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Dimniki - Keramične tuljave - 2. del: Tuljave za delovanje v vlažnih razmerah - Zahteve in preskusne metode

Chimneys - Clay ceramic flue liners - Part 2: Flue liners operating under wet conditions - Requirements and test methods

Abgasanlagen - Keramik-Innenrohre - Teil 2: Innenrohre für Nassbetrieb - Anforderungen und Prüfungen

Conduits de fumée - Conduits intérieurs en terre cuite/céramique - Partie 2 : Exigences et méthodes d'essai pour utilisation en conditions humides

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Chimneys - Clay/ceramic flue liners - Part 2: Flue liners operating under wet conditions - Requirements and test methods

Conduits de fumée - Conduits intérieurs en terre cuite/céramique - Partie 2: Exigences et méthodes d'essai pour utilisation en conditions humides

Abgasanlagen - Keramik-Innenrohre - Teil 2: Innenrohre für den Nassbetrieb - Anforderungen und Prüfungen

This European Standard was approved by CEN on 16 December 2011.

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Foreword

This document (EN 1457-2:2012) 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of an identical text or by endorsement, at the latest by July 2012, and conflicting national standards shall be withdrawn at the latest by July 2012.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 1457:1999.

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 Directive(s), see informative Annex ZA, which is an integral part of this document.

EN 1457 is made of two parts:

— EN 1457-1, *Chimney — Clay/ceramic flue liners — Part 1: Flue liners operating under dry conditions — Requirements and test methods*;

— EN 1457-2, *Chimney — Clay/ceramic flue liners — Part 2: Flue liners operating under wet conditions — Requirements and test methods*.

The main changes with respect to the previous edition are:

EN 1457 has been split in 2 parts: EN 1457-2 is a product standard for clay/ceramic flue liners operating under wet conditions.

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 is a product standard for clay/ceramic flue liners operating under wet conditions with solid walls or walls with vertical perforations for use in the construction of multiwall chimneys and flue pipes which serve to convey products of combustion from fireplaces or heating appliances to the outside atmosphere by negative or positive pressure. It includes the flue liners used for domestic and industrial chimneys which are not structurally independent (free-standing). This European Standard specifies the performance requirements for factory made flue liners and chimney fittings. Testing including thermal testing with or without insulation, marking and inspection are covered by this standard. Flue liners that are specified to this standard will meet the requirements of EN 1457-1 with the same working temperature, pressure, designation and soot fire resistance.

2 Normative references

The following referenced documents are indispensable for the application 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 312, *Particleboards — Specifications*

EN 1443:2003, *Chimneys — General requirements*

EN 10088-1, *Stainless steels — Part 1: List of stainless steels*

EN 13384-1:2002+A2:2008, *Chimneys — Thermal and fluid dynamic calculation methods — Part 1: Chimneys serving one appliance*

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

EN ISO 6946, *Building components and building elements — Thermal resistance and thermal transmittance — Calculation method (ISO 6946)*

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

ISO 2859-1, *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 1443:2003 and the following apply.

3.1
nominal size
numerical designation of size which is a convenient round number equal to or approximately equal to either:

a) the internal diameter of circular flue liners;

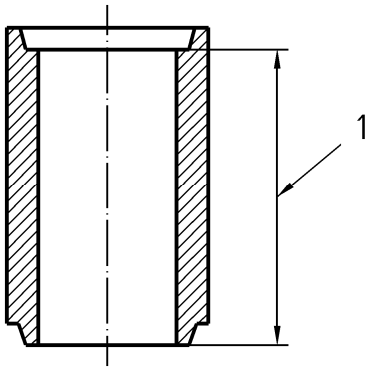
b) the internal width of square flue liners;

c) the internal width and breadth of the cross section of rectangular flue liners

NOTE The nominal length is expressed in millimetres.

3.2
nominal height
numerical designation of the internal height in millimetres of a straight flue liner which is a convenient round number approximately equal to the internal height of the flue liner

NOTE See Figure 1.



Key

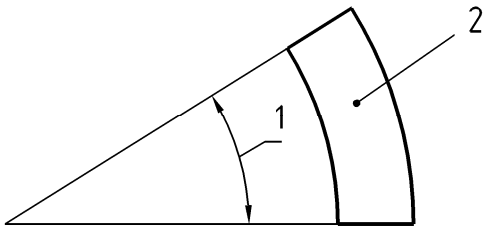
1 internal height

Figure 1 — Internal height

3.3
nominal angle of curvature
angle subtended by a curved flue liner at the centre of the curve

NOTE 1 The nominal angle is expressed in degrees.

NOTE 2 See Figure 2.



Key

1 angle of curvature
2 curved flue liner

Figure 2 — Angle of curvature

3.4
wet operating condition
condition when the chimney is designed to operate normally with the temperature of the inner surface of the flue liner at and below the water dew point

3.5
dry operating condition
condition when the chimney is designed to operate normally with the temperature of the inner surface of the flue liner above the water dew point

4 Flue liners and openings

4.1 Flue liner cross-sections

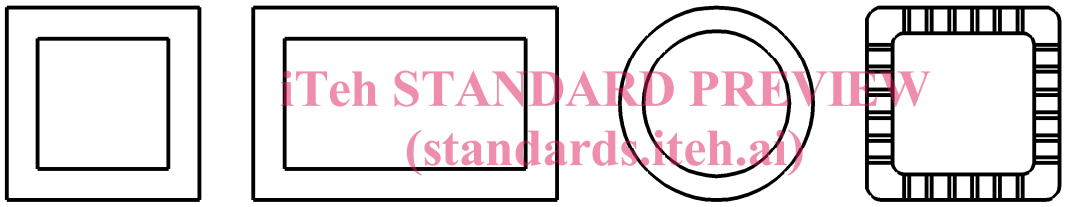
Flue liners shall be either:

a) circular or square in cross-section with rebated or spigot and socket ends;

b) square or rectangular in cross-section with rebated ends and rounded internal corners;

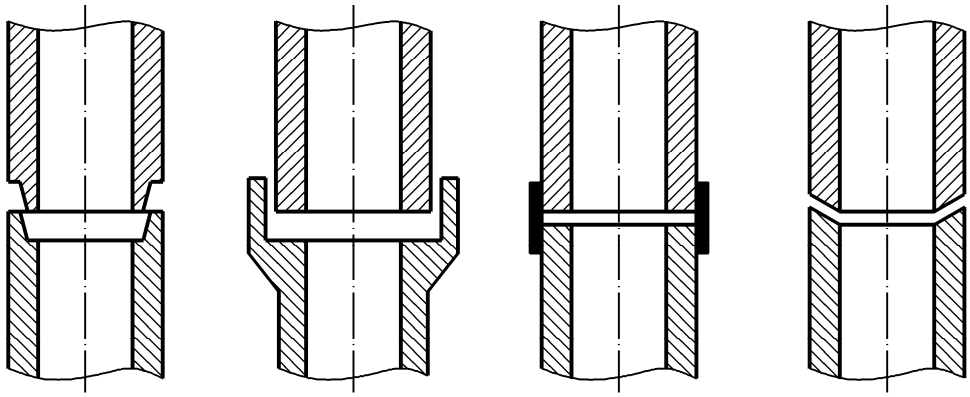
c) circular, square or rectangular in cross-section with butt joints and jointed with a sleeve;

d) circular or square in cross-section with taper joints.



a) Square **b) Rectangular** **c) Circular** **d) Wall with vertical perforations**

Figure 3 — Examples of cross-section configuration



a) Rebated b) Spigot & socket c) Sleeve d) Tapered

Figure 4 — Joint configuration

4.2 Inspection openings and chimney junctions

Inspection openings are used for inspection and cleaning of the inner liners of chimneys and for soot removal and shall meet the requirements of flue liners as appropriate.

All inspection openings shall have a door.

The inspection opening shall have a door with a separate humidity barrier or have two sheets.

Chimney junctions are used to connect flues from heat appliances to chimneys. Chimney junctions are purpose-made tee-pieces or inner liner sections with an opening to which branches are fitted. The branch angles can be 45° to 95° (α in Figure 5). At the position of junctions, the outer walls have corresponding openings.

Chimney junctions should have the same cross-sectional area as the flue liner. Reductions and expansions are acceptable provided that the resistance to the exhaust gases is not increased.

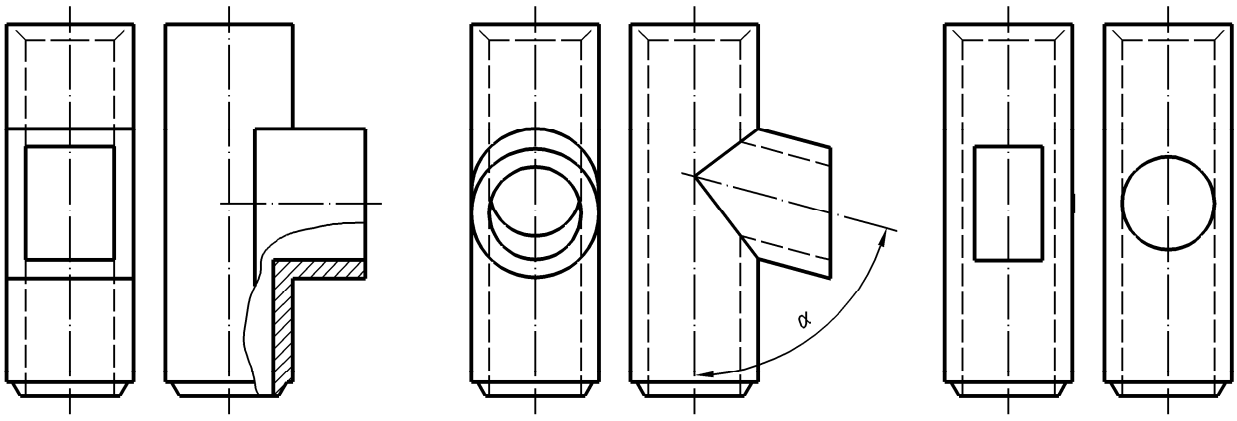


Figure 5 — Examples of inspection openings and chimney junctions

5 Types of flue liner

There are four main types of clay/ceramic flue liner dependent on working temperature, with sub-classes dependent on whether the flue liners are to be used in chimneys designed to work under negative or positive pressure or are to have soot fire resistance. A non exhaustive list abbreviated designations for flue liners according temperature, pressure, soot fire resistance and condensate resistance is given in Table 1. The suitability of each type of flue liner to be used in chimneys designed to operate under negative or positive pressure and wet conditions is also given.

NOTE A flue liner can be designated in one or more types provided that it complies with the appropriate requirements for each type.

Table 1 — Types of clay/ceramic flue liners, conditions of use, air test pressures and maximum leakage rates after thermal testing for operating under wet conditions

Types of flue liner	Temperature class	Pressure class	Soot fire resistance class	Test pressure Pa	Permitted leakage rate $m^3\ s^{-1}\ m^{-2} \cdot 10^{-3}$
A3 N2	600	Negative	Yes (G)	20	3
A3 N1	600	Negative	Yes (G)	40	2
A3 P1	600	Positive	Yes (G)	200	0,006
A4 N2	600	Negative	No (O)	20	3
A4 N1	600	Negative	No (O)	40	2
A4 P1	600	Positive	No (O)	200	0,006
B3 N2	400	Negative	Yes (G)	20	3
B3 N1	400	Negative	Yes (G)	40	2
B3 P1	400	Positive	Yes (G)	200	0,006
B4 N2	400	Negative	No (O)	20	3
B4 N1	400	Negative	No (O)	40	2
B4 P1	400	Positive	No (O)	200	0,006
C4 N2	300	Negative	No (O)	20	3
C4 N1	300	Negative	No (O)	40	2
C4 P1	300	Positive	No (O)	200	0,006
D4 N2	200	Negative	No (O)	20	3
D4 N1	200	Negative	No (O)	40	2
D4 P1	200	Positive	No (O)	200	0,006

6 Materials

Flue liners shall be manufactured from suitable clay/ceramic material which, when fired, meet the performance requirements given in this standard.

Flue liners may be unglazed or glazed on the interior and/or exterior. When glazed, they need not be glazed on the jointing surfaces.

7 Tolerances on dimensions

7.1 Transverse dimension

When tested in accordance with 16.1, the internal diameter of circular flue liners measured on any diameter shall not deviate more than ± 3 % of the manufacturer's stated nominal internal diameter.

The internal width or breadth of square or rectangular section flue liners shall not deviate more than ± 3 % of the manufacturer's stated nominal internal length of the side.

7.2 Height

When tested in accordance with 16.2, the height of a flue liner shall not deviate more than ± 3 % on the manufacturer's stated nominal height subject to a maximum value of 20 mm.

7.3 Angle of curvature

When tested in accordance with 16.3, the angle of curvature of curved flue liners shall not deviate more than ± 5° on the manufacturer's stated nominal curvature.

7.4 Straightness

When tested in accordance with 16.4, the permissible deviation from straightness of straight flue liners shall be 1 % of the test length.

7.5 Squareness of ends

When tested in accordance with 16.5, the permissible deviation from square of the ends of straight flue liners, shall be not greater than an angle of slope 30 mm/m.

7.6 Deviation from shape of cross section

When tested in accordance with 16.6, the permissible deviation from square of the angles of, and flatness of walls for square or rectangular shape straight flue liners, shall be not greater than 5 % of the manufacturer's stated nominal internal width or breadth.

7.7 Geometry of joints

The design and dimensions of the joints shall be as specified by the manufacturer to provide an adequate joint.

8 Proof load

8.1 Straight flue liners

When tested in accordance with 16.7, straight flue liners shall withstand an intensity of loading of 10 MN/m^2.

8.2 Curved flue liners

Where curved flue liners are fired in a plant alongside straight flue liners, using the same materials and firing process, the proof load of these curved flue liners is deemed to be that of the straight flue liners when tested in accordance with 16.7.

If curved flue liners are not normally fired alongside straight flue liners, straight flue liners or short lengths of straight flue liners made for test purposes, using the same materials and firing process as for curved flue liners, shall be tested for compliance with the requirements of 8.1.

8.3 Minimum load for inspection opening sections

When tested in accordance with 16.7, the minimum load of inspection opening sections shall be as given in Table 2.

Table 2 — Minimum load

Height of chimney in m	Minimum load in kN
≤12,5	25
> 12,5 ≤ 25	50
> 25 ≤ 50	100

For chimneys with area greater than 0,04 m^2 the following equation shall be used:

$$F = \chi \cdot H \cdot G/100$$

where

F is the minimum load in kilonewtons;

χ is the safety factor = 5;

H is the height of chimney in metres;

G is the weight per metre in kilograms per metre.

9 Gas tightness/leakage, thermal shock resistance and soot fire resistance for straight flue liners

9.1 Initial test

Prior to thermal testing a test flue constructed in accordance with 16.8.3 with N1 and N2 liners shall have a leakage rate not greater than 2 $m^3\ s^{-1}\ m^{-2} \times 10^{-3}$ of internal surface area tested at a differential pressure of (40 ± 2) Pa when tested as described in 16.8.5.

Prior to thermal testing a test flue constructed in accordance with 16.8.3 with P1 liners shall have a leakage rate not greater than 0,006 $m^{3\cdot}\ s^{-1}\ m^{-2\cdot}\ 10^{-3}$ of internal surface area tested at a differential pressure of (200 ± 10) Pa when tested as described in 16.8.5.

Where chimney fittings are fired in a plant alongside straight flue liners using the same material and firing process, the gas tightness/leakage, thermal shock resistance and soot fire resistance shall be deemed to be that of straight flue liners when tested in accordance with 16.8.3.

If the chimney fittings are not normally fired alongside straight flue liners, straight flue liners or short lengths of straight flue liner shall be made for test purposes using the same material and firing process as for chimney fittings shall be tested for complying with 9.2.1.

9.2 Final gas tightness after testing

9.2.1 General

When flue liners are tested for sootfire resistance, thermal shock testing need not be carried out.

9.2.2 Final gas tightness after sootfire testing

When tested in accordance with 16.8, flue liners A3, B3 shall have a leakage rate after sootfire testing not greater than the values given in Table 3 for the appropriate type of flue liner, test temperature and differential pressure. Flue liners shall be tested with insulation as described in 16.8.3 or they shall be tested without insulation. If they are tested with insulation, liners shall be marked "i". If tested without insulation, liners shall be marked "i".

The precision for the appropriate testing differential pressure is that given in 9.1.

9.2.3 Final gas tightness after thermal shock testing

When tested in accordance with 16.8 flue liners not included in 9.2 shall have a leakage rate after thermal shock testing not greater than the values given in Table 3 for the appropriate type of flue liner, test temperature and differential pressure. Flue liners shall be tested with insulation as described in 16.8.3 or they shall be tested without insulation. If they are tested without insulation they shall be marked accordingly.

Table 3 — Test temperature, test pressure and leakage rates

Type of flue liner	Test temperature °C	Test Pressure Pa	Permitted leakage rate $m^3\ s^{-1}\ m^{-2} \cdot 10^{-3}$
A3 N2	1 000	20	3
A3N1	1 000	40	2
A3 P1	1 000	200	0,006
A4 N2	700	20	3
A4N1	700	40	2
A4 P1	700	200	0,006
B3 N2	1 000	20	3
B3 N1	1 000	40	2
B3 P1	1000	200	0,006
B4 N2	500	20	3
B4 N1	500	40	2
B4 P1	500	200	0,006
C4 N2	350	20	3
C4 N1	350	40	2
C4 P1	350	200	0,006
D4 N2	250	20	3
D4 N1	250	40	2
D4 P1	250	200	0,006