

Whitepaper on the Classification Criteria for Orientation and Type of Installation for Smoke Control Dampers (SCD's).

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1) The meaning of “v_{ed}”, “h_{od}”, “v_{ew}”, “h_{ow}” and their relation to the installation of SCD's.

The set of standards for Smoke Control Dampers, EN 1366-10:2011+A1:2017, EN 13501-4 and EN 12101-8, respectively the test, classification and product standard, makes the distinction between 4 different installation related suffixes “v_{ed}”, “h_{od}”, “v_{ew}”, “h_{ow}”.

In this section, the following subjects will be reviewed:

- A) the meaning and use of the orientation suffix: “v_e” and “h_o”
- B) the meaning and use of the installation suffixes “d” and “w”

A) The meaning and use of the orientation suffix: “v_e” and “h_o”

The orientation suffixes, “v_e” or “h_o” in the full classification of a Smoke Control Damper refer to the position of the damper in relation to the structure in which it is installed.

Extract of the test standard EN 13501-4:2016: “7.3.5 Classes”, “7.3.5.1 Multi compartment fire resisting smoke control dampers”:

“v_{ed}”, “v_{ew}” or “v_{edw}” and/or “h_{od}”, “h_{ow}” or “h_{odw}” indicate the suitability for vertical and/or horizontal use, together with mounting in a duct or in a wall or both respectively.

NOTE .

- Vertical, v_e, indicates the damper is placed in a vertical plane
- Horizontal, h_o, indicates the damper is placed in a horizontal plane
- w indicates the damper is mounted in a wall or floor
- d indicates the damper is mounted in a duct

So, “v_e” is to be understood as ‘suited for installation in the vertical plane’. This opposed to its counterpart “h_o” which stands for ‘suited for installation in the horizontal plane’.

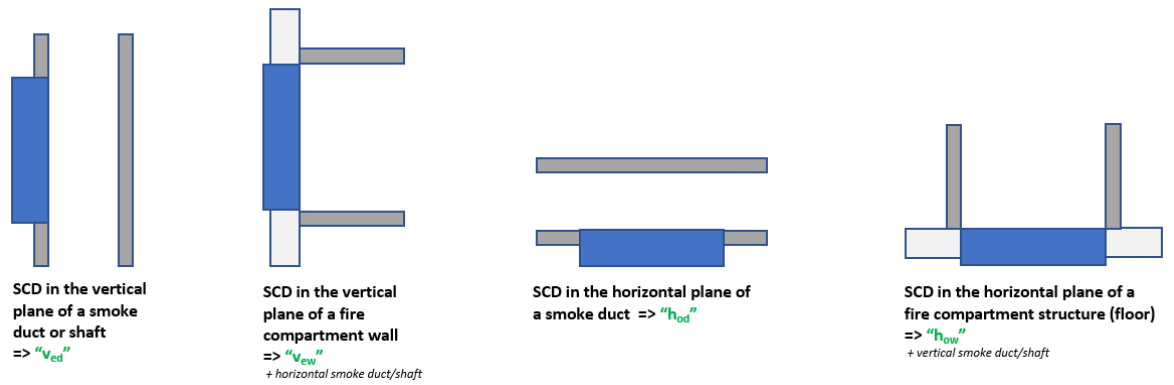
That vertical plane can be:

- a vertical surface of a horizontal or vertical smoke control duct or shaft which leads to a “v_{ed}” suffix in the classification
- the vertical face of a fire compartment structure (wall), which is covered by the suffix “v_{ew}”

A horizontal plane can be:

- a horizontal surface of a horizontal or vertical smoke control duct or shaft which leads to a “h_{od}” suffix in the classification

- the horizontal face of a fire compartment structure (floor), which is covered by the suffix “h_{ow}”



B) The meaning and use of the suffixes “d” and “w”

a) The meaning and use of suffix “d”

“d” stands for ‘duct mounted’, which means that the SCD’s was fire tested in a duct set up, like shown in both figures hereunder (EN1366-10:2011 + A1:2017).

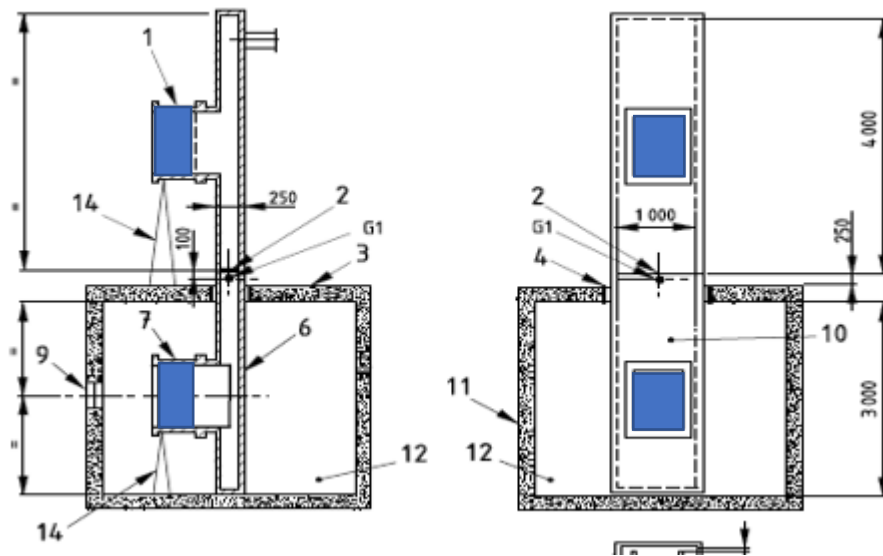


Figure 9 — Test arrangement for multi-compartment smoke control dampers mounted on the surface of a vertical duct

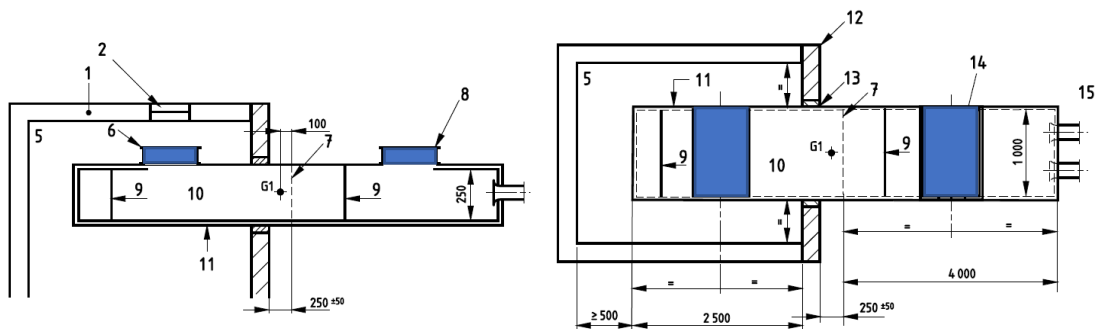


Figure 8 — Test arrangement for multi-compartment smoke control dampers mounted on the surface of a duct

Both safety positions 'open' and 'closed' are evaluated in one test. The maintenance of opening is tested with a SCD in the oven (7/6), while the 'EI' or 'EIS'-criteria are evaluated on the SCD which is mounted outside the oven (1/14).

b) The meaning and use of suffix "w"

"w" stands for 'wall mounted', which means that the SCD's was fire tested in a compartment wall set up, like shown in the figure hereunder (EN1366-10:2011 + A1:2017).

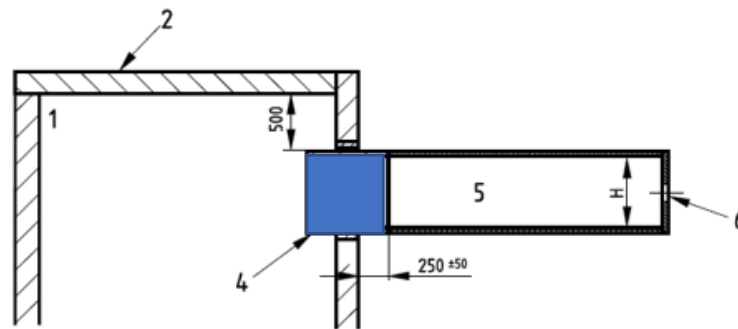


Figure 5 — Test arrangement for smoke control dampers to be mounted in a compartment boundary (for more information see EN 1366-2)

For "w"-classified, thus wall mounted SCD's, the test standard EN 1366-10 refers to the EN 1366-2 test standard for fire dampers. The SCD is installed like a fire damper, but fire tested in its two safety positions, meaning you need one test with the damper blade closed and one with the damper blade open.

The requirements for the 'E', 'EI', 'ES' or 'EIS'-criteria must be met.

A SCD can have multiple classifications. So not only " v_{ed} ", " h_{od} ", " v_{ew} ", " h_{ow} ", but also combinations, if tested in the different configurations as explained above. When tested in vertical and/or horizontal wall and duct mounting, the suffixes become " v_{edw} " and/or " h_{odw} ". Mind that this is not an additional classification, next to " d " or " v ". It only indicates that the SCD concerned is fit for installation into a duct as well as into a wall.

2) The difference between " v_{ew} "-classification and ' v_{ed} '-classified SCD's in builders work ducts.

Typically, " v_{ew} "-classified SCD's are installed like fire dampers are installed. Most often, but not exclusively, they are part of a combined comfort ventilation/smoke control system, which is reflected by an additional ' $C_{10.000}$ ' or ' C_{mod} '-suffix in their classification. Like a fire damper, they are connected to ductwork, which must be a classified smoke control duct at least at one end. Default, these dampers are in an open position, like a fire damper. As they are SCD's and not fire dampers, they have 2 safety positions, being 'open' or 'closed'. This is reflected in the fire test configurations prescribed in the EN 1366-10 test standard, whom are totally different for " v_{ed} " or " v_{ew} "-classified SCD's. (see figures 5, 8 and 9 from EN 1366-10:2011 + A1:2017 above).

The " v_{ew} "-classification only covers SCD's installed in a vertical fire compartment wall, which is not part of a duct or shaft.

Annex A1, in paragraph 9.7 "Application to duct constructions other than that tested" in the latest version of the test standard for SCD's, EN1366-10:2011 + A1:2017, allows the use of the test results with fire board smoke control ducts for builders work on site with other materials with a higher density and a higher wall thickness.

So, when a duct mounted SCD was tested, f.i. in a Promat L500 duct, its 'Multi' "v_{ed}"-classification allows for installation in ducts/shafts made in solid construction materials like masonry or concrete of at least the same thickness as the Promat panels.

Still, its "v_{ed}"- classification does not allow installation of the SCD in fire compartment walls. The same applies to "v_{ew}"-classified SCD's: their classification does not cover installation in the face of ducts or shafts. Even if they are made from concrete or another solid material.

The face of a duct or shaft is never to be confused with a 'wall'. Even if the duct is made from concrete, concrete blocks or masonry.

So, to conclude:

SCD's installed in a vertical or horizontal duct or shaft, must have a "v_{ed}"-classification.

SCD's installed in a fire compartment wall require a "v_{ew}"-suffix in their classification.

References:

EN 1366-10 :2011 + A1 :2017 Test standard
EN 13501-4 :2016 Classification standard
EN 12101-8 :2011 Product standard

Extracts from EN 13501-4 :2016 Classification standard :

EUROPEAN STANDARD

EN 13501-4

NORME EUROPÉENNE

EUROPÄISCHE NORM

June 2016

ICS 13.220.50

Supersedes EN 13501-4:2007+A1:2009

English Version

Fire classification of construction products and building elements - Part 4: Classification using data from fire resistance tests on components of smoke control systems

Classement au feu des produits et éléments de construction - Partie 4: Classement à partir des données d'essais de résistance au feu des composants de dispositifs de contrôle de fumée

Klassifizierung von Bauprodukten und Bauarten zu ihrem Brandverhalten - Teil 4: Klassifizierung mit den Ergebnissen aus den Feuerwiderstandsprüfungen von Anlagen zur Rauchfreihaltung

This European Standard was approved by CEN on 23 April 2016.

7.3 Classification of smoke control dampers

7.3.1 General

As described in 7.2.1 (for smoke ducts) there are two types of smoke control dampers: multi-compartment and single compartment smoke control dampers.

7.3.2 Test method and field of application rules

The test method for multi and single compartment smoke control dampers shall be as given in EN 1366-10. The method is applicable to smoke dampers installed in a duct or in fire separating elements designed to withstand the standard temperature time curve for multi compartment dampers and a constant temperature of either 300 °C or 600 °C for single compartment dampers. Extended application shall be carried out as specified in EN 15725.

Remark Rf-t: '... fire separating elements' = compartment wall or floor

7.3.5 Classes

7.3.5.1 Multi compartment fire resisting smoke control dampers

EI 30 60 90 120

E 30 60 90 120

The classification is completed by the suffix 'multi' to indicate suitability for multi compartment use.

"HOT 400/30" (High Operational Temperature) indicates that the damper has the ability to be opened or closed during a period of 30 minutes under temperature conditions below 400 °C.

"v_{ed}", "v_{ew}" or "v_{edw}" and/or "h_{od}", "h_{ow}" or "h_{odw}" indicate the suitability for vertical and/or horizontal use, together with mounting in a duct or in a wall or both respectively.

NOTE

- Vertical, ve, indicates the damper is placed in a vertical plane
- Horizontal, ho, indicates the damper is placed in a horizontal plane
- w indicates the damper is mounted in a wall or floor
- d indicates the damper is mounted in a duct

"S" indicates a leakage rate of less than 200 m³/(h·m²) as an additional leakage restriction to the defined performance requirement.

"500", "1 000" or "1 500" indicates that when tested at these negative pressures the damper is suitable for use over the range from the tested negative pressure up to a positive pressure of 500 Pa.

"AA" or "MA" indicates automatic activation or manual intervention.

EUROPEAN STANDARD

EN 1366-10:2011+A1

NORME EUROPÉENNE

EUROPÄISCHE NORM

April 2017

ICS 13.220.50; 91.140.30

Supersedes EN 1366-10:2011

English Version

Fire resistance tests for service installations - Part 10: Smoke control dampers

Essais de résistance au feu des installations techniques
- Partie 10: Volets de désenfumage

Feuerwiderstandsprüfungen für Installationen - Teil
10: Entrauchungsklappen

6 Test methods

6.1 General

Smoke control dampers shall be tested according to their proposed end use application to enable classification to be made. They are broadly split into the two main groups of multi and single compartment applications. Within these applications there are further tests to which each type may be subjected, and these shall be considered before embarking on a test sequence. The required initiation regime and number of cycles to be tested shall be included within the sequence of testing.

6.2 Initiation regimes for elevated temperature and fire tests

6.2.1 Smoke control damper for systems with automatic activation

This clause describes the timing criteria to be used when testing the above (see Figure 1).

T = 0 s - furnace ignition

The smoke control damper mounted in the furnace shall be closed;
The smoke control damper mounted outside the furnace shall be open, unless if in its application it will never be open at the commencement of a smoke situation.

T = 30 s

Signal the smoke control damper mounted in the furnace to move to the open position;
Signal the smoke control damper mounted outside the furnace to close, or the smoke control damper remains in the closed position, if in its application it will never be open at the commencement of a smoke situation.

T = 90 s – smoke control dampers shall reach their end positions (otherwise failure results)

The hereabove mentioned initiation regimes apply on duct as well as wall-mounted smoke control dampers(SCD's). Because a wall mounted SCD can remain closed or open at the beginning of a fire

test, it requires 2 fire tests being the tests described in 6.5.1 and 6.5.2. Vertical duct tests are defined in 6.5.4.

6.5 Multi compartment fire resisting smoke control dampers

6.5.1 Fire resistance test according to EN 1366-2 (for units mounted within or on the face of a compartment structure)

6.5.1.5 Fire resistance test

The test sample shall be mounted in the test equipment shown in EN 1366-2. It shall be tested for ambient leakage using the method described in EN 1366-2 and then fire tested using a pressure selected from Table 1. No fusible element is required or allowed. The initiation regime shall be selected from 6.2. Units shall be open at the start of the test, unless if in its application it will never be open at the commencement of a smoke situation.

The heating conditions and the furnace atmosphere shall conform to those specified in EN 1363-1 following the standard curve and tolerances.

The furnace pressure shall be controlled to EN 1366-2 throughout the test at the mid-height position of the ducts in the furnace.

EN 1366-2:2015 (E)

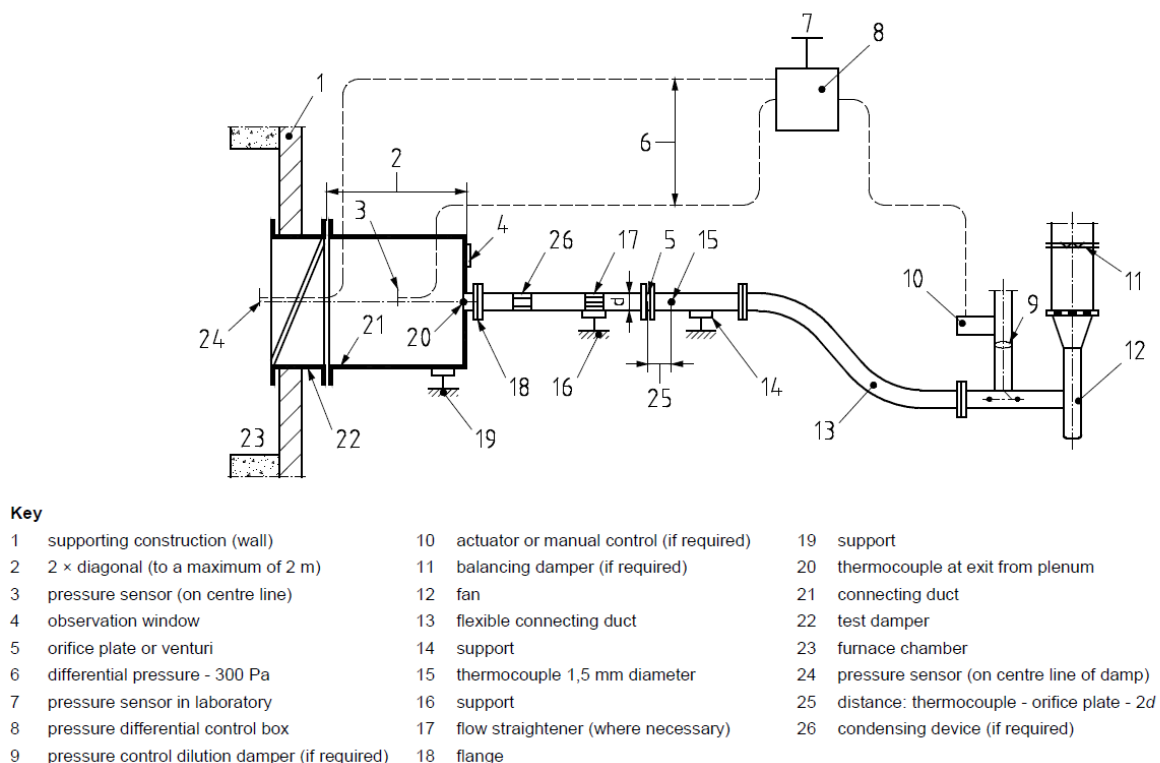


Figure 1 — Example of general test arrangement

6.5.2 Maintenance of opening test (for units mounted within a compartment structure)

6.5.2.5 Fire resistance test

The test sample shall be mounted in the test equipment shown in Figure 5. It shall be tested for

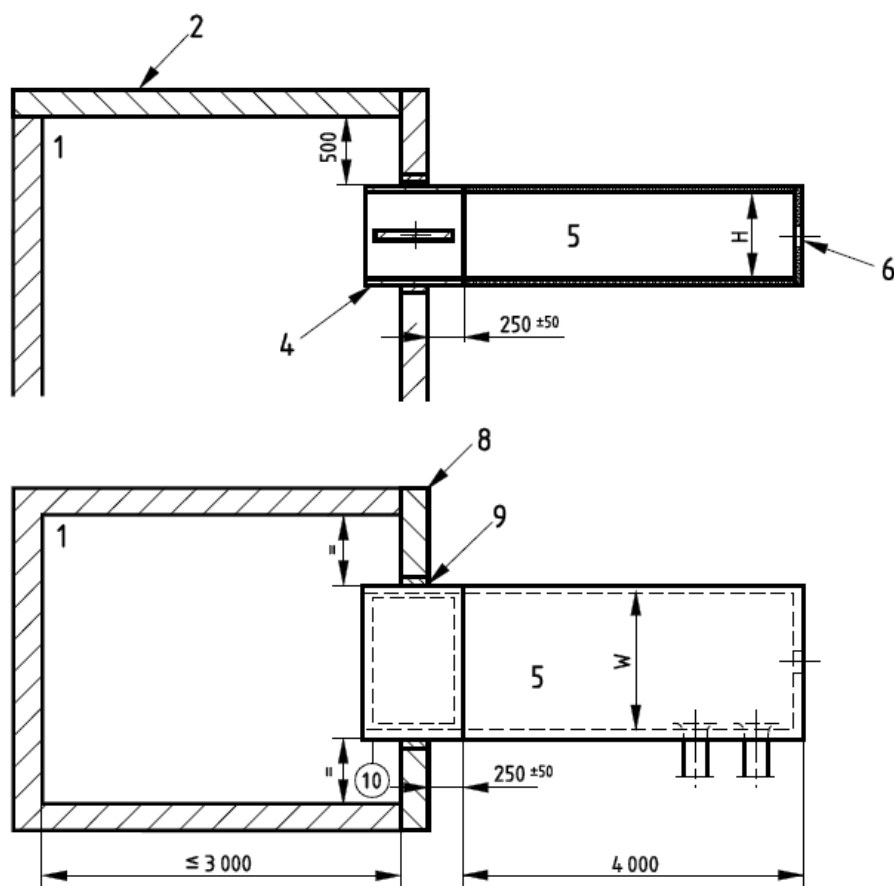
ambient leakage using the method described in EN 1366-2 and then fire tested using a pressure selected from Table 1.

The initiation regime shall be selected from 6.2. Units shall be closed at the start of the test and then opened at the correct time.

The heating conditions and the furnace atmosphere shall conform to those specified in EN 1363-1 following the standard curve and tolerances.

The furnace pressure shall be controlled to (15 ± 3) Pa throughout the test at the mid-height position of the smoke control damper in the furnace. For smoke control 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.

The equipment shown in Figure 5



Key

- | | |
|------------------------|----------------------------------|
| 1 furnace chamber | 8 supporting construction (wall) |
| 2 furnace roof | 9 fire stopping as in practice |
| 4 smoke control damper | 10 motor inside |
| 5 duct | W width |
| 6 observation window | H height |

NOTE For test according to 6.5.1.5 the damper is in open position by the start of the test; for test according to 6.5.2.5 the damper is in closed position by the start of the test.

Figure 5 — Test arrangement for smoke control dampers to be mounted in a compartment boundary (for more information see EN 1366-2)

6.5.4 Vertical duct test for surface mounted smoke control dampers

6.5.4.1 Sequence

Two smoke control damper samples of the largest size shall be selected. Each unit shall be tested for ambient leakage. The two units shall then be subjected to a cycling test, the number of

Figure 9 — Test arrangement for multi-compartment smoke control dampers mounted on the surface of a vertical duct