

SLOVENSKI STANDARD
oSIST prEN 1457-1:2016
01-november-2016

Dimovodne naprave - Keramične tuljave - 1. del: Tuljave za delovanje v suhih razmerah - Zahteve in preskusne metode

Chimney - Clay/ceramic flue liners - Part 1: Flue liners operating under dry conditions - Requirements and test methods

Abgasanlagen - Keramik-Innenrohre - Teil 1: Innenrohre für den Trockenbetrieb - Anforderungen und Prüfungen

Conduits de cheminée - Conduits intérieurs en terre cuite/céramique - Partie 1 : Exigences et méthodes d'essai pour utilisation en conditions sèches

<https://standards.iteh.ai/catalog/standards/sist/d6c7ddb4-60c8-4d67-822e-8dd7ef7b0a21/ksist-pr-en-1457-1-2016>

Ta slovenski standard je istoveten z: prEN 1457-1

ICS:

91.060.40

Dimniki, jaški, kanali

Chimneys, shafts, ducts

oSIST prEN 1457-1:2016

en,fr,de

iTeh STANDARD PREVIEW (standards.iteh.ai)

[ksIST FprEN 1457-1:2018](https://standards.iteh.ai/catalog/standards/sist/d6c7ddb4-60c8-4d67-822e-8dd7ef7b0a21/ksist-fpren-1457-1-2018)

<https://standards.iteh.ai/catalog/standards/sist/d6c7ddb4-60c8-4d67-822e-8dd7ef7b0a21/ksist-fpren-1457-1-2018>

EUROPEAN STANDARD
NORME EUROPÉENNE
EUROPÄISCHE NORM

DRAFT
prEN 1457-1

September 2016

ICS 91.060.40

Will supersede EN 1457-1:2012

English Version

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

Conduits de cheminée - Conduits intérieurs en terre
cuite/céramique - Partie 1 : Prescriptions et méthodes
d'essai pour utilisation en conditions sèches

Abgasanlagen - Keramik-innenrohre - Teil 1:
Innenrohre für Trockenbetrieb - Anforderungen und
Prüfungen

This draft European Standard is submitted to CEN members for enquiry. It has been drawn up by the Technical Committee CEN/TC 166.

If this draft becomes a European Standard, 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.

This draft European Standard was established by CEN in three official versions (English, French, German). A version in any other language made by translation under the responsibility of a CEN member into its own language and notified to the CEN-CENELEC Management Centre has the same status as the official versions.

CEN members are the national standards bodies of 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 United Kingdom.

Recipients of this draft are invited to submit, with their comments, notification of any relevant patent rights of which they are aware and to provide supporting documentation.

Warning : This document is not a European Standard. It is distributed for review and comments. It is subject to change without notice and shall not be referred to as a European Standard.



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

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

Contents	Page
European foreword.....	5
1 Scope	6
2 Normative references	6
3 Terms and definitions	6
4 Flue liners and openings	8
4.1 Flue liner cross-sections	8
4.2 Inspection openings and chimney junctions	9
5 Types of flue liner	9
6 Materials.....	10
7 Tolerances on dimensions.....	10
7.1 Transverse dimension.....	10
7.2 Height	10
7.3 Angle of curvature.....	11
7.4 Straightness.....	11
7.5 Squareness of ends.....	11
7.6 Deviation from shape of cross section.....	11
7.7 Geometry of joints.....	11
8 Proof load.....	11
8.1 Straight flue liners	11
8.2 Curved flue liners	11
8.3 Minimum load for inspection opening sections.....	11
9 Gas tightness /leakage, thermal resistance and soot fire resistance for straight flue liners	12
9.1 Initial test.....	12
9.2 Final gas tightness after testing	12
9.2.1 General.....	12
9.2.2 Final gas tightness after sootfire testing.....	12
9.2.3 Final gas tightness after thermal shock testing	12
10 Durability	13
10.1 Corrosion resistance	13
10.2 Freeze/Thaw resistance	13
11 Water absorption and bulk density.....	13
11.1 General.....	13
11.2 Water absorption	13
11.3 Bulk density	14
12 Abrasion resistance.....	14
13 Flow resistance	14
14 Thermal resistance.....	14
15 Assessment and verification of constancy of performance – AVCP.....	14
15.1 General.....	14
15.2 Type testing.....	14

15.2.1	General	14
15.2.2	Test samples, testing and compliance criteria	15
15.2.3	Test reports	16
15.2.4	Shared other party results	16
15.2.5	Cascading determination of the product type results	17
15.3	Factory production control (FPC)	18
15.3.1	General	18
15.3.2	Requirements	18
15.3.3	Product specific requirements	21
15.3.4	Initial inspection of factory and of FPC	22
15.3.5	Continuous surveillance of FPC	22
15.3.6	Procedure for modifications	23
15.3.7	One-off products, pre-production products (e.g. prototypes) and products produced in very low quantity	23
16	Test methods	24
16.1	Size	24
16.2	Height	24
16.3	Angle of curvature	24
16.4	Straightness	24
16.5	Squareness of ends	25
16.6	Deviation from shape of cross-section	26
16.7	Proof load	28
16.7.1	Test specimen	28
16.7.2	Testing equipment	28
16.7.3	Test procedure	28
16.8	Thermal testing	29
16.8.1	Test flue	29
16.8.2	Test equipment	30
16.8.3	Assembly of test flue	31
16.8.4	Thermal conditioning	31
16.8.5	Measurement of leakage rate	32
16.8.6	Expression of results	32
16.9	Corrosion resistance	32
16.9.1	Test specimens	32
16.9.2	Test equipment	33
16.9.3	Test procedure	33
16.9.4	Expression of results	34
16.10	Water absorption	34
16.10.1	Test specimen	34
16.10.2	Test equipment	34
16.10.3	Test procedure	34
16.10.4	Expression of results	34
16.11	Bulk density	34
16.11.1	Test specimen	34
16.11.2	Test procedure	35
16.11.3	Expression of results	35
16.12	Abrasion resistance	35
16.12.1	Test flue	35
16.12.2	Test equipment	35
16.12.3	Test procedure	36
16.12.4	Expression of results	36
17	Designation	37

prEN 1457-1:2016 (E)

18	Marking.....	38
19	Release of dangerous substances.....	38
	Annex A (normative) Sampling procedures for an AQL of 10 % and inspection level S2	39
A.1	Acceptability determination	39
A.1.1	Single sampling.....	39
A.1.2	Double sampling.....	39
A.2	Normal inspection.....	39
A.3	Normal to reduced inspection	40
A.4	Reduced to normal inspection.....	41
A.5	Tightened inspection	41
A.6	Tightened to normal inspection	41
A.7	Discontinuation of inspection	41
	Annex B (normative) Thermal resistance	42
B.1	Method 1: simplified calculation for flue liners without cavities.....	42
B.2	Method 2: thermal resistance of flue liners with or without cavities	42
B.2.1	General.....	42
B.2.2	Data	43
B.2.2.1	Thermal properties of the material.....	43
B.2.2.2	Boundary conditions.....	44
B.2.3	Specific conditions for the cavities	44
B.2.3.1	General.....	44
B.2.3.2	Heat transmitted by conduction-convection in the air	45
B.2.3.3	Heat transmitted by radiation.....	46
B.2.3.4	Equivalent thermal conductivity.....	46
B.2.4	Calculations.....	47
B.2.4.1	General.....	47
B.2.4.2	Numerical resolution.....	47
B.3	Method Approximate thermal resistance values	47
	Annex C (normative) Measurement of the coefficient of friction of chimneys	48
	Annex D (informative) Comparison with designation given in EN 1443:2003.....	50
	Annex ZA (informative) Relationship of this European Standard with Regulation (EU) No.305/2011.....	51
ZA.1	Scope and relevant characteristics.....	51
ZA.2	System of Assessment and Verification of Constancy of Performance (AVCP)	52
ZA.3	Assignment of AVCP tasks	52
	Bibliography.....	54

ITEH STANDARD PREVIEW
(standards.iteh.ai)

KSIST prEN 1457-1:2016

<https://standards.iteh.ai/catalog/standards/sist/d6c7ddb4-60c8-4d67-822e-8dd7ef7b0a21/ksist-pr-en-1457-1-2018>

European foreword

This document (prEN 1457-1:2016) has been prepared by Technical Committee CEN/TC 166 “Chimney”, the secretariat of which is held by ASI.

This document is currently submitted to the CEN Enquiry.

This document will supersede EN 1457-1:2012.

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:

- New Clause 15: Assessment and verification of constancy of performance – AVCP
- New Annex ZA: Relationships of this European Standard with Regulation (EU) n°305/2011

<https://standards.iteh.ai/catalog/standards/sist/doc/ddb4-60c8-4d67-822e-8dd7ef7b0a21/ksist-fpren-1457-1-2018>

1 Scope

This European Standard is a product standard for clay/ceramic flue liners operating under dry 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. This part does not cover flue liners operating under wet conditions.

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 312, *Particleboards - Specifications*

EN 1443:2003, *Chimneys - General requirements*

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

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 - 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)*

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:

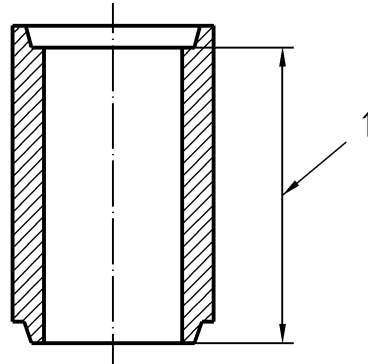
- a) the internal diameter in millimetres of circular flue liners;
- b) the internal width in millimetres of square flue liners;
- c) the internal width and breadth in millimetres of the cross section of rectangular flue liners

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 1 to entry: See Figure 1.



Key

1 internal height

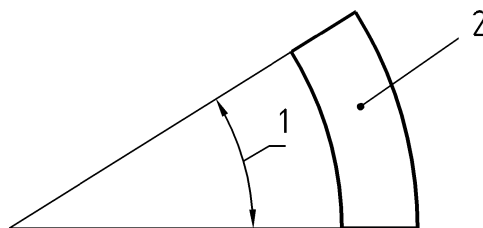
Figure 1 — Internal height
(standards.iteh.ai)

3.3

nominal angle of curvature

angle subtended in degrees by a curved flue liner at the centre of the curve

Note 1 to entry: 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 inner liner 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 inner liner 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:

- circular or square in cross-section with rebated or spigot and socket ends;
- square or rectangular in cross-section with rebated ends and rounded internal corners;
- circular, square or rectangular in cross-section with butt joints and jointed with a sleeve;
- circular or square in cross-section with taper joints.

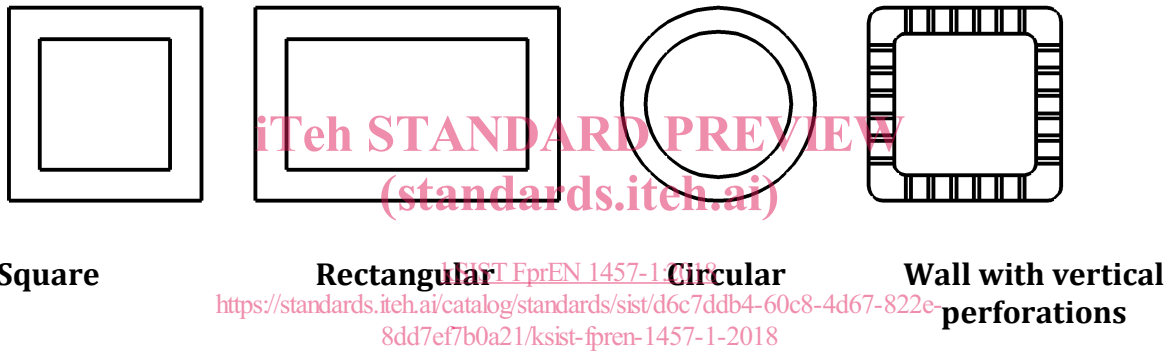


Figure 3 — Examples of cross-section configuration

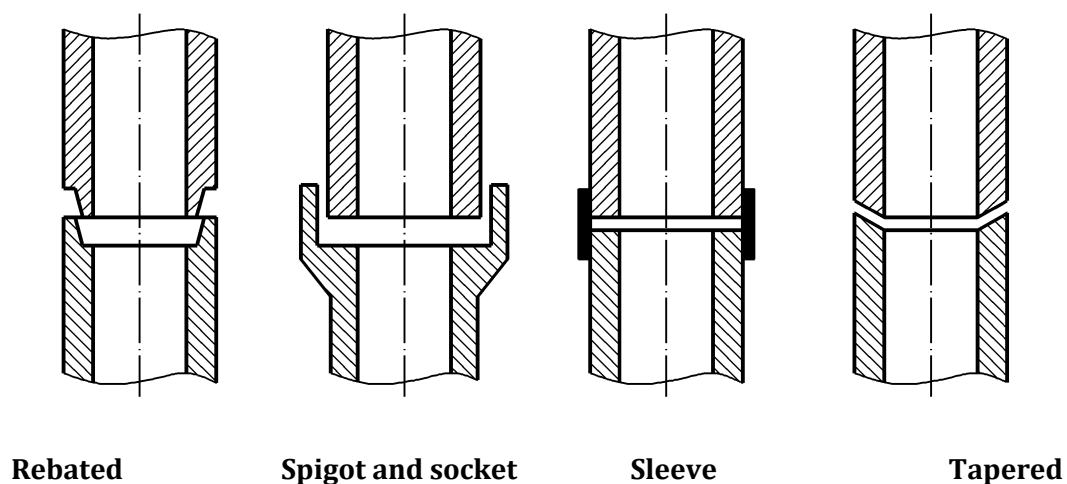


Figure 4 — Joint configuration

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.

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.

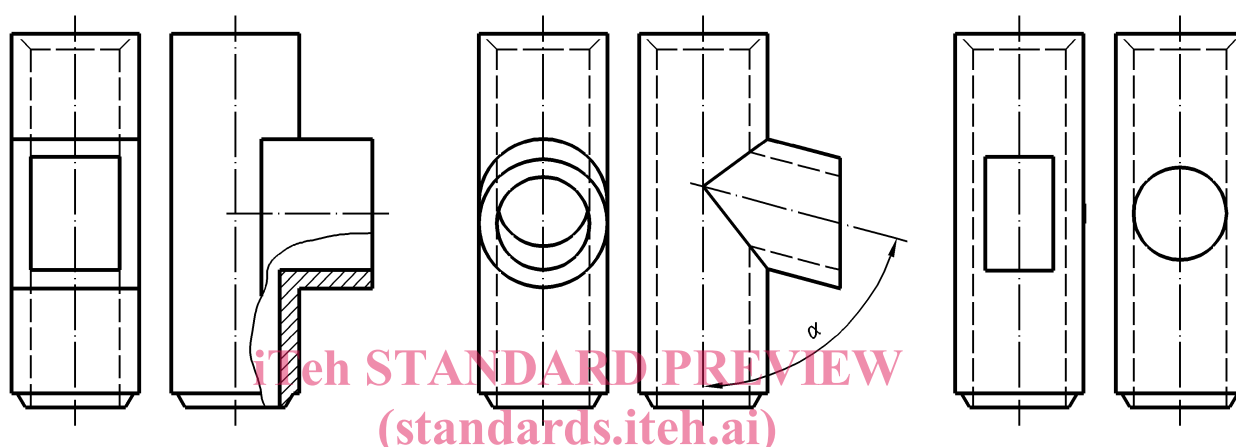


Figure 5 — Examples of inspection openings and chimney junctions

<https://standards.iteh.ai/catalog/standards/sist/d6c7ddb4-60c8-4d67-822e-8dd7ef7b0a21/ksist-fpren-1457-1-2018>

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. The types, working temperatures, test pressures and maximum leakage rates are 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 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 operating under dry conditions, air test pressures and maximum leakage rates after thermal testing

Types of flue liner	Temperature Class	Pressure Class	Soot fire resistance Class	Test pressure Pa	Maximum leakage rate $\text{m}^3 \text{s}^{-1} \text{m}^{-2} \cdot 10^{-3}$
A1 N ₂	600	Negative	Yes (G)	20	3
A1 N1	600	Negative	Yes (G)	40	2
A2 N ₂	600	Negative	No (O)	20	3
A2 N1	600	Negative	No (O)	40	2
A2 P1	600	Positive	No (O)	200	0,006
B1 N ₂	400	Negative	Yes (G)	20	3
B1 N1	400	Negative	Yes (G)	40	2
B2 N ₂	400	Negative	No (O)	20	3
B2 N1	400	Negative	No (O)	40	2
B2 P1	400	Positive	No (O)	200	0,006
C2 N ₂	300	Negative	No (O)	20	3
C2 N1	300	Negative	No (O)	40	2
C2P1	300	Positive	No (O)	200	0,006
D1 N ₂	200	Negative	No (O)	20	3
D1 N1	200	Negative	No (O)	40	2
D1 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 European 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 $\pm 3 \%$ 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 $\pm 3 \%$ 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 $\pm 3 \%$ 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 $\pm 5^\circ$ 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/m².

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

The maximum height of the chimney shall be determined and declared according to the test described in 16.7.

The following equation shall be used:

$$F = \chi \cdot H \cdot G / 100 \quad (1)$$

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.

iTeh STANDARD PREVIEW
(standards.iteh.ai)

ksist prEN 1457-1:2018
https://standards.iteh.ai/catalog/standards/sist/00c7adb7-60c8-4d07-822c-8dd7ef7b0a21/ksist-prEN-1457-1-2018

9 Gas tightness /leakage, thermal 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 $2 \text{ m}^3 \text{ s}^{-1} \cdot \text{m}^{-2} \times 10^{-3}$ of internal surface area tested at a differential pressure of $(40 \pm 2) \text{ Pa}$ 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 $0,006 \text{ m}^3 \cdot \text{s}^{-1} \cdot \text{m}^{-2} \times 10^{-3}$ of internal surface area tested at a differential pressure of $(200 \pm 10) \text{ Pa}$ 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 soot fire 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 A1 and B1 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 without insulation they shall be marked accordingly.

If they are tested with insulation, declare “tested with insulation” i ;

If they are tested without insulation, declare “tested without insulation” 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 2 — Test temperature, test pressure and leakage rates

Type of flue liner	Test temperature °C	Test pressure Pa	Maximum leakage rate $\text{m}^3 \cdot \text{s}^{-1} \cdot \text{m}^{-2} \cdot 10^{-3}$
A1 N ₂	1 000	20	3
A1 N1	1 000	40	2
A2 N ₂	700	20	3
A2 N1	700	40	2
A2 P1	700	200	0,006
B1 N ₂	1 000	20	3
B1 N1	1 000	40	2
B2 N ₂	500	20	3
B2 N1	500	40	2
B2 P1	500	200	0,006
C2 N ₂	350	20	3
C2 N1	350	40	2
C2 P1	350	200	0,006
D1 N ₂	250	20	3
D1 N1	250	40	2
D1 P1	250	200	0,006

10 Durability

10.1 Corrosion resistance

When tested in accordance with 16.9, the mass loss from any test piece shall not exceed a mass loss of 5 %.

NOTE This is an accelerated test to represent a corrosion resistance and practical installed life of at least 100 years.

10.2 Freeze/Thaw resistance

Where national regulations require freeze/thaw resistance of flue liners, they shall be tested according to EN 14297. The product shall not present any damage of type 7, 8, 9 and 10 in accordance with EN 14297:2004, Table 1.

11 Water absorption and bulk density

11.1 General

The flue liner body shall be tested for either water absorption or bulk density for production control.

11.2 Water absorption

When tested in accordance with 16.10, the mean water absorption values expressed as a percentage of five samples shall not vary more than $\pm 2,5$ % from the mean value obtained from the last type test.