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Requirements for natural smoke and heat exhaust ventilators

1 Introduction

The task of natural smoke and heat exhaust ventilators is to ensure a smoke free layer above the floor by removing smoke in the case of fire. Furthermore they serve to exhaust hot gases released by a fire in the developing stages. The horizontal spread of fire is retarded by reducing the temperatures in the roof area.

During service life, it is essential that the smoke and heat exhaust ventilators operate fully and reliably to guarantee free escape routes and assist in the evacuation of occupants in the case of fire, including reduction of financial loss. The standard DIN EN 12101-2: 2003-09 specifies the testing and classification of natural smoke and heat exhaust ventilators to ensure compliance with the requirements made.

1.1 Basic requirements for natural smoke and heat exhaust ventilators

It must be ensured that the natural smoke and heat exhaust ventilators will operate fully and reliably during their service life. Furthermore the natural smoke and heat exhaust ventilators must feature one of the following initiation or release devices:

- Thermal initiation or release device,
- Initiation device activated by an electrical signal (smoke detector, manual operation...),
- Pneumatic initiation device,
- Initiation device able to respond to other types of release signal
- In specific cases, a manually operated initiation device may be fitted.

The opening mechanism is to be provided with an internal energy source/power supply (gas container with pressure release device or spring system) or an external energy source. The device must open within a maximum time (opening time) of 60 seconds.

1.2 Classifiable requirements for natural smoke and heat exhaust ventilators

DIN EN 12101-2 allows classification according to the following requirements indicated in the pertaining CE marking:

– Aerodynamic free area A a = X,
– Functional reliability – Re X,
– Dual purpose ventilation,
– Opening under load (snow and wind loads) – SL X,
– Opening at low ambient temperature – T X,
– Resistance under wind load – W X,
Resistance to wind-induced vibrations of wind deflectors,
– Resistance to heat – B X
Reaction to fire of materials (Class A1 or test as per EN 13501-1).

The characteristics must be demonstrated on the basis of initial type tests (ITT)

1.3 ITT – Initial Type Tests

1.3.1 Aerodynamic free area

There are two methods to determine the aerodynamic free area:

• Simplified method:
For horizontally mounted natural smoke and heat exhaust ventilators of a maximum size of 2,5 m x 2,5 m and an upstand height of ³300 mm this gives C_{v0} = 0,4.

• Experimental method:
For horizontally mounted natural smoke and heat exhaust ventilators with and without side wind (C_{vw} and C_{v0})
For vertically mounted SVEHS only without side wind (C_{v0})

Aerodynamic free area: Aa = Av * Cv

1.3.2 Functional reliability

Reliability of the natural smoke and heat exhaust ventilators is classified as follows:

– Re 50
– Re 1000
– Re A
– With or without dual purpose ventilation

Functional reliability is demonstrated by testing the specified smoke-heat exhaust cycles and as necessary, additional 10.000 cycles in the comfort position (ventilation position)

Test specimen:

– Maximum size (max. width & max. height)
– Mounting in dimensionally stable test rig
– Defined fixing (screws and position)

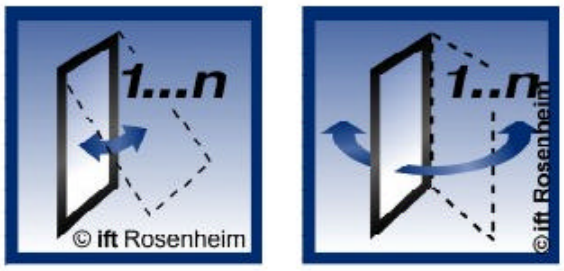

Figure 1 Piktograms durability of top, bottom and centre hung elements and mechanical durability of **ift** Rosenheim

– Mount at angle within the range of angles specified (minimum installation angle)
– Use of most critical energy source
– Verify whether ventilator opens within 60 seconds into the fire open position during and at the end of exposure

Figure 2
Piktogram snow load of **ift** Rosenheim

1.3.3 Opening under load

Snow load is classified as follows (test load in N/m²):

– SL 0
– SL 125
– SL 250
– SL 500
– SL 1000
– SL A

Ventilators without wind deflectors of installation angles > 45 are rated class SL 0. The test load is applied using test weights of 5 kg (max.) each and exposure to the most unfavourable wind direction with a side wind of 10 m/s. During this exposure, the device is opened three times each for a maximum opening time of 60 seconds.

Test specimen:

– Maximum size (max. width & max. height)
– Mounting in dimensionally stable test rig
– Defined fixing (screws and position)
– Mount at angle within the range of angles specified (minimum installation angle)
– Use of the most critical energy source

1.3.4 Opening at low ambient temperature

Classification at low ambient temperature is as follows (test temperature in ° C):

– •T (00)
– •T (-05)
– •T (-15)
– •T (-25)
– •T A

Untested ventilators are rated T(00) without need of testing. The ventilators are mounted at the minimum installation angle in the climate chamber and subjected to simulation of wind and snow loads.

Test specimen:

– Maximum size (max. width & max. height)
– Mounting in dimensionally stable test rig
– Defined fixing (screws and position)
– Mount at angle within the range of angles specified (minimum installation angle)
– Use of the most critical energy source

1.3.5 Performance under wind load

The wind loads are classified as follows (test load in Pa):

– WL 1500
– WL 2000
– WL A

The ventilator is subjected to a simulated suction load (outward opening smoke and heat exhaust ventilators). The test load is applied for a period of 10 ± 1 minutes. The ventilator must remain closed during the test. Subsequent to exposure the ventilator must open from the normal installation position into the fire open position within 60 seconds and remain in the fire open position without external energy supply.

Natural smoke and heat exhaust ventilators with wind deflectors are tested to both the lowest natural frequency of the wind deflector > 10 Hz and the logarithmic damping decrement > 0,1.

Test specimen:

– Maximum size (max. width & max. height)
– Mounting in dimensionally stable test rig
– Defined fixing (screws and position)
– Mount at angle within the range of angles specified (minimum installation angle)
– Use of the most critical energy source

Figure 3 Piktograms resistance to wind load and fire behavior/resistance to fire of **ift** Rosenheim

1.3.6 Heat resistance

Classification of heat resistance (test temperature in ° C):

– B 300
– B 600
– BA

Test in a furnace as per EN 1363-1. The ventilator is exposed to the test temperature for a period of 5 minutes. Thereafter, the ventilator shall open into the fire open position and remain in this position for 30 minutes until completion of the test. The throat area must not decrease by more than 10 %. The ventilator must be composed of materials of class A1 (CWFT-List) or the materials must be tested to EN 13501-1.

Test specimen:

– Maximum size (max. width & max. height)
– Mounting in dimensionally stable test rig
– Defined fixing (screws and position)
– Mount at angle within the range of angles specified (minimum installation angle)
– Use of the most critical energy source

1.4 Surveillance

The initial inspection of the factory is carried out by a surveillance body approved by the DIBt. The inspection covers the following:

"The manufacturer shall establish, document and maintain a factory production control system (FPC) to ensure that the products placed on the market conform to the stated performance characteristics." "The FPC system shall be sufficiently detailed to ensure that the conformity of the product is apparent." An FPC system conforming to the requirements of EN ISO 9001 and made specific to the requirements of DIN EN 12101-2 is considered sufficient.

This is followed by mandatory continuous third party surveillance with the objective of surveillance, assessment and approval of the FPC and review of compliance with the provisions resulting from the initial inspection.

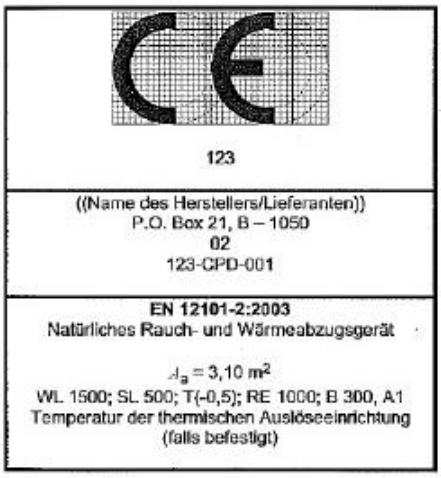

Figure 4 Example for CE marking of a natural smoke and heat exhaust ventilator

1.5 Certificate and declaration of conformity

If both the results obtained from all areas relevant for initial type testing, and the outcome of the initial inspection of the factory are positive, the notified body will issue the certificate for declaration of conformity. The manufacturer is responsible for affixing of the CE marking.

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Born on November 15, 1969 in Brannenburg

1988 – 1993 University education in Electronic Engineering at University of Applied Sciences Munich, specialising in control, regulation and process control technology, Work experience: automation and military technology, electronics, control technology, PLC-programming

Since 12/1993 Measurement, control and regulation technology at **ift** Rosenheim, Specialising on:
PC Visualisation and automation, development of data acquisition systems via data bus, control programming, construction of testing and measurement equipment, maintenance and servicing, conducting specialised tests

1999 – 2000 Additional: IT-administration at **ift** Rosenheim, Specialising on:
Software- and Hardware maintenance "y2k problem", Server- and Client exchange, introduction of email and internet access

Since 10/2000 Head of department for measurement, control and regulation technology as well as calibration at **ift** Rosenheim, Specialising on:
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