.10 Vibrating machinery

Where the frequency of vibration of an item of machinery is critical to the test method, it shall be checked according to 5.2.4.10.

4.3.11 Pressure or vacuum

Where the pressure or vacuum is critical to the test method, it shall be checked according to 5.2.4.11.

5 Calibration and checking

5.1 Calibration of reference standards and reference instruments

5.1.1 Laboratory reference standards

5.1.1.1 Reference standards for in-house calibration

Where calibration of test measuring instruments is carried out in-house the laboratory shall hold appropriate reference standards or reference instruments that are used solely for calibration purposes.