

This document is a preview generated by EVS

Fire resistance tests for service installations - Part 8:  
Smoke extraction ducts

## EESTI STANDARDI EESSÕNA

## NATIONAL FOREWORD

<p>See Eesti standard EVS-EN 1366-8:2024 sisaldab Euroopa standardi EN 1366-8:2024 ingliskeelset teksti.</p> <p>Standard on jõustunud sellekohase teate avaldamisega EVS Teatajas.</p> <p>Euroopa standardimisorganisatsioonid on teinud Euroopa standardi rahvuslikele liikmetele kättesaadavaks 16.10.2024.</p> <p>Standard on kättesaadav Eesti Standardimis- ja Akrediteerimiskeskusest.</p>	<p>This Estonian standard EVS-EN 1366-8:2024 consists of the English text of the European standard EN 1366-8:2024.</p> <p>This standard has been endorsed with a notification published in the official bulletin of the Estonian Centre for Standardisation and Accreditation.</p> <p>Date of Availability of the European standard is 16.10.2024.</p> <p>The standard is available from the Estonian Centre for Standardisation and Accreditation.</p>
--	---

Tagasisidet standardi sisu kohta on võimalik edastada, kasutades EVS-i veebilehel asuvat tagasiside vormi või saates e-kirja meiliaadressile [standardiosakond@evs.ee](mailto:standardiosakond@evs.ee).

ICS 13.220.20, 13.220.50

Standardite reprodutseerimise ja levitamise õigus kuulub Eesti Standardimis- ja Akrediteerimiskeskusele. Andmete paljundamine, taastekitamine, kopeerimine, salvestamine elektroonsesse süsteemi või edastamine ükskõik millises vormis või millisel teel ilma Eesti Standardimis- ja Akrediteerimiskeskuse kirjaliku loata on keelatud.

Kui Teil on küsimusi standardite autorikaitse kohta, võtke palun ühendust Eesti Standardimis- ja Akrediteerimiskeskusega: Koduleht [www.evs.ee](http://www.evs.ee); telefon 605 5050; e-post [info@evs.ee](mailto:info@evs.ee)

The right to reproduce and distribute standards belongs to the Estonian Centre for Standardisation and Accreditation. No part of this publication may be reproduced or utilized in any form or by any means, electronic or mechanical, including photocopying, without a written permission from the Estonian Centre for Standardisation and Accreditation.

If you have any questions about copyright, please contact Estonian Centre for Standardisation and Accreditation: Homepage [www.evs.ee](http://www.evs.ee); phone +372 605 5050; e-mail [info@evs.ee](mailto:info@evs.ee)

EUROPEAN STANDARD

EN 1366-8

NORME EUROPÉENNE

EUROPÄISCHE NORM

October 2024

ICS 13.220.20; 13.220.50

Supersedes EN 1366-8:2004

English Version

## Fire resistance tests for service installations - Part 8: Smoke extraction ducts

Essais de résistance au feu des installations techniques  
- Partie 8 : Conduits d'extraction de fumées

Feuerwiderstandsprüfungen für Installationen - Teil 8:  
Entrauchungsleitungen

This European Standard was approved by CEN on 2 September 2024.

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.

This European Standard exists 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, France, Germany, Greece, Hungary, Iceland, Ireland, Italy, Latvia, Lithuania, Luxembourg, Malta, Netherlands, Norway, Poland, Portugal, Republic of North Macedonia, Romania, Serbia, Slovakia, Slovenia, Spain, Sweden, Switzerland, Türkiye and United Kingdom.



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

CEN-CENELEC Management Centre: Rue de la Science 23, B-1040 Brussels

<b>Contents</b>		<b>Page</b>
European foreword .....		5
Introduction .....		7
1	Scope.....	8
2	Normative references.....	8
3	Terms and definitions.....	9
4	Test equipment.....	10
4.1	General.....	10
4.2	Furnace .....	10
4.3	Perforated plate .....	10
4.4	Air velocity measuring station .....	11
4.5	Ambient temperature leakage measuring device.....	11
4.6	Pressure sensors for differential pressure control .....	11
4.7	Welded connecting duct .....	12
4.8	Extraction fan .....	12
4.9	Thermocouples.....	12
4.10	Surface thermocouples .....	12
4.11	Oxygen measuring equipment .....	12
4.12	Oxygen measurement probes.....	12
4.13	Restraining equipment.....	12
4.14	Deflection measurements.....	13
5	Test conditions .....	13
6	Test specimen .....	13
6.1	Size .....	13
6.1.1	General.....	13
6.1.2	Length.....	13
6.1.3	Cross-section .....	13
6.2	Number .....	13
6.3	Design.....	14
6.3.1	General.....	14
6.3.2	Openings in duct.....	14
6.3.3	Joints in horizontal ducts .....	14
6.3.4	Joints in vertical ducts.....	14
6.3.5	Support for vertical ducts .....	14
6.3.6	Compensators .....	15
6.3.7	Access panels.....	15
7	Installation of test specimen.....	15
7.1	General.....	15
7.2	Standard supporting construction .....	15
7.3	Restraint of ducts.....	15
7.3.1	Inside the furnace .....	15
7.3.2	Outside the furnace.....	16
8	Conditioning .....	16
8.1	General.....	16

8.2	Water-based sealing materials.....	16
9	Application of instrumentation.....	16
9.1	Thermocouples.....	16
9.1.1	Furnace thermocouples (plate thermometers).....	16
9.1.2	Unexposed surface thermocouples.....	16
9.1.3	Measurement of gas temperature adjacent to nozzles.....	16
9.2	Pressure.....	16
9.2.1	Furnace pressure.....	16
9.2.2	Under-pressure in duct.....	17
9.3	Oxygen measurements.....	17
9.4	Deflection measurement for determination of reduction in internal cross-sectional area.....	17
10	Test procedure.....	18
10.1	General.....	18
10.2	Pre-test adjustment of the perforated plate.....	19
10.3	Test at ambient temperature.....	19
10.4	Pre-fire test procedures.....	19
10.5	Fire test.....	20
11	Performance criteria.....	21
11.1	General requirements.....	21
11.2	Criteria at ambient temperature.....	22
11.2.1	Ambient leakage.....	22
11.2.2	Reduction in internal cross-sectional area under ambient conditions outside the furnace.....	22
11.3	Criteria under fire conditions.....	22
11.3.1	General.....	22
11.3.2	Integrity.....	23
11.3.3	Insulation.....	23
11.3.4	Smoke-Leakage.....	23
12	Test report.....	23
13	Field of direct application of test results.....	24
13.1	General.....	24
13.2	Vertical and horizontal ducts.....	24
13.3	Sizes of ducts.....	24
13.4	Supporting construction.....	25
13.5	Steel ducts.....	25
Annex A	(normative) Measurement of volume/mass flow.....	42
A.1	Hints on measuring volume flow or mass flow with differential pressure devices.....	42
A.2	Density.....	42
A.3	Absolute pressure (barometric pressure).....	43
A.4	Viscosity.....	43
A.5	Characteristic data of the inlet nozzles according to Figure 7 of this standard.....	44
Annex B	(informative) Measurement of oxygen concentration Details on measuring oxygen concentration with paramagnetic cell analysers.....	47
B.1	General.....	47
B.2	Choice of O <sub>2</sub> measuring devices.....	47

<b>B.3</b>	<b>Effect of O<sub>2</sub> measuring device errors .....</b>	<b>48</b>
<b>B.4</b>	<b>Zero and end point drift .....</b>	<b>48</b>
<b>Annex C</b>	<b>(informative) The usage of correction factors for the consideration of different parameters.....</b>	<b>51</b>
<b>C.1</b>	<b>Details for the development of the correction factors and their error limits.....</b>	<b>51</b>
<b>C.2</b>	<b>The complete formula for the leakage mass flow and the parameters.....</b>	<b>51</b>
<b>C.3</b>	<b>Application of correction factors in the simple mass flow formulae and achievable accuracy .....</b>	<b>54</b>
<b>Annex D</b>	<b>(normative) Method for testing air leakage post fire test when the oxygen measuring system indicates a failure (after corrections) .....</b>	<b>56</b>
<b>D.1</b>	<b>General purpose of Annex D .....</b>	<b>56</b>
<b>D.2</b>	<b>Presumptions for conducting post fire leakage test .....</b>	<b>56</b>
<b>D.3</b>	<b>Undertaking the air leakage test.....</b>	<b>57</b>
<b>Bibliography</b>	<b>.....</b>	<b>58</b>

## European foreword

This document (EN 1366-8:2024) has been prepared by Technical Committee CEN/TC 127 “Fire safety in buildings”, the secretariat of which is held by BSI.

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 April 2025, and conflicting national standards shall be withdrawn at the latest by April 2025.

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 1366-8:2004.

In comparison with the previous edition, the following technical modifications have been made:

- method for determination of reduction in internal cross-sectional area is added;
- positions for measurement of deflection of cross-section outside furnace are defined;
- introduction of an alternative oxygen sampling probe;
- use of two separate O<sub>2</sub> analysers based on paramagnetic measurement method for the two sampling points is mandatory;
- accuracy of ambient leakage measuring device revised from  $\pm 5\%$  to  $\pm 2,5\%$ ;
- standard for gas temperature thermocouples added;
- failure criteria for mechanical stability of duct inside furnace defined.

This document has been prepared under a standardization request addressed to CEN by the European Commission. The Standing Committee of the EFTA States subsequently approves these requests for its Member States.

EN 1366, *Fire resistance tests for service installations* consists of the following parts:

- *Part 1: Ventilation ducts;*
- *Part 2: Fire dampers;*
- *Part 3: Penetration seals;*
- *Part 4: Linear joint seals;*
- *Part 5: Service ducts and shafts;*
- *Part 6: Raised access and hollow core floors;*
- *Part 7: Conveyor systems and their closures;*
- *Part 8: Smoke extraction ducts;*
- *Part 9: Single compartment smoke extraction ducts;*

- *Part 10: Smoke control dampers;*
- *Part 11: Fire protective Systems for cable systems and associated components;*
- *Part 12: Non-mechanical fire barrier for ventilation ductwork;*
- *Part 13: Chimneys.*

Any feedback and questions on this document should be directed to the users' national standards body. A complete listing of these bodies can be found on the CEN website.

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

## Introduction

This document has been prepared because a method of test for fire resisting smoke extraction ducts has become necessary to evaluate the ability of fire resisting ducts already tested to EN 1366-1 to function adequately as smoke extraction ducts.

Leakage is measured at both ambient and elevated temperatures. During the tests, air/gases are drawn through the duct at a differential pressure between the inside and outside of the duct. Leakage is determined at ambient temperature by sealing the openings in the duct located in the furnace and taking flow measurements through a flow-measuring device located just before the extraction fan. With respect to determining leakage at elevated temperatures, oxygen concentration measuring techniques are used.

The method described in this test is complex and requires sophisticated instrumentation. It is not recommended therefore to try to test multiple assemblies in this test.

**CAUTION** — The attention of all persons concerned with managing and carrying out this fire resistance test is drawn to the fact that fire testing can be hazardous and that there is a possibility that toxic and/or harmful smoke and gases might be evolved during the test. Mechanical and operational hazards might also arise during the construction of the test elements or structures, their testing and disposal of test residues.

An assessment of all potential hazards and risks to health should be made and safety precautions should be identified and provided. Written safety instructions should be issued. Appropriate training should be given to relevant personnel. Laboratory personnel should ensure that they follow written safety instructions at all times.

## 1 Scope

This document specifies a test method for determining the fire resistance of smoke extraction ducts. It is applicable only to smoke extraction ducts that pass through another fire compartment apart from the compartment from where smoke needs to be extracted in case of fire. It represents fire exposure of a fully developed fire.

This method of test is only applicable to fire resistant ventilation ducts (same construction) with the following classification according to EN 13501-3:

- fire from inside and outside  $i \leftrightarrow o$ ;
- applicable to a pressure difference up to 500 Pa in fire conditions;

NOTE 1 It is assumed that the duct A test(s) in accordance with EN 1366-1 has been performed with an under-pressure of minimum 500 Pa.

- with integrity (E) and insulation (I) criteria equal to or higher than the intended classification for the smoke extraction duct.

For the purposes of the test described in this document, the duct is referred to as duct C.

This test method has been designed to cover both vertical and horizontal smoke extraction ducts. A vertical system need not be evaluated to this method provided that:

- both horizontal (ho) and vertical (ve) classification according to EN 13501-3 has been obtained for the ventilation duct;
- it has been tested in a horizontal orientation to this method.

If the ventilation duct in practise is only used for vertical applications in smoke extraction systems, only vertical (ve) classification is obtained in accordance with EN 13501-3 and tested only in a vertical orientation to this test method.

This test method is suitable for ducts constructed from non-combustible materials (class A1 and A2-s1, d0 according to EN 13501-1).

NOTE 2 Reaction with components of the duct can affect the oxygen concentration inside the duct leading to inaccurate calculation of the leakage rate. If it is determined this has happened refer to Annex D.

This document applies to four sided rectangular and circular ducts only (with fire exposure on all sides). Ducts that utilize elements of construction for one, two or three sides are not covered. An alternative test method for one, two and three sided ducts will be developed separately.

## 2 Normative references

The following documents are referred to in the text in such a way that some or all of their content constitutes requirements 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 1363-1, *Fire resistance tests — Part 1: General requirements*

EN 1366-1, *Fire resistance tests for service installations — Part 1: Ventilation ducts*

EN 1507, *Ventilation for buildings — Sheet metal air ducts with rectangular section — Requirements for strength and leakage*

EN 10095, *Heat resisting steels and nickel alloys*

EN 13501-3, *Fire classification of construction products and building elements — Part 3: Classification using data from fire resistance tests on products and elements used in building service installations: fire resisting ducts and fire dampers*

EN 60584-1, *Thermocouples — Part 1: EMF specifications and tolerances (IEC 60584-1)*

EN ISO 13943, *Fire safety — Vocabulary (ISO 13943)*

EN ISO 5167-1, *Measurement of fluid flow by means of pressure differential devices inserted in circular cross-section conduits running full — Part 1: General principles and requirements (ISO 5167-1)*

EN ISO 5167-2, *Measurement of fluid flow by means of pressure differential devices inserted in circular cross-section conduits running full — Part 2: Orifice plates (ISO 5167-2)*

EN ISO 5167-3, *Measurement of fluid flow by means of pressure differential devices inserted in circular cross-section conduits running full — Part 3: Nozzles and Venturi nozzles (ISO 5167-3)*

### 3 Terms and definitions

For the purposes of this document, the terms and definitions given in EN 1363-1 and EN ISO 13943 and the following apply.

ISO and IEC maintain terminology databases for use in standardization at the following addresses:

- ISO Online browsing platform: available at <https://www.iso.org/obp>
- IEC Electropedia: available at <https://www.electropedia.org/>

#### 3.1

##### **smoke extraction duct**

fire resistant duct used for the extraction of smoke in case of fire

#### 3.2

##### **fire-resistant ventilation duct**

duct used for the distribution or extraction of air and designed to provide a degree of fire resistance

[SOURCE: EN 1366-1:2014+A1:2020, definition 3.1]

#### 3.3

##### **self-supporting duct**

duct constructed e.g. from fire-protective boards without encasing a steel duct

[SOURCE: EN 1366-1:2014+A1:2020, definition 3.3]

#### 3.4

##### **suspension devices**

components used for securing a duct to a load bearing structure

#### 3.5

##### **supporting construction**

wall, partition or floor through which the duct passes in the test

[SOURCE: EN 1366-1:2014+A1:2020, definition 3.5]