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Fire resistance tests for service installations - Part 2: Fire dampers

Feuerwiderstandsprüfungen für Installationen - Teil 2: Brandschutzklappen

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Fire resistance tests for service installations - Part 2: Fire dampers

Feuerwiderstandsprüfungen für Installationen - Teil 2: Brandschutzklappen

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EUROPEAN COMMITTEE FOR STANDARDIZATION
COMITÉ EUROPÉEN DE NORMALISATION
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Contents

Page

Foreword

This document (prEN 1366-2:2010) has been prepared by Technical Committee CEN/TC 127 “Fire safety in buildings”, the secretariat of which is held by BSI.

This document is currently submitted to the CEN Enquiry.

This document will supersede EN 1366-2:1999.

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 89/106/EEC.

EN 1366 ‘Fire resistance tests for service installations’ consists of the following

Part 1: Ducts

Part 2: Fire dampers

Part 3: Penetration seals (in course of preparation)

Part 4: Linear joint seals (in course of preparation)

Part 5: Service ducts and shafts (in course of preparation)

Part 6: Raised floors (in course of preparation)

Part 7: Closures for conveyors and trackbound transportation systems (in course of preparation)

Part 8: Smoke extraction ducts (in course of preparation)

Part 9: Single compartment smoke extraction ducts (in course of preparation)

Part 10: Smoke control dampers (in course of preparation)

Introduction

The purpose of the test is to evaluate the ability of a fire damper to prevent fire and smoke spreading from one fire compartment to another through the air ductwork system which may penetrate fire separating walls and floors.

The fire damper is attached (directly or remotely via a section of ducting), to a fire separating element in a manner representative of practice. Tests are performed starting with the fire damper in the open position to expose the temperature sensing element of the fire damper to furnace conditions.

Temperature and integrity measurements are carried out in various parts of the test construction during the test. The leakage of the fire damper system is measured (continuously during the test) by direct flow measurements whilst maintaining a constant pressure differential across the closed fire damper of 300 Pa. The leakage of the fire damper in the closed position is also measured at ambient temperature, where a reduced leakage classification is required to be achieved.

Caution

The attention of all persons concerned with managing and carrying out this fire resistance test is drawn to the fact that fire testing may be hazardous and that there is a possibility that toxic and/or harmful smoke and gases may be evolved during the test. Mechanical and operational hazards may 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 shall be made and safety precautions shall be identified and provided. Written safety instructions shall be issued. Appropriate training shall be given to relevant personnel. Laboratory personnel shall ensure that they follow written safety instructions at all times.

1 Scope

This Part of EN 1366 specifies a method for determining the fire resistance of fire dampers installed in fire separating elements designed to withstand heat and the passage of smoke and gases at high temperature. The Standard is used in conjunction with EN 1363-1.

This standard is not suitable for testing fire dampers in suspended ceilings without modification.

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.

prEN 520, *Gypsum plasterboards — Specification — Test method (ISO 6308:1980 modified).*

EN 1363-1, *Fire resistance tests — Part 1: General requirements.*

EN 1363-2, *Fire resistance tests — Part 2: Alternative and additional procedures.*

prEN ISO 13943, *Fire safety — Vocabulary (ISO/DIS 13943:1998).*

EN ISO 5167-1, *Measurement of fluid flow by means of orifice plates, nozzles and venturi tubes inserted in circular cross-section conduits running full (ISO 5167-1:1991).*

ISO 5221, *Air distribution and air diffusion — Rules to methods of measuring air flow rate in an air handling duct.*

3 Terms and Definitions

For the purposes of this Part of EN 1366, the definitions given in EN 1363-1 and prEN ISO 13943, together with the following, apply:

3.1
fire damper
a device for use in heating, ventilation and air-conditioning (HVAC) systems at fire boundaries to maintain compartmentation and protect means of escape in case of fire – it may have reduced smoke leakage characteristics

3.2
insulated fire damper
a fire damper which satisfies both the integrity and insulation criteria for the anticipated fire resistance period

3.3
uninsulated fire damper
a fire damper which satisfies the integrity criteria for the anticipated fire resistance period, but which does not provide a long enough insulation period to gain an EI classification

3.4
fire damper actuating mechanism
a mechanism, integral or directly associated with the fire damper which, when initiated causes the damper to change from the "open" to the "closed" position

3.5
temperature sensing element
a thermally actuated device designed to respond to a rise in temperature of the surrounding air and release the fire damper blade(s) at a predetermined temperature. It can interface with mechanical, electrical, electronic, or pneumatically operated actuating mechanisms which are positioned integrally or remotely from the device

3.6
test specimen
the fire damper, connecting frame and (if applicable) the perimeter penetration sealing system

3.7
connecting duct
the duct section between the fire damper or supporting construction and the measuring station

3.8
test construction
the complete assembly of the test specimen, the connecting duct and the supporting construction

3.9
measuring station
The equipment installed between the connecting duct and the exhaust equipment to determine the volume flow rate of gases passing through the fire damper under test

3.10
exhaust equipment
The equipment consisting of a fan and balancing or dilution dampers (if any), to apply and maintain the underpressure in the connecting duct

3.11
HVAC system
Heating, ventilating and air conditioning system

3.12
Compartment boundary
text of the definition

4 Test equipment

4.1 General

In addition to the test equipment specified in EN 1363-1, and if applicable, EN 1363-2, the following is required: Examples of test configurations are shown in figures 1 and 2.

4.2 Connecting duct

The connecting duct shall be of all welded construction fabricated from (1,5 + 0,1) mm thick steel with a width and height appropriate to the size of fire damper being tested. The duct shall have a length of two times the diagonal dimension of the damper up to a maximum of 2 m. The connecting duct shall be provided with a gas tight observation window.

4.3 Volume flow measuring station

This shall consist of a venturi, orifice plate, or other suitable device and (where necessary) an air flow straightener, installed in straight lengths of pipe, all sized to EN ISO 5167-1 and ISO 5221. It shall be installed between the connecting duct and the exhaust fan to determine the volume flow rate of gases passing through the fire damper under test. The measuring device shall be capable of measuring to an accuracy of ± 5%. Regardless of whether vertical or horizontal fire dampers are being tested, the volume flow measuring station shall always be used in a horizontal orientation.

4.4 Condensing unit

Where materials used in the construction of a fire damper may generate quantities of steam during the fire test, a condensing unit having provision for drainage shall be installed between the fire damper and the flow measuring device. When using the condensing device, the temperature recorded by the thermocouple positioned downstream of the flow measuring device described in 4.3 shall not exceed 40 °C.

4.5 Gas temperature measuring devices

These shall be positioned adjacent to the flow measuring device. A suitable device is a 1,5 mm diameter sheathed thermocouple orientated vertically with its measuring junction located at the centre line of the measuring duct and at a distance equal to twice the diameter of the measuring duct downstream from the flow measuring device. A similar thermocouple shall be located at the exit from the connecting duct plenum (see figure 1).

4.6 Exhaust fan system

This shall be capable of controlling the flow rates and maintaining the specified pressure differential between the connecting duct and the furnace when the fire damper is closed.

The 300 Pa (or higher if applicable) pressure differential shall be regulated by means of a dilution damper installed just before the fan inlet. The pressure shall be controlled to within + 5% of the specified value. A balancing damper shall be fitted at the outlet of the fan to adjust the pressure range of the systems to suit the fire damper under test. A variable speed fan may be used instead of the dilution damper.

5 Test conditions

The heating conditions and the furnace atmosphere shall conform to those given in EN 1363-1, or if applicable, EN 1363-2.

The furnace pressure shall be controlled to EN 1363-1, except in the case of testing fire dampers installed in a vertical separating element when the pressure shall be controlled to (15 ± 3) Pa at mid height of the damper. If two such fire dampers are being tested simultaneously, this pressure shall be established at mid height of the lower fire damper.

For fire dampers installed in a horizontal separating element the pressure shall be controlled to (20 ± 3) Pa at 100 mm below the underside of the separating element to which it is fixed.

Details of pressure conditions within the connecting duct are given in 9.2.

6 Test specimen

6.1 Size

For the fire test, see 10.4, the maximum size of fire damper shall be tested. For the determination of leakage at ambient temperature test, see 10.3, both the smallest and the largest size fire damper shall be tested.

6.2 Number of tests

The number of test specimens required shall be determined from tables 1 and 2. For establishing the symmetry of a fire damper, the presence of the actuating mechanism can be ignored. However, in such a case the damper shall be installed so that the temperature sensing element is on the side away from the furnace, as this is considered to be the more onerous condition because as it will be further from the furnace, the time to its operation will be consequently longer.

When insulated dampers are faced fixed to a wall, then two tests are required; one with the damper inside the furnace and one outside. In the case of an uninsulated damper fixed in this manner, only a damper on the inside of the furnace needs to be tested, as this is considered to be to the most onerous condition.

Table 1 Number of tests – standard application

Fire damper installation application in practice	Asymmetrical fire damper	Symmetrical fire damper
Installed within a wall	2	1
Installed within a floor	2	1

Table 2 Number of tests – special application

Fire damper installation application in practice	Asymmetrical fire damper	Symmetrical fire damper
Installed on face of wall	2	1
Installed on face of floor	2	1
Damper mounted on section of duct in the fire compartment (wall and floor application)	1 for wall application 1 for floor application	1 for wall application 1 for floor application
Damper mounted on section of duct outside the fire compartment (wall only)	1	1

6.3 Design

6.3.1 General

The test shall be made on a test specimen representative of the assembly on which information is required.

6.3.2 Orientation to be tested

Fire dampers which are to be installed in both horizontal and vertical constructions shall be tested in both orientations.

6.3.3 Fire dampers installed within a wall or floor opening

Fire dampers which are to be installed within an opening in line with a wall shall be tested as shown in figure 1. Fire dampers which are to be installed within an opening in line with a floor shall be tested as shown in figure 2.

6.3.4 Fire dampers mounted on to the face of a wall or floor

Uninsulated fire dampers which are to be mounted onto the face of a wall or floor shall be tested with the fire damper positioned within the furnace. An example of a fire damper mounted onto the face of a wall inside the furnace is shown in figure 3.

Insulated fire dampers which are to be mounted onto the face of a wall or floor shall be tested from both sides so that the insulation properties of the fire damper body, and where appropriate the duct, can be evaluated. An example of a fire damper mounted onto the face of a wall outside the furnace is shown in figure 4. Fire dampers which can be mounted above or below the floor shall be subjected to fire from below.

6.3.5 Fire Dampers mounted remote from a wall or floor

6.3.5.1 General

For test purposes, fire dampers which are to be mounted remote from the wall or floor shall be attached to a length of ductwork. This duct shall be attached to the supporting construction with the fire damper installed at

the other end of the duct. This ductwork shall be considered as part of the test specimen and shall be installed by the sponsor.

6.3.5.2 Fire dampers mounted inside the furnace

The length of ductwork inside the furnace described in 6.3.5.1 shall be (1500 + 50) mm. The distance between the outer surface of the duct and the furnace wall, roof or floor shall be not less than 500 mm. An example of a fire damper mounted remote from a wall inside the furnace is given in figure 5.

6.3.5.3 Fire dampers mounted outside the furnace

The length of ductwork outside the furnace described in 6.3.5.1 shall be (500 + 50) mm. An example of a fire damper mounted remote from a wall outside the furnace is given in figure 6.

6.3.6 Temperature sensing element

The temperature sensing element shall be included in the test specimen configuration. Where alternative release mechanisms are in series with the basic temperature sensing element and can be shown not to inhibit the basic release mechanism then only the one such mechanism is required to be tested.

7 Installation of test specimen

7.1 General

The test specimen shall be installed, as far as possible, in a manner representative of practice.

The fire damper shall be installed and sealed as in practice in a supporting construction in accordance with the manufacturer's instructions. Where the manufacturer of the fire damper requires it to be tested in a length of insulated ductwork he shall specify the length over which the duct is to be insulated as shown in figure 7.

7.2 Supporting construction

The supporting construction selected shall have fire resistance equal to (or greater than, the anticipated fire resistance of the fire damper being tested.

NOTE If at the end of the test duration, the damper is performing better than it is intended, the test should be allowed to continue provided the damper can still stay in place.

Information on the applicability of the test results when a specific supporting construction is given in clause 13. Examples of standard supporting constructions are given in table 3 to 5.

Table 3 Standard rigid wall constructions

Type of construction	Thickness mm	Density kg/m^3	Test duration t h
Normal concrete/masonry	110 ± 10	2200 ± 200	$t \leq 2$
	150 ± 10	2200 ± 200	$2 < t \leq 3$
	175 ± 10	2200 ± 200	$3 < t \leq 4$
Aerated concrete[a]	110 ± 10	650 ± 200	$t \leq 2$
	150 ± 10	650 ± 200	$2 < t \leq 4$

[a] This supporting construction may be made from blocks, bonded together with mortar or adhesive