



# SLOVENSKI STANDARD SIST EN 1766:2017

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Nadomešča:  
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## Proizvodi in sistemi za zaščito in popravilo betonskih konstrukcij - Preskusne metode - Referenčni betoni za preskušanje

Products and systems for the protection and repair of concrete structures - Test methods - Reference concretes for testing

Produkte und Systeme für den Schutz und die Instandsetzung von Betontragwerken - Prüfverfahren - Referenzbetone für Prüfungen

Produits et systèmes pour la protection et la réparation des structures en béton - Méthodes d'essais - Bétons de référence pour essais

Ta slovenski standard je istoveten z: EN 1766:2017

### ICS:

91.080.40	Betonske konstrukcije	Concrete structures
91.100.30	Beton in betonski izdelki	Concrete and concrete products

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EUROPEAN STANDARD

**EN 1766**

NORME EUROPÉENNE

EUROPÄISCHE NORM

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ICS 91.080.40

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English Version

## Products and systems for the protection and repair of concrete structures - Test methods - Reference concretes for testing

Produits et systèmes pour la protection et la réparation  
des structures en béton - Méthodes d'essais - Bétons de  
référence pour essais

Produkte und Systeme für den Schutz und die  
Instandsetzung von Betontragwerken - Prüfverfahren -  
Referenzbetone für Prüfungen

This European Standard was approved by CEN on 4 December 2016.

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

**CEN-CENELEC Management Centre: Avenue Marnix 17, B-1000 Brussels**

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## European foreword

This document (EN 1766:2017) 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of an identical text or by endorsement, at the latest by August 2017, and conflicting national standards shall be withdrawn at the latest by November 2018.

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 1766:2000.

The main technical changes that have been made in this new edition are as follows:

- a) Definition of 3 new reference MC concretes;
- b) Definition of thresholds for the tensile bond strength for reference concretes C(0,40); C(0,45); C(0,70) and new MC concretes.

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, Former Yugoslav Republic of Macedonia, France, Germany, Greece, Hungary, Iceland, Ireland, Italy, Latvia, Lithuania, Luxembourg, Malta, Netherlands, Norway, Poland, Portugal, Serbia, Romania, Slovakia, Slovenia, Spain, Sweden, Switzerland, Turkey and the United Kingdom.

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**EN 1766:2017 (E)****1 Scope**

This European Standard specifies the composition, characteristics and preparation procedure for reference concrete substrates, which are to be used in the test methods to measure performances of products and systems for the repair and protection of concrete structures.

The provisions of this Standard are applicable to concrete with a maximum aggregate size of 16 mm or 20 mm or with a maximum aggregate size of 8 mm or 10 mm.

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

EN 206, *Concrete — Specification, performance, production and conformity*

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

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

EN 1008, *Mixing water for concrete - Specification for sampling, testing and assessing the suitability of water, including water recovered from processes in the concrete industry, as mixing water for concrete*

EN 1542, *Products and systems for the protection and repair of concrete structures - Test methods - Measurement of bond strength by pull-off*

EN 12390-3, *Testing hardened concrete - Part 3: Compressive strength of test specimens*

EN 12620, *Aggregates for concrete*

**3 Principle**

Reference concrete test specimens with reproducible surface texture and appropriate strength are cast to enable the resistance against physical or chemical exposure of repair materials to be evaluated.

The required surface roughness is obtained by grit blasting the surface of the hardened concrete.

**4 Equipment****4.1 Concrete mixer (forced action pan mixer)****4.2 Moulds**

Moulds for producing concrete specimens, of non-absorbent, rigid material, not attacked by cement paste, of a size 300 mm × 300 mm × 100 mm or other sizes specified in individual test method standards, corresponding to the property to be tested, shall be used.

**4.3 High frequency vibrating table**

Or vibration rod suitable for compaction of the concrete in the moulds.

#### 4.4 Grit blasting equipment

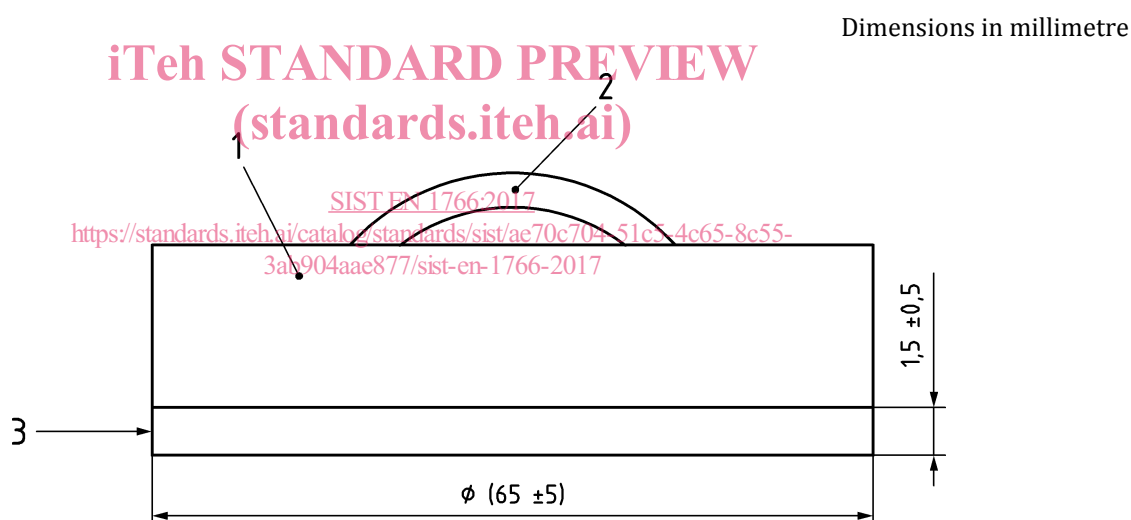
It shall comply with the following:

- air pressure approximately 0,5 MPa;
- nozzle diameter 8 mm to 12 mm;
- the spread angle of the nozzle shall be sufficient to prevent the jet from cutting deeply into the concrete surface. This shall be demonstrated by preliminary test.

NOTE As alternative, high pressure water-blasting equipment, capable of operating with or without the addition of grit, can be used subject to preliminary tests to confirm that the required surface texture can be achieved.

#### 4.5 Surface roughness measuring equipment

- Measuring cylinder, of  $(25 \pm 1)$  ml total capacity and 20 mm maximum internal diameter;
- disc, comprising a flat wooden disc  $(65 \pm 5)$  mm in diameter with a hard rubber disc of the same diameter  $(1,5 \pm 0,5)$  mm thick stuck to one face, the reverse face being provided with a handle (see Figure 1).



#### Key

- wooden disk
- handle
- rubber disk

**Figure 1 — Disk for surface roughness measurement**

## 5 Materials

### 5.1 Aggregates

Aggregates according to EN 12620 shall be natural and silica-based with low water absorption (less than 2 % by mass). The aggregate grading, measured according to EN 933-2, shall conform to the maximum sizes listed in clause 6.2 and 6.3 and have an appropriate size distribution in order to obtain

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the mechanical properties specified for each type, i.e. tensile strength, tensile bond strength and compressive strength. Typical aggregate gradings for this purpose are exemplary, given in Annex A.

**5.2 Mixing water**

Water according to EN 1008 shall be used.

**5.3 Cement**

Portland type CEM I 42,5 R according to EN 197-1 shall be used.

**5.4 Admixtures**

Admixtures according to EN 934-2 shall be used.

**5.5 Grit for surface preparation by blasting**

Commercial grit for grit-blasting of concrete shall be used, with grain size within the range of 0,25 mm to 1,0 mm. The grit shall not contain ferrous components such as chilled cast iron slag, which are prone to rusting.

**5.6 Silica sand for measuring roughness**

Silica sand with a grain size of 0,05 mm to 0,1 mm, dried to a constant weight, shall be used.

**6 Reference concrete mixes**

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**6.1 General**

This standard specifies eight types of reference concrete, defined by the maximum size of the aggregate and mix proportions. The reference concrete is chosen according to the type of product or system for the protection and repair of concrete structures and to the related test methods standards.

NOTE 1 The water taken into account hereafter in the water/cement ratio is the added water plus the water already contained in the admixtures and the additions.

Workability should be appropriate to achieve adequate placing of concrete with freedom from bleeding or segregation. Any special requirements for surface finish of placed specimens for particular test methods using reference concrete samples will be stated in those test methods.

Admixtures conforming to EN 934-2 are permitted to give a workable concrete mix to meet the requirements of Table 1 or to confer adequate freeze–thaw resistance by entrainment of air.

NOTE 2 The application of a suitable plasticizer or super plasticizer conforming to EN 934-2 is likely to be required to achieve optimum compaction, as described in 6.4.

**6.2 Reference concrete with 16 mm or 20 mm aggregate****6.2.1 Compositions and properties (see Table 1)****6.2.1.1 Type C (0,40)**

The mix shall contain 410/425 kg/m<sup>3</sup> cement and have a water/cement ratio of 0,40. Mixes shall have a 28 day mean compressive strength measured according to EN 12390-3 of (60 ± 5) N/mm<sup>2</sup> for cubes and (50 ± 5) N/mm<sup>2</sup> for cylinders, a median tensile bond strength by pull off according to EN 1542 greater than 3 N/mm<sup>2</sup>.



**6.2.1.2 Type C (0,45)**

The mix shall contain 360/375 kg/m<sup>3</sup> cement and have a water/cement ratio of 0,45. Mixes shall have a 28 day mean compressive strength measured according to EN 12390-3 of (50 ± 5) N/mm<sup>2</sup> for cubes and (40 ± 5) N/mm<sup>2</sup> for cylinders and, when applicable, a median tensile bond strength by pull off according to EN 1542 greater than 2,5 N/mm<sup>2</sup>.

**6.2.1.3 Type C (0,70)**

The mix shall contain 260/275 kg/m<sup>3</sup> cement and a water/cement ratio of 0,70 ± 0,05. Mixes shall have a 28 day mean compressive strength measured according to EN 12390-3 of (30 ± 5) N/mm<sup>2</sup> for cubes and (25 ± 5) N/mm<sup>2</sup> for cylinders and, when applicable, a mean bond strength by pull off according to EN 1542 greater than 1,5 N/mm<sup>2</sup>.

**6.3 Reference concrete with 8 mm or 10 mm aggregate****6.3.1 Compositions and properties (see Table 1)****6.3.1.1 Type MC (0,40)**

The mix shall contain 455/470 kg/m<sup>3</sup> cement and have a water/cement ratio of 0,40.

After 28 days the reference concrete shall have an average tensile bond strength determined by pull off according to EN 1542 with a minimum value of 3,0 N/mm<sup>2</sup>, but not for any individual result. The pull off test shall be carried out on the prepared concrete surface immediately before applying the material to be tested, using at least one substrate specimen from each batch of concrete. At least one in every 15 specimens shall be tested.

NOTE The requirements are usually met by a concrete with a compressive strength which satisfies class C50/60, as specified in EN 206.

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**6.3.1.2 Type MC (0,45)**

The mix shall contain 395/410 kg/m<sup>3</sup> cement and have a water/cement ration of 0,45.

After 28 days the reference concrete shall have a median tensile bond strength determined by pull off, according to EN 1542 greater than 2,5 N/mm<sup>2</sup>, but not for any individual result. The pull off test shall be carried out on the prepared concrete surface immediately before applying the material to be tested, using at least one substrate specimen from each batch of concrete. At least one in every 15 specimens shall be tested.

NOTE The requirements are usually met by a concrete with a compressive strength which satisfies class C 40/50, as specified in EN 206.

**6.3.1.3 Type MC (0,70)**

The mix shall contain 290/305 kg/m<sup>3</sup> cement and a water/cement ratio of 0,70 ± 0,05. Mixes shall have a 28 day mean compressive strength measured according to EN 12390-3 of (30 ± 5) N/mm<sup>2</sup> for cubes and (25 ± 5) N/mm<sup>2</sup> for cylinders and, when applicable, a median tensile bond strength by pull off according to EN 1542 greater than 1,5 N/mm<sup>2</sup>.

**6.3.1.4 Type MC (0,75)**

The mix shall contain 235/240 kg/m<sup>3</sup> cement (10/8 mm) and a water/cement ratio of 0,75 ± 0,05. Mixes shall have a 28 day mean compressive strength measured according to EN 12390-3 of (25 ± 5) N/mm<sup>2</sup> for cubes and (20 ± 5) N/mm<sup>2</sup> for cylinders and, when applicable, a median tensile bond strength by pull off according to EN 1542 greater than 1,2 N/mm<sup>2</sup>.