



SLOVENSKI STANDARD

SIST EN 16622:2016

01-maj-2016

Kalcijska mikrosilika za beton - Definicije, zahteve in merila skladnosti

Silica-calcium fume for concrete - Definitions, requirements and conformity criteria

Siliko-Calciumstaub für Beton - Definitionen, Anforderungen und Konformitätskriterien

Fumées hydrauliques de silico-calcium pour béton - Définitions, exigences et critères de conformité

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91.100.30	Beton in betonski izdelki	Concrete and concrete products
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EUROPEAN STANDARD

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Silica-calcium fume for concrete - Definitions, requirements and conformity criteria

Fumées de silico-calcium pour béton - Définitions,
exigences et critères de conformité

Siliko-Calciumstaub für Beton - Definitionen,
Anforderungen und Konformitätskriterien

This European Standard was approved by CEN on 26 September 2015.

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EUROPEAN COMMITTEE FOR STANDARDIZATION
COMITÉ EUROPÉEN DE NORMALISATION
EUROPÄISCHES KOMITEE FÜR NORMUNG

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EN 16622:2015 (E)

European foreword

This document (EN 16622:2015) has been prepared by Technical Committee CEN/TC 104 “Concrete and related products”, the secretariat of which is held by DIN.

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of an identical text or by endorsement, at the latest by May 2016, and conflicting national standards shall be withdrawn at the latest by August 2017.

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 has been prepared under a mandate given to CEN by the European Commission and the European Free Trade Association.

For relationship with Regulation (EU) No. 305/2011, see informative Annex ZA, which is an integral part of this document.

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, Former Yugoslav Republic of Macedonia, 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.

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Introduction

Silica-calcium fume (SCF) according to this European Standard is a special type of silica fume containing some calcium. It is collected by filters as a by-product of the carbothermal process to produce silica-calcium alloys. It is only supplied as a densified product. SCF from more than one furnace, filter or intermediate storage silo will normally be blended in the production plant.

Many years of practical experience, especially in France, have demonstrated that SCF which satisfies the requirements in this European Standard has both hydraulic and pozzolanic properties, and may be used to produce concrete with improved properties in both the fresh and hardened states.

SCF is normally used in combination with a plasticizer and/or superplasticizer.

This European Standard is based on EN 13263-1 "Silica fume for concrete - Part 1: Definitions, requirements and conformity criteria", with similar structure and requirements. The differences in the material properties is taken into account, for instance that silica-calcium fume is partly hydraulic unlike silica fume. When it comes to conformity, this European Standard refers to EN 13263-2 "Silica fume for concrete - Part 2: Conformity evaluation".

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1 Scope

This European Standard applies to the silica-calcium fume (SCF) which is a by-product of the carbothermal process used to produce silica-calcium alloys.

This European Standard gives requirements for chemical and physical properties for SCF to be used as a type II addition in concrete conforming to EN 206, or in mortars, grouts and other mixes. This European Standard also states conformity criteria and related rules.

This European Standard does not give rules for the use of SCF in concrete. Some general rules for the use of type II additions are given in EN 206.

NOTE Supplementary rules related to the use of SCF in concrete may be given in non-conflicting national standards for concrete.

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 196-1, *Methods of testing cement — Part 1: Determination of strength*

EN 196-2, *Method of testing cement — Part 2: Chemical analysis of cement*

EN 196-6, *Methods of testing cement — Part 6: Determination of fineness*

EN 196-7, *Methods of testing cement — Part 7: Methods of taking and preparing samples of cement*

EN 197-1, *Cement — Part 1: Composition, specifications and conformity criteria for common cements*

EN 413-2, *Masonry cement — Part 2: Test methods*

EN 451-1, *Method of testing fly ash — Part 1: Determination of free calcium oxide content*

EN 934-2, *Admixtures for concrete, mortar and grout — Part 2: Concrete admixtures — Definitions, requirements, conformity, marking and labelling*

EN 1097-7, *Tests for mechanical and physical properties of aggregates — Part 7: Determination of the particle density of filler — Pycnometer method*

EN 13263-2, *Silica fume for concrete — Part 2: Conformity evaluation*

ISO 9277, *Determination of the specific surface area of solids by gas adsorption — BET method*

ISO 9286, *Abrasive grains and crude — Chemical analysis of silicon carbide*

3 Terms and definitions

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

NOTE Some terms and definitions from EN 13263-2 to which this European Standard refers are included here for convenience. Where needed they are modified for the application to SCF.

3.1

activity index

ratio (in percent) of the compressive strength of standard mortar bars, prepared with 90 % test cement plus 10 % SCF by mass, to the compressive strength of standard mortar bars prepared with 100 % test cement, when tested at the same age

3.2

allowable probability of acceptance CR

for a given sampling plan, allowed probability of acceptance of SCF with a characteristic value outside the specified characteristic value

3.3

characteristic value

value having a prescribed probability of not being attained in a hypothetical unlimited test series

Note 1 to entry: Equivalent to “fractile” which is defined in ISO 3534-1.

[SOURCE: ISO 8930:1987]

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3.4

control period

period of production and dispatch identified for the assessment of the test results

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3.5

densified SCF

SCF that has been treated to increase the bulk density by particle agglomeration, the bulk density typically being above 500 kg/m³

3.6

depot

bulk SCF handling facility – not located at the production plant – used for the dispatch of SCF– whether in bulk or bagged – after transfer or storage where the manufacturer has full responsibility for all aspects of the quality of the SCF

3.7

initial period

immediate period after the first issuing of the declaration of performance for a SCF

3.8

determination of product type

testing of the first audit sample

3.9

new production plant

production plant which is not already producing SCF

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3.10**production plant**

facility producing SCF:

- a) silica-calcium alloy production plant;
- b) processing plant, for example for the selection, blending or densifying of SCF

3.11**quality control**

part of quality management focused on fulfilling quality requirements

[SOURCE: EN ISO 9000:2015, 3.3.7]

3.12**sampling plan**

specific plan which states the (statistical) sample size(s) to be used, the percentage P_k on which the characteristic value is based, and the allowable probability of acceptance CR

[SOURCE: EN 13263-1:2005+A1:2009, 3.23]

3.13**silica-calcium fume (SCF)**

very fine particles of amorphous silicon dioxide and dicalcium silicate collected as a by-product of the carbothermal process used to produce silica-calcium alloys

Note 1 to entry: SCF may be processed, for example by classification, selection, blending, densifying, or by a combination of these processes, in adequate production plants. Such processed SCF may consist of SCF from different sources, each conforming to the definition given in this subclause.

3.14**single result limit value**

value of a chemical or physical property which – for any single test result – in the case of an upper limit is not to be exceeded or in the case of a lower limit is, as a minimum, to be reached

[SOURCE: EN 13263-1:2005+A1:2009, 3.26]

3.15**specified characteristic value**

characteristic value of a chemical or physical property which in the case of an upper limit is not to be exceeded or in the case of a lower limit is, as a minimum, to be reached

[SOURCE: EN 13263-1:2005+A1:2009, 3.27]

3.16**spot sample**

sample taken within a short period of time and at a fixed point from within a larger quantity, relating to the intended tests. It can be obtained by combining one or more immediately consecutive increments

[SOURCE: EN 196-7:2007, 3.6]

3.17**test**

technical operation that consists of the determination of a characteristic of a product according to a specified procedure

[SOURCE: EN 13263-1:2005+A1:2009, 3.29]

3.18**test cement**

cement used for evaluation of the activity index of SCF

3.19**testing laboratory**

laboratory which measures, examines, tests, calibrates or otherwise determines the characteristics or performance of materials or products

[SOURCE: EN 13263-1:2005+A1:2009, 3.31]

3.20**test method**

specified technical procedure for performing a test

3.21**type II addition**

pozzolanic or latent hydraulic addition

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[SOURCE: EN 206:2013, 3.1.2.3]

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3.22**works' quality manual**

document that provides information on the production control which is applied by a manufacturer at a particular production plant to ensure conformity of the SCF with the requirements of this European Standard

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4 Health, hygiene and environment**4.1 Release of dangerous substances**

National regulations on dangerous substances may require verification and declaration on release, and sometimes content, when construction products covered by this standard are placed on those markets. In the absence of European harmonized test methods, verification and declaration on release/content should be done taking into account national provisions in the place of use.

NOTE An informative database covering European and national provisions on dangerous substances is available at the Construction website on EUROPA accessed through: http://ec.europa.eu/growth/tools-databases/cp-ds/index_en.htm.

4.2 Emission of radioactivity

SCF used in products shall not release any radioactivity in excess of the maximum permitted levels specified in a relevant European Standard for the material or permitted in the national regulations of the member state of destination".

NOTE See ZA.1 in Annex ZA.

5 Product characteristics

5.1 General

The chemical and physical requirements in 5.2 and 5.3 are specified as characteristic values. Compliance with a specified characteristic value is assessed by means of a statistical control procedure as described in Clause 8.

The test methods prescribed in this European Standard are reference methods. In factory production control other methods may be used provided they give results equivalent to those obtained with the reference method. In case of dispute, only the reference method shall be used.

5.2 Chemical requirements

5.2.1 Silicon dioxide

The content of silicon dioxide, SiO₂, as determined by the method described as reference method in EN 196-2 shall not be less than 70 % by mass and shall be declared.

NOTE In the 2013 edition of EN 196-2, the reference method is described in 4.5.3.

5.2.2 Elemental silicon

The content of elemental silicon, determined according to ISO 9286, shall not be greater than 0,5 % by mass.

5.2.3 Total calcium oxide

The total calcium oxide content, as determined by the reference method described in EN 196-2, shall be in the range of 10 % to 20 % by mass.

5.2.4 Free calcium oxide

The content of free calcium oxide, free CaO, as determined by the method described in EN 451-1, shall not be greater than 1,0 % by mass.

5.2.5 Sulfate

The sulfate content, as determined by the method described in EN 196-2 and expressed as SO₃, shall not be greater than 2,0 % by mass.

5.2.6 Total content of alkalis

The total content of alkalis determined by the method described in EN 196-2 and calculated as "Na₂O equivalent" shall be declared.

NOTE Different national provisions adopt different principles but in general only a small proportion of alkalis in the components of the concrete including silica-calcium fume are considered to contribute to alkali silica reaction, see CEN/TR 16349. Normally silica fumes are considered to reduce the risk of alkali aggregate reactions, see 5.3 in CEN/TR 16349:2012.

5.2.7 Chloride

The content of chloride, calculated as Cl⁻ and determined in accordance with the method described in EN 196-2, shall not be greater than 0,30 % by mass. If the Cl⁻ content is above 0,10 % by mass, the upper limit for its characteristic value shall be declared by the manufacturer.

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