



# SLOVENSKI STANDARD

## SIST EN 16497-2:2017

01-maj-2017

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### Dimovodne naprave - Betonske systemske dimovodne naprave - 2. del: Tlačno izravnani sistem

Chimneys - Concrete System Chimneys - Part 2: Balanced flue applications

Abgasanlagen - System-Abgasanlagen aus Beton - Teil 2: Raumluftunabhängige Anwendungen

Conduits de fumée - Conduits-systèmes de fumée en béton - Partie 2: Applications équilibrées

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Ta slovenski standard je istoveten z: EN 16497-2:2017

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#### **ICS:**

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| 91.060.40 | Dimniki, jaški, kanali    | Chimneys, shafts, ducts        |
| 91.100.30 | Beton in betonski izdelki | Concrete and concrete products |

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EUROPEAN STANDARD

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March 2017

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## Chimneys - Concrete System Chimneys - Part 2: Balanced flue applications

Conduits de fumée - Conduits-Systèmes de fumée en béton - Partie 2: Applications équilibrées

Abgasanlagen - System-Abgasanlagen aus Beton - Teil 2: Luft-Abgas-Anlagen

This European Standard was approved by CEN on 28 November 2016.

CEN members are bound to comply with the CEN/CENELEC Internal Regulations which stipulate the conditions for giving this European Standard the status of a national standard without any alteration. Up-to-date lists and bibliographical references concerning such national standards may be obtained on application to the CEN-CENELEC Management Centre or to any CEN member.

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**EN 16497-2:2017 (E)****European foreword**

This document (EN 16497-2:2017) has been prepared by Technical Committee CEN/TC 166 “Chimneys”, the secretariat of which is held by ASI.

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of an identical text or by endorsement, at the latest by September 2017, and conflicting national standards shall be withdrawn at the latest by December 2018.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 has been prepared under a mandate given to CEN by the European Commission and the European Free Trade Association, and supports essential requirements of EU Directive(s).

For relationship with EU Regulation, see informative Annex ZA, which is an integral part of this document.

In this European Standard, the Annexes A, C and D are normative (not forming part of the product specification) and Annexes E and ZA are informative.

This standard is one of a series of coordinated standards dealing with specification, design, and testing of chimneys, both single and multi wall.

The coordinated package of standards is further divided by material of construction and this European Standard is one of a series of specifications and execution documents dealing with design and installation of concrete chimney products and systems.

The standards in this series for concrete chimney products and systems are:

EN 1857, *Chimneys — Components — Concrete flue liners;*

EN 1858, *Chimneys — Components — Concrete flue blocks;*

EN 12446, *Chimneys — Components — Concrete outer wall elements.*

EN 16497-1, *Chimneys — Concrete system chimneys — Part 1: Non-balanced flue applications*

EN 16497-2, *Chimneys — Concrete system chimneys — Part 2: Balanced flue applications*

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, Serbia, Slovakia, Slovenia, Spain, Sweden, Switzerland, Turkey and the United Kingdom.



## 1 Scope

This European Standard specifies the materials, dimensional and performance requirements for straight concrete system chimneys for balanced flue applications comprising a concrete flue liner and a combustion air supply duct, and a combination of compatible chimney components, which may be concrete flue blocks (see Clause 4), obtained or specified from one manufacturing source with product responsibility for the whole chimney.

The European Standard does not apply to concrete system chimneys with back ventilation.

This European Standard does not cover products designated wet (W) in conjunction with corrosion class 3.

This European Standard also applies to concrete system chimneys constructed from storey-height elements and flue blocks reinforced for handling.

This European Standard does not apply to structurally independent (free standing or self-supporting) system chimneys.

NOTE Any reference to the term flue blocks implies both flue blocks and their fittings, except where otherwise indicated.

## 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 206:2013+A1:2016, *Concrete — Specification, performance, production and conformity*

EN 1443, *Chimneys — General requirements* SIST EN 16497-2:2017

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EN 13216-1, *Chimneys — Test methods for system chimneys — Part 1: General test methods* SIST EN 16497-2:2017

EN 13384-1, *Chimneys — Thermal and fluid dynamic calculation methods — Part 1: Chimneys serving one heating appliance*

EN 14297:2004, *Chimneys — Freeze-thaw resistance test method for chimney products*

CEN/TS 16134:2011, *Chimney terminals — General requirements and material independent test methods*

EN ISO 7500-1:2015, *Metallic materials — Calibration and verification of static uniaxial testing machines — Part 1: Tension/compression testing machines — Calibration and verification of the force-measuring system (ISO 7500-1:2015)*

ISO 2859-1:1999, *Sampling procedures for inspection by attributes — Part 1: Sampling schemes indexed by acceptance quality limit (AQL) for lot-by-lot inspection*

## 3 Terms and definitions

For the purposes of this document, the terms and definitions given in EN 1443 and the following apply.

### 3.1

#### **flue block fitting**

element fitted to the flue block such as an access opening or offset

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## 3.2

**hollow wall flue block**

flue block having vertical cavities

Note 1 to entry: Cavities may pass through both ends of the block.

## 3.3

**manufacturer's declared internal transverse dimension**

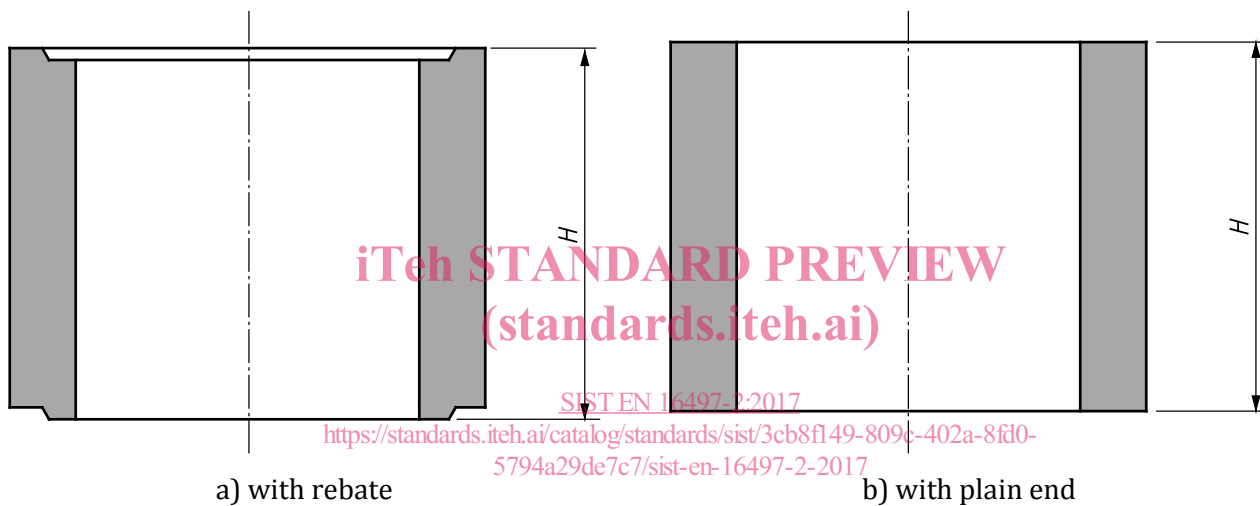
internal dimension of the flue block measured perpendicular to the longitudinal axis

## 3.4

**manufacturer's declared height**

internal height of the flue block

Note 1 to entry: Examples of measurement are shown in Figure 1.

**Key**

$H$  internal height

**Figure 1 — Manufacturer's declared height**

## 3.5

**manufacturer's declared structural height**

maximum constructional height of the flue blocks as declared by the manufacturer

## 3.6

**manufacturer's declared overall wall thickness**

dimensions at its thinnest point, between the inside face of the flue and the outside face of the flue block, not measured at any joint feature

Note 1 to entry: Examples for joint features are spigot/socket end

## 3.7

**multi wall flue block**

flue block consisting of a flue liner and at least one additional wall

**3.8****reinforced flue block**

flue block having reinforcement to assist handling (not for structural stability)

**3.9****solid wall flue block**

flue block without cavities in the thickness of its walls

**3.10****straight flue block**

flue block designed to be used in a vertical section of a chimney, without having any special characteristics and having the ends perpendicular to the axis of the flue

**3.11****storey-height flue block**

factory made flue block having an overall height relating to the floor to floor height of a building

**3.12****transfer block**

flue block designed to facilitate connection to another chimney product

**3.13****concrete**

material formed by mixing cement, aggregate and water and with or without the incorporation of admixtures or additions, which develops its properties by hydration

[SOURCE: EN 206:2013+A1:2016, 3.1.1.1]

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**3.14****precast concrete**

concrete that is cast in a place other than its final location of use

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**3.15****balanced flue chimney system**

System where the air entry to the combustion air supply duct is adjacent to the discharge of combustion products from the flue, the inlet and outlet being so positioned that wind effects are substantially balanced

**4 Form**

The concrete system chimney for balanced flue applications shall comprise of flue blocks, which may be of single wall or multi wall construction, and a combustion air supply duct.

In the context of this standard the term 'flue block' means a vertical element of a system chimney which may also comprise the following items where appropriate.

- Flue blocks according to EN 1858
- Flue liners according to EN 1857
- Insulation layer;
- outer wall elements according to EN 12446, or EN 13069, or of appropriate metal;
- mortar for jointing flue liners;

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- mortar for jointing a flue block or outer wall elements;
- terminal;
- chimney base;
- cladding;
- opening section;
- reinforcement for handling.
- Pressure equalising opening
- Combustion air supply duct.

This duct may be an additional passage within a flue block, or a separate duct, possibly of other materials.

Single wall or multi-wall flue blocks shall be manufactured in one of the following forms:

- single flue;
- multi-flue;
- flue/combustion air/ventilation combination.

NOTE See Annex B for examples of typical flue block types.

Flue blocks shall have a maximum of four flues, combustion air or ventilation passages.

## 5 Materials

### 5.1 General

The wall or walls of concrete flue liners or concrete flue blocks shall be precast concrete. For multiwall concrete flue blocks the concrete liner and outer wall may be separated by an air space or insulation.

The material of a separate combustion air supply duct may be same as the flue liner or flue block or be of other materials, e.g. metal tube, but it shall have the appropriate resistance to fire external to external.

Materials used in the manufacture of system chimneys shall be identified for factory production control purposes.

When insulation forms part of a system chimney, it shall be of bonded material as specified by the manufacturer. If the insulation is supplied as a separate item, it shall be installed in accordance with the system chimney manufacturer's installation instructions.

The manufacturer shall declare the density of any insulation and the bulk density of the concrete elements and when tested to A.11 the density shall be within  $\pm 10\%$  of the declared value (see 8.10).

CE-marked chimney components are deemed to satisfy these requirements.

### 5.2 Reaction to fire

In accordance with Commission Decision 96/603/EC, as amended, concrete elements of system chimneys to this standard are classified as reaction to fire class A1 without test provided they contain

not more than a mass or volume fraction of 1 % (whichever is the more onerous) of homogeneously distributed organic materials.

### 5.3 Reinforcement for handling

**5.3.1** Where a concrete element is reinforced for handling, the reinforcement shall have a maximum diameter of 8 mm and a minimum concrete cover of 15 mm on all sides for temperature classes up to and including T250 and a minimum concrete cover of 20 mm on all sides for all other temperature classes.

**5.3.2** In concrete elements having a bulk density of less than 2 000 kg/m<sup>3</sup>, when measured in accordance with A.10, any reinforcement shall be protected against corrosion by one of the following means:

- a) use of stainless steel;
- b) by completely covering any mild steel reinforcement with a coating (e.g. typically Portland cement CEM I or CEM II mixed with water to form a slurry, or epoxy resin).

CE-marked chimney components are deemed to satisfy these requirements.

## 6 Surface treatment

Any surface treatment of the concrete elements, e.g. render, shall be applied, as described by the product manufacturer, before the product is tested.

## 7 Tolerances on dimensions of individual concrete components

### 7.1 Declared dimensions

CE-marked chimney components according to EN 1857, EN 1858, EN 12446 and EN 16497-1 are deemed to satisfy these requirements.

Tolerances on manufacturer's declared dimensions of concrete components, including taper, shall be:

- a) Declared internal transverse dimensions
  - below 300 mm :  $\pm 3$  mm
  - 300 mm and above :  $\pm 1,5$  %
- b) Declared height
  - below 300 mm :  $\pm 5$  mm
  - 300 mm to 700 mm :  $\pm 7$  mm
  - above 700 mm :  $\pm 10$  mm
- c) Storey height elements constructed from individual blocks
  - Declared height up to 3 m  $\pm 10$  mm
  - Declared height over 3 m  $\pm 30$  mm
- d) Declared overall wall thickness

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|                |   |
|----------------|---|
| below 10 mm    | : $\begin{matrix} +1 \\ -2 \end{matrix}$ mm   |
| 10 mm to 40 mm | : $\begin{matrix} +5 \\ -1,5 \end{matrix}$ mm |
| above 40 mm    | : $\begin{matrix} +12 \\ -5 \end{matrix}$ %   |

The tolerances of other materials e.g. metal ducts shall be according to the relevant chimney standard for that material.

**7.2 Straightness**

**7.2.1** When tested as described in A.2, the limit deviation from straightness of a straight concrete components of manufacturer's declared height greater than 300 mm and less than 1 000 mm shall not be greater than 1 % of the declared height.

**7.2.2** When tested as described in A.2 for concrete components having a manufactured height equal to or greater than 1 000 mm, the limit deviation shall not be greater than 0,5 % of the manufacturers declared height.

**7.3 Squareness of ends**

When tested in accordance with either procedure described in A.1, the test sample shall not touch the upright for the first procedure and the dimension G shall not be greater than 5 mm for the second procedure.

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**8 Performance****8.1 Heat stress resistance**

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**8.1.1** When concrete system chimneys, including those designated soot fire resistant, are tested in accordance with A.3 at the test temperature appropriate to the designation specified in Table 1, the system chimney shall subsequently meet the requirements of 8.4 and 8.5.

When a concrete system chimney is multi-flued with an equal wall thickness, the heat stress test shall be carried out on the flue with the highest designation and temperature.

**8.1.2** The distance to combustible material, xx, shall be declared. The maximum temperature measured on the surface of adjacent combustible materials shall not exceed 85 °C when related to an ambient temperature of 20 °C.

**8.2 Heat shock resistance**

**8.2.1** Following the heat stress resistance test in 8.1, when a concrete system chimney designated as soot fire resistant is tested as described in A.3 at a flue gas temperature of 1 000 °C for a period of 30 min ± 1 min, the block shall subsequently meet the requirements of 8.4 and 8.5.

**8.2.2** The distance to combustible material, xx, shall be declared. The maximum temperature measured on the surface of adjacent combustible materials shall not exceed 100 °C when related to an ambient temperature of 20 °C, when the test assembly is tested at the test temperature of 1 000 °C over a period of 30 min.

**Table 1 — Heat stress test temperature**

| Temperature group | Temperature of flue gas<br>°C   |
|-------------------|---------------------------------|
| T600              | 700 <sup>+50</sup> <sub>0</sub> |
| T450              | 550 <sup>+50</sup> <sub>0</sub> |
| T400              | 500 <sup>+50</sup> <sub>0</sub> |
| T300              | 350 <sup>+35</sup> <sub>0</sub> |
| T250              | 300 <sup>+30</sup> <sub>0</sub> |
| T200              | 250 <sup>+25</sup> <sub>0</sub> |
| T160              | 190 <sup>+19</sup> <sub>0</sub> |
| T140              | 170 <sup>+17</sup> <sub>0</sub> |
| T120              | 150 <sup>+15</sup> <sub>0</sub> |
| T100              | 120 <sup>+12</sup> <sub>0</sub> |
| T080              | 100 <sup>+10</sup> <sub>0</sub> |

### 8.3 Thermal resistance

Thermal resistance of the flue duct shall be measured in accordance with the method given in A.4 (reference method) or calculated in accordance with the method given in Annex C and the value obtained declared.

The value for CE-marked flue block chimney components may be used.

### 8.4 Gas tightness

When tested in accordance with A.5, the gas tightness of the flue duct expressed as a leakage rate of the flue duct shall not be greater than the values specified in Table 4 for the relevant gas tightness class before and after the thermal performance tests.

When tested in accordance with A.5 the gas tightness of the combustion air supply duct expressed as a leakage rate of the combustion air supply duct shall not be greater than the value for N<sub>2</sub> specified in Table 4 before and after the thermal performance tests.

NOTE For factory production control the test sample may be one element.

### 8.5 Abrasion resistance

All flue ducts having satisfied the gas tightness requirements of 8.4, when tested as described in A.6, the weight of the deposit collected shall not exceed the values in Table 2, and shall subsequently meet the gas tightness requirements of 8.4.