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Chimneys — Accessories

Part 2: Chimney fans — Requirements and test methods

National foreword

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European foreword

This document (EN 16475-2:2017) has been prepared by Technical Committee CEN/TC 166 "Chimneys", the secretariat of which is held by ASI.

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of an identical text or by endorsement, at the latest by September 2017, and conflicting national standards shall be withdrawn at the latest by December 2018.

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 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 Directives.

For relationship with EU Regulation, see informative Annex ZA, which is an integral part of this document.

EN 16475-2 is one part of the series EN 16475, *Chimneys — Accessories*, which currently consists of:

— *Part 2: Chimney fans — Requirements and test methods* [the present document];

— *Part 3: Draught regulators, standstill opening devices and combined secondary air devices — Requirements and test methods*;

— *Part 6: Access components — Requirements and test methods* [currently at Enquiry stage];

— *Part 7: Rain caps — Requirements and test methods*.

This document defines the requirements related to CEN/TC 166 standards. Requirements related to other EU Directives are also applicable.

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Introduction

In November 2009 CEN/TC 166 assigned TG 2 of CEN/TC 166/WG 1 the task to develop this standard for chimney accessories and issued a preliminary work item.

1 Scope

This European Standard covers electrically operated metal fans for chimneys that are able to create a stable positive or negative pressure for the chimney.

This European Standard covers fans installed inline in the connecting flue pipe (inline fans) or mounted on the chimney outlet (exhaust fans).

This standard excludes chimney cowls (Terminals with aerodynamic characteristics).

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 1443:2003, *Chimneys — General requirements*

EN 1856-1:2009, *Chimneys — Requirements for metal chimneys — Part 1: System chimney products*

EN 1856-2:2009, *Chimneys — Requirements for metal chimneys — Part 2: Metal flue liners and connecting flue pipes*

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

EN 10346, *Continuously hot-dip coated steel flat products for cold forming — Technical delivery conditions*

EN 13216-1:2004, *Chimneys — Test methods for system chimneys — Part 1: General test methods*

EN 14297, *Chimneys — Freeze-thaw resistance test method for chimney products*

EN 15287-1:2007+A1:2010, *Chimneys — Design, installation and commissioning of chimneys — Part 1: Chimneys for non-roomsealed heating appliances*

EN 60335-1, *Household and similar electrical appliances — Safety — Part 1: General requirements (IEC 60335-1)*

EN 60335-2-80, *Household and similar electrical appliances — Safety — Part 2-80: Particular requirements for fans (IEC 60335-2-80)*

EN ISO 3744, *Acoustics — Determination of sound power levels and sound energy levels of noise sources using sound pressure — Engineering methods for an essentially free field over a reflecting plane (ISO 3744)*

EN ISO 5136, *Acoustics — Determination of sound power radiated into a duct by fans and other air-moving devices — In-duct method (ISO 5136)*

EN ISO 5801, *Industrial fans — Performance testing using standardized airways (ISO 5801)*

3 Terms and definitions

For the purposes of this document, the terms and definitions given in EN 1443 and the following apply.

3.1
inline fan
fan positioned in the connecting flue pipe

3.2
exhaust fan
fan positioned on the outlet of the chimney

3.3
chimney fan
exhaust fan or inline fan

3.4
soot fire safe accessories
As
accessory that may not perform its intended function during and after a sootfire but does not prevent the safe operation or change the designation "G" of the chimney or connecting flue pipe

Note 1 to entry: "As" can only be used for accessories and not for chimneys, flue liners and connecting flue pipes.

Note 2 to entry: Measures to be taken after the event of a sootfire will be found in the relevant product standard.

4 Product characteristics

4.1 General

Recommended minimum material specifications for components of chimney fans in contact with combustion products are the following:

a) stainless steel quality of 1.4301 in accordance with EN 10088-1 with a wall thickness of at least 0,7 mm;

b) stainless steel quality of 1.4401 in accordance with EN 10088-1 with a wall thickness of at least 0,7 mm;

c) aluminium with a wall thickness of at least 1,5 mm for EN AW-4047A;

d) aluminium with a wall thickness of at least 1,5 mm for EN AW-6060 and of 1,0 mm for EN AW-1200A;

e) cast aluminium (EN AB 46200, EN AB 46100) with a wall thickness of at least 2,5 mm;

f) for galvanized products with a steel quality of 1.0306 in accordance with EN 10346 with a wall thickness of at least 0,7 mm.

Recommended minimum material specifications for impeller blades are the following:

g) stainless steel quality of 1.4401 in accordance with EN 10088-1 with a wall thickness of at least 0,7 mm.

The exhaust fan or the inline fan shall fulfil the following requirements, if appropriate.

4.2 Dimensions and tolerances

The manufacturer is free to choose dimensions and tolerances of the chimney fan.

4.3 Mechanical resistance and stability

4.3.1 General

The chimney fan impeller shall be able to move freely before and after the thermal tests except for a product designated As after a soot fire test.

4.3.2 Wind load

4.3.2.1 General

When tested in accordance with 5.1.2, the product shall remain mechanically stable and safe.

This test shall be performed only for the types that have performed the thermal tests.

4.3.2.2 Exhaust fans subject to wind load

When the fan is tested in accordance with 5.1.2, it shall be able to withstand a horizontal and vertical load of 1,5 KN/m^2.

4.3.2.3 Fan support

a) **Exhaust fan**

In the design of the fixing of the fan, the risk of deflagration should be taken care of.

b) **Inline fans**

The design of the fixing of the inline fan, the risk of deflagration and static load should be taken care of. The fan shall support itself.

4.3.3 Resistance to freeze–thaw

Metal fans are considered to meet the requirement of EN 14297.

4.4 Thermal performance

4.4.1 Reaction to fire

As the fire reaction is not relevant for chimney fans, no declaration is necessary.

4.4.2 Fire resistance — Exhaust fan

The distance to combustible material for exhaust fans (as shown in Figure 3) shall be one of the following:

a) O(xx) M stands for “Measured value” as determined by 5.2.5. When related to an ambient temperature of 20 °C, the maximum surface temperature of combustible materials adjacent to the test fan shall not exceed 85 °C at the distance declared (see EN 15287-1:2007+A1:2010, 4.3.2 and EN 1856-2:2009, 6.6.2);

b) As(xx) M, G (xx) M stands for “Measured value” as determined by 5.2.5 and 5.2.6. When related to an ambient temperature of 20 °C, the maximum surface temperature of combustible materials adjacent to the test fan shall not exceed 85 °C during the heat stress test and shall not exceed 100 °C during the sootfire resistance test, both at the distance declared (see EN 15287-1:2007+A1:2010, 4.3.2 and EN 1856-2:2009, 6.6.2);

c) O (NM), As (NM), G (NM) stands for "Not Measured value" as determined by EN 1856-2:2009, 7.2.1. The spigot dimension of the fan is used in the formula. The requirements are met, if the distance to combustible material is calculated in accordance with EN 15287-1:2007+A1:2010, 4.3.9.3, or EN 1856-2:2009, 6.2.2.

NOTE The designation string of the exhaust fan does not include (NM) and (M).

4.4.3 Declaration of temperature class

4.4.3.1 General

The temperature class of the exhaust fan is declared by the manufacturer as specified in Table 1, and shall be verified in accordance with the tests described in 5.2.5 and 5.2.6.

Table 1 — Temperature levels and test temperature

Temperature level	Nominal working temperature (T) °C	Test temperature °C
T 080	≤ 80	100
T 100	≤ 100	120
T 120	≤ 120	150
T 140	≤ 140	170
T 160	≤ 160	190
-	-	-
T 200	≤ 200	250
T 250	≤ 250	300
T 300	≤ 300	350
-	-	-
T 400	≤ 400	500
T 450	≤ 450	550
T 600	≤ 600	700

4.4.3.2 Inline fan

4.4.3.2.1 General

The distance to combustible material (as shown in Figure 2) for inline fans shall be:

a) O(xx) M stands for "Measured value" as determined by 5.2.5. When related to an ambient temperature of 20 °C, the maximum surface temperature of combustible materials adjacent to the test fan shall not exceed 85 °C at the distance declared (see EN 15287-1:2007+A1:2010, 4.3.2 and EN 1856-2:2009, 6.6.2);

b) As(xx) M, G (xx) M stands for "Measured value" as determined by 5.2.5 and 5.2.6. When related to an ambient temperature of 20 °C, the maximum surface temperature of combustible materials

adjacent to the test fan shall not exceed 85 °C during the heat stress test and shall not exceed 100 °C during the sootire resistance test, both at the distance declared (see EN 15287-1:2007+A1:2010, 4.3.2 and EN 1856-2:2009, 6.6.2);

c) O (NM), As (NM), G (NM) stands for "Not Measured value" as determined by EN 1856-2:2009, 7.2.1. The spigot dimension of the fan is used in the formula. The requirements are met, if the distance to combustible material is calculated in accordance with EN 15287-1:2007+A1:2010, 4.3.9.3, or EN 1856-2:2009, 6.2.2.

4.4.3.2.2 Declaration of temperature class

The temperature class of the inline fan is declared by the manufacturer as specified in Table 1, and shall be verified in accordance with the tests 5.2.5 and 5.2.6.

4.4.4 Heat stress resistance

A chimney fan shall be tested in accordance with 5.2.5. After performing the heat stress test, the criteria to pass the test are:

a) Flow resistance: When tested in accordance with 5.3.2, the flow resistance shall not be higher than declared by the manufacturer.

b) Capacity: When tested in accordance with 5.3.3, the product is not allowed to lose its ability to create mechanical draught during the test. The manufacturer shall provide a formula for the capacity chart (for an example, see 5.3.3).

c) Gas tightness: Only inline fans shall declare a pressure type and pass a gas tightness test in accordance with 5.3.1.

4.4.5 Sootfire resistance

When a chimney fan is designated as sootfire resistant G or sootfire safe As, it shall be tested in accordance with 5.2.6. After performing the sootfire resistance test, the criteria to pass the test are:

a) Flow resistance: After tested in accordance with 5.3.2, the flow resistance shall be declared. For fans with class G or As a deviation of 25 % is allowed on the coefficient of flow resistance values before and after the heatshock test.

b) Capacity: When tested in accordance with 5.3.3, the product shall not lose its ability to create mechanical draught during the test if it shall fullfil the requirements for a G designation. The As criteria is also fulfilled, if the fan loses its ability to create mechanical draught.

c) Gas tightness: Only for inline fans a pressure type shall be declared and a gas tightness test in accordance with 5.3.1 shall be performed.

4.5 Hygiene, health and the environment

4.5.1 Gas tightness

The gas tightness shall be tested in accordance with 5.3.1. The leakage rate shall not be greater than those specified in Table 2. Table 2 is a modified version of EN 1443, Table 5. The test rig is the same as in Figure 6. The test is done in accordance with EN 1856-2:2009, A.2.

Table 2 — Leakage rates

Pressure type	Test pressure Pa	Leakage rate/Flue surface area $l \cdot s^{-1} \cdot m^{-2}$
N1	40	< 2,0
P1	200	< 0, 006
P2	200	< 0, 120
H1	200 and 5 000	< 0, 006
H2	200 and 5 000	< 0, 120

4.5.2 Condensate resistance

Condensate resistance is only applicable for inline fans. If an inline fan is designated for wet operation (W) in accordance with EN 1443, the inline fan which was exposed to thermal test in 5.2.6, shall be tested in accordance with EN 13216-1:2004, 5.5.

During the test period of 4 h there shall be no signs of coloured water outside the inline fan.

4.5.3 Durability against corrosion

4.5.3.1 General

The corrosion classes shall be declared in accordance with EN 1443:2003, Table 2.

The designation of the corrosion class shall be declared either on the basis of the results of the test method described in EN 1856-1 or shall be declared in accordance with 4.5.3.2 or 4.5.3.3.

4.5.3.2 Dry application

Chimney fans of a material as described in 4.1 a), d) or e) are considered to be designated 2 or if the impeller blade is of a material described in 4.1 g) are considered to be designated 3.

Chimney fans of a material as described in 4.1 b) are considered to be designated 3.

Chimney fans of a material as described in 4.1 c) and f) are considered to be designated 1.

4.5.3.3 Wet application

Chimney fans of a material as described in 4.1 b) are considered to be designated 2.

Chimney fans of a material as described in 4.1 c) or e) are considered to be designated 1.

4.5.4 Dangerous substances

National regulations on dangerous substances may require verification and declaration on release, and sometimes content, when construction products covered by this standard are placed on those markets.

In the absence of European harmonized test methods, verification and declaration on release/content should be done taking into account national provisions in the place of use.

NOTE An informative database covering European and national provisions on dangerous substances is available at the Construction website on EUROPA accessed through: http://ec.europa.eu/growth/tools-databases/cp-ds_en

4.6 Additional criteria for chimney operation

4.6.1 Flow characteristic

The flow characteristic of the inline or exhaust fan shall be determined in accordance with 5.3.3.

4.6.2 Resistance to ice formation

An icing test applies only for exhaust fans in wet application. Ice built-up may maximum cover 15 % of the free exhaust opening area of the fan. The fan shall be able to restart after being tested in accordance with 5.3.4.

4.6.3 Cleaning and maintenance

4.6.3.1 Cleaning of the fan

It shall be possible to clean the fan of foreign objects or residues from the combustion after the fan has been installed.

If the access to the fan is restricted for safety reasons it shall be possible to gain access by the means of a common tool. The size of the cleaning opening shall be big enough to enable a sufficient cleaning.

4.6.3.2 Cleaning of the chimney

A chimney fan shall not hinder the sweeping of the chimney. Provisions to open or remove the exhaust fan top or the exhaust fan itself shall be taken. It might be necessary to use a tool to gain access to the chimney.

4.6.4 Maintenance of the fan

It shall be possible to dismantle and assemble the part that is meant to be serviced, for instance to mount a new motor. The product shall also be ready for cleaning, that means that all service openings shall be easily opened.

4.7 Safety

4.7.1 Mechanical safety

NOTE The DIRECTIVE 2006/42/EC “Machinery, and amending Directive 95/16/EC (recast)” might be considered.

a) General principles

The manufacturer of machinery or his authorized representative shall ensure that a risk assessment is carried out in order to determine the health and safety requirements which apply to the machinery. The machinery shall then be designed and constructed taking into account the results of the risk assessment.

b) Principles of safety integration

Chimney fans shall be designed and constructed so that it is fit for its function, and can be operated, adjusted and maintained without putting persons at risk when these operations are carried out under the conditions foreseen but also taking into account any reasonably foreseeable misuse thereof.

The measures taken shall aim at eliminating any risk throughout the foreseeable lifetime of the machinery including the phases of transport, assembly, dismantling, disabling and scrapping.

4.7.2 Electrical safety

The safety is obtained by fulfilling the requirements of EN 60335-1 and EN 60335-2-80.

5 Testing, assessment and sampling methods

5.1 Mechanical resistance and stability

5.1.1 General

When tested in accordance with 5.1.2 the product shall remain mechanically stable and safe. After the heat stress test, the inline fans shall fulfil the demands of 5.3.1.

5.1.2 Wind load test

5.1.2.1 General

The projected area of the exhaust fan is defined as the largest cross section. All different installation methods shall be tested. During the test, the fan shall remain attached to the chimney adapter.

5.1.2.2 Preparation of test specimen

The test shall be carried out with the exhaust fan installed on a chimney able to withstand the wind load of 1,5 KN/m^2 on the exhaust fan.

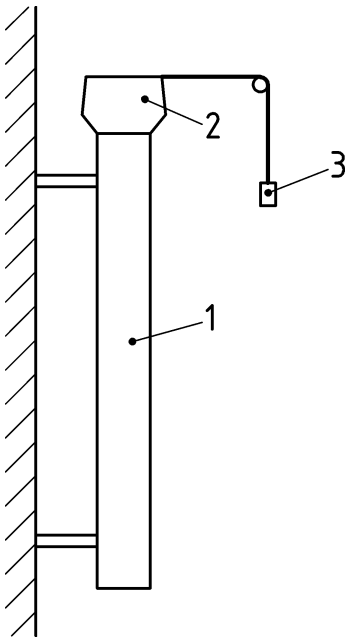
The exhaust fan consisting of the manufacturer declared components (e.g. inner liner guide, mounting plate and insulation) shall be installed as specified by the manufacturer.

Carry out the tests on the thermal tested sample (see Figure 1). The chimney fixed to the wall shall be so stable that is does not deform during testing. A wall thickness of 2 mm is recommended.

5.1.2.3 Test procedure horizontal wind load

Flush with top point of exhaust fan attach a 4 mm to 6 mm steel wire (by drilling a hole, welding or other suitable method). Through the steel wire apply a horizontal load on the exhaust fan, increase the load up to 1,5 KN/m^2 ± 2,5 %.

Record that the fan maintains its safe attachment to the chimney. Small movements are allowed during the test.



Key

1 chimney fixed to wall
2 chimney fan
3 load

Figure 1 — Horizontal wind load test

5.2 Thermal performance

5.2.1 General

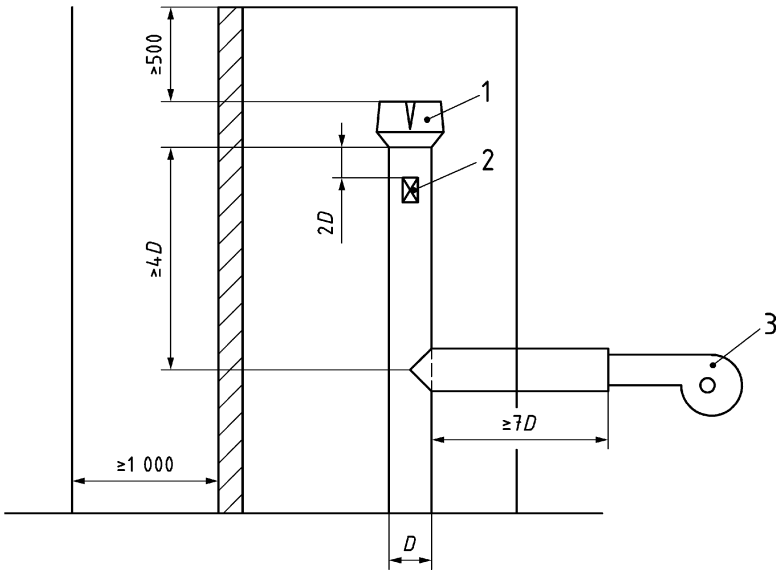
The chimney fan to be tested shall be mounted in the test assembly and supported according to the manufacturer's instruction manual. The fan shall be fitted with adapters where appropriate.

5.2.2 Test assembly for heat stress and thermal shock tests

5.2.2.1 General

Test rigs for exhaust and inline fans shall be in accordance with Figures 2 and 3.

Dimensions in millimetres

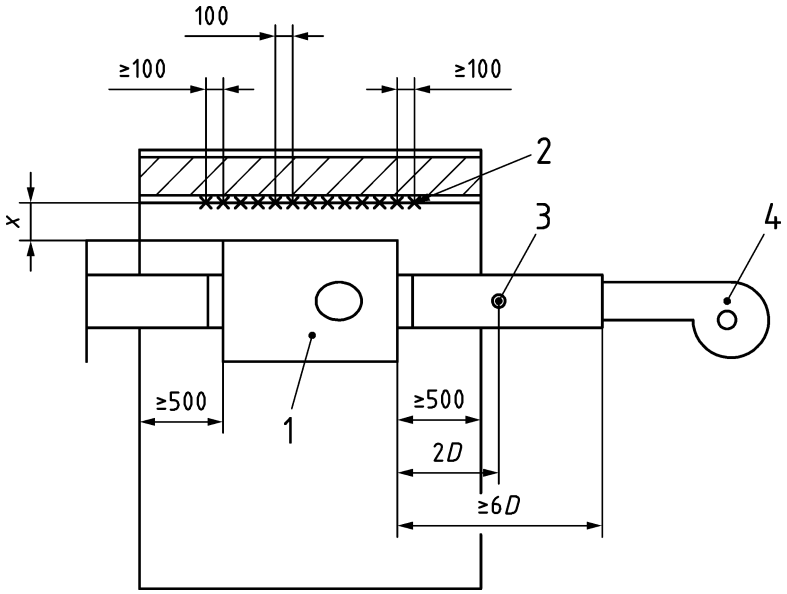


Key

1 exhaust fan
2 flue gas temperature
3 hot gas generator
D diameter of hot gas connecting pipe

Figure 2 — Test rig with insulated chimney for exhaust fan

Dimensions in millimetres



Key

1 inline fan
2 thermocouples
3 flue gas temperature
4 hot gas generator
D diameter of the hot gas connecting pipe
x distance to combustible material

Figure 3 — Test rig with insulated chimney for inline fan

5.2.2.2 Test assembly for exhaust fan

The test fan shall be the fan representing the manufacturer's product range. The size shall be the largest size produced up to 200 mm flue diameter. For larger diameters the distance may be calculated from the formula in EN 1856-1:2009, 6.4.

The exhaust fan shall be inserted as upper part of a vertical chimney assembly as shown in Figure 2. The diameter of the chimney shall be consistent with the size of the chimney connections of the test fan or to be approximately sized to simulate conditions of radiation to the fan which would be expected in use.

A flue gas generator in accordance with EN 13216-1:2004, 5.7.2.4, shall be used to supply flue gases to the vertical chimney assembly. The flue gas generator outlet shall be connected to the inlet of the vertical chimney assembly by means of a tee at the generator. The test chimney shall be insulated to provide a thermal resistance value of not less than that equivalent to 50 mm thickness of material having a thermal conductivity of (0,125 ± 0,005) W/mK at (750 ± 5) °C (see Figure 2).

5.2.2.3 Test assembly for inline fan

The test fan is the fan representing the manufacturer's product range. The size shall be the largest size produced up to 200 mm flue diameter. For larger diameters the distance may be calculated from the formula in EN 1856-1:2009, 6.4.

The inline fan shall be inserted as a part of a vertical chimney assembly as shown in Figures 3 and 5 . The diameter of the chimney shall be consistent with the size of the chimney connections of the test fan or to be approximately sized to simulate conditions of radiation to the fan which would be expected in use.

A flue gas generator in accordance with EN 13216-1:2004, 5.7.2.4, shall be used to supply flue gases to the vertical chimney assembly.

The flue gas generator outlet shall be connected to the inlet of the chimney assembly. The test chimney shall be insulated to provide a thermal resistance value of not less than that equivalent to 50 mm thickness of material having a thermal conductivity of (0,125 ± 0,005) W/mK at (750 ± 5) °C (see Figure 3).

5.2.3 Test structures

5.2.3.1 Test structure exhaust fan

Construct a test structure consisting of two walls at right angles to each other. The test corner extremities shall extend beyond the exhaust fan external dimensions by at least 300 mm, and by at least 500 mm above the topmost surface of the exhaust fan (see Figure 2). The test corner walls shall be constructed with the material dimensions and specifications described in EN 13216-1:2004, 5.7.2.2.2 and 5.7.2.2.3. If the highest temperature is measured at the periphery of the test corner then the test corner walls shall be extended by at least 150 mm beyond the point of the highest temperature.

The minimum distance between the test corner and building structures (i.e. walls, etc.) shall be 1,0 m.

5.2.3.2 Test structure inline fan

Construct a test structure consisting of a wall and a ceiling at right angles to each other. The test structure extremities shall extend beyond the inline fan external dimensions by at least 500 mm (see Figure 3). The test structure wall and ceiling shall be constructed with the material dimensions and specifications in EN 13216-1:2004, 5.7.2.2.2 and 5.7.2.2.3. If the highest temperature is measured at the periphery of the test structure then the test structure wall and ceiling shall be extended by at least 150 mm beyond the point of the highest temperature.

The minimum distance between the test structure and building structures (i.e. walls, etc.) shall be 1,0 m.

5.2.4 Measuring parameters

5.2.4.1 Test environment, test room

The test room shall be in accordance with EN 13216-1:2004, 5.7.4.1. This requirement is deemed fulfilled in a closed test room.

The velocity of the ambient air shall, if measured, be with an accuracy according to EN 13216-1:2004.

5.2.4.2 Hot gas temperature

The hot gas temperature measuring shall be in accordance with EN 13216-1:2004, 5.7.4.2, except for the position of the thermocouple in Figures 2 and 3.

The thermocouple used for the measurement shall have a maximum wire diameter of 1,0 mm if unshielded and a maximum total diameter of 1,5 mm if shielded.

5.2.4.3 Hot gas velocity

The hot gas velocity measuring shall be in accordance with EN 13216-1:2004, 5.7.4.3. Besides the methods described, an orifice plate is also an acceptable method.

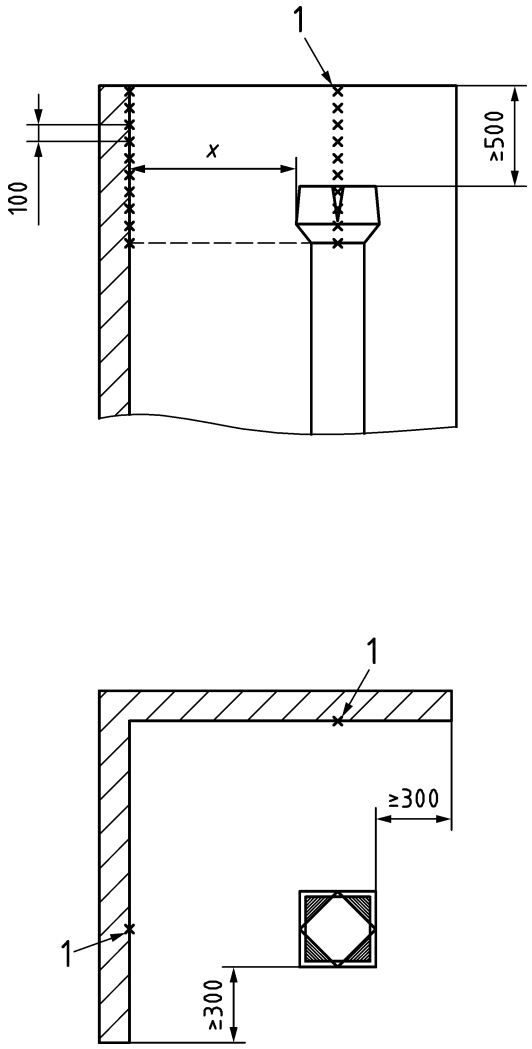
5.2.4.4 Test structure, surface temperatures

The maximum surface temperatures of the test corner walls or cealing shall be determined. These temperatures shall be measured using equipment meeting the accuracy requirements specified in EN 13216-1:2004, 5.7.4.4. The position of the measurement points shall be as illustrated in Figures 4 and 5.

The position of the thermocouples in accordance with EN 13216-1 could be kept, if it is ensured that the maximum surface temperature is recorded with that setup.

The thermocouples shall be installed as described in Annex C and D.

Dimensions in millimetres



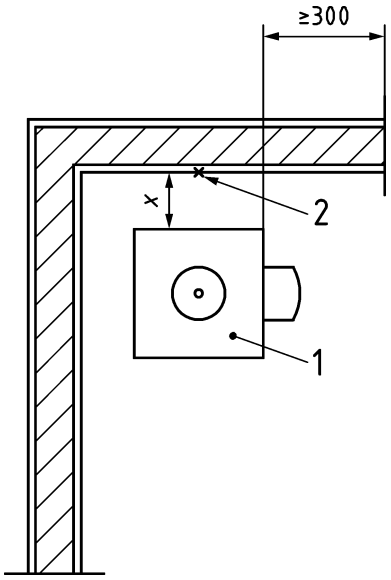
Key

1 thermocouples

x distance to combustible

Figure 4 — Position of the thermocouples test rig for the exhaust fan

Dimensions in millimetres



Key

1 inline fan

2 thermocouples

x distance to combustible

Figure 5 — Position of the thermocouples test rig for the inline fan

5.2.4.5 Exhaust fan surface temperatures

If exhaust fan temperatures shall be measured, this shall be done as described in Annex D.

The exhaust fan temperatures shall be measured with an accuracy in accordance with EN 13216-1:2004, 5.7.4.4.

5.2.4.6 Ambient temperature

Ambient temperature shall be measured as described in Annex E.

Ambient temperatures during the test shall be as described in EN 13216-1:2004, 4.2.

The ambient air temperature shall be measured with an accuracy in accordance with EN 13216-1:2004, 5.7.4.5.4.

5.2.5 Test procedure for heat stress test

Generate hot gas with a velocity in the test chimney and a test temperature specified in EN 13216-1:2004, Table 1, appropriate to the hot gas velocity for negative and positive pressure chimneys, product designation and diameter.

For exhaust fans always use the values for negative pressure chimneys.

Regulate the rate of rise of the hot gas temperature to achieve the test temperature defined in EN 1443, with an average increase of 50 K per min.

Normal production sizes are limited to a diameter of 200 mm. Hot gas velocities for other sizes are possible by calculating in accordance with EN 13384-1.

Maintain the hot gas temperature at $^{-0}_{+5}$ % of the test temperature, and the flow rate at $^{-0}_{+10}$ % of the value given in EN 13216-1:2004, Table 1, until equilibrium or 6 h. Equilibrium is deemed to exist when the rate of rise of the temperature at the hottest point on the test assembly or structure does not exceed 1 K per 30 min up to hot gas temperatures of 250 °C and 2 K per 30 min for higher hot gas temperatures.

After equilibrium has been reached, determine the highest temperature on the test corner, using an IR-thermometer. On the position with the highest temperature place a thermocouple as described in Annex D, and continue until equilibrium has been reached again on this thermocouple, but not less than 30 min.

During the test phase, the ambient temperature shall not vary by more than 5 K.

Record the temperatures after firing the test assembly until the temperatures have reached their maximum.

5.2.6 Test procedure for sootfire resistance test

5.2.6.1 General

With the test assembly temperatures within 10 °C of the test room ambient conditions, generate hot gas with the volume flow and test temperature specified in EN 13216-1:2004, Table 1, appropriate to the diameter. Regulate the rate of rise of the hot gas temperature to achieve 1 000 °C in (10 ± 1) min. The ambient air temperature may vary during the test by more than 5 °C. Maintain the hot gas temperature at 1 000 °C (−20 + 50) °C for a period of 30 min.

After 25 min at 1 000 °C, determine the highest temperature on the test corner, using an IR-thermometer. If the position of this temperature is more than 5 cm different from the position found during the heat stress test, terminate the thermal shock test, and move the thermocouple to the new position. Repeat the thermal shock test with a new exhaust fan mounted (if necessary) in exactly the same angular position.

After 30 min turn off the hot gas generator.

Continue to record the temperatures on the test assembly until the temperatures have reached their maximum.

NOTE The relevant product standard may require to run the test with a positive pressure chimney and a high positive pressure chimney for sootfire condition.

5.2.6.2 Test results

Record all temperature values as specified in 5.2.4. Record any instance where the maximum temperature exceeds the allowed values.

For the purpose of determining temperature rises on the exhaust fan and on enclosures and structures, such temperatures shall be related to the ambient air temperature.

Continue to record the temperatures on the test assembly until the temperatures have reached their maximum.

5.3 Hygiene, health and the environment

5.3.1 Gas tightness test

5.3.1.1 Test apparatus

Provide an air supply capable of delivering air at a rate sufficient to achieve and maintain the required test pressure at the leakage rate appropriate to the designation.

Unmount the fan and seal the inlet and the outlet of the test fan with an air tight seal in a typical manner (see Figure 6).

For the measurement of the pressure use:

— for fans designated N, a device with the pressure to an accuracy of ± 1 Pa;

— for fans designated P, a device with the pressure to an accuracy of ± 5 Pa;

— for fans designated H, a device with the pressure to an accuracy of ± 50 Pa.

For measurement of the leakage flow for both negative and for positive pressure fans in accordance with EN 1443 use a flow measuring device with an accuracy of ± 5 %.

5.3.1.2 Test sample

The test sample shall be the test fan used for the thermal performance tests, thermally conditioned according to the designation given in Table 2.

5.3.1.3 Measuring parameters

Measure and record:

— the gas leakage and the pressure maintained during the test in accordance with Table 2;

— the inner dimensions of the test sample;

— calculate the inner surface area.

Record the air flow rate, the pressure and the inner dimensions of the test sample.

5.3.1.4 Test procedure

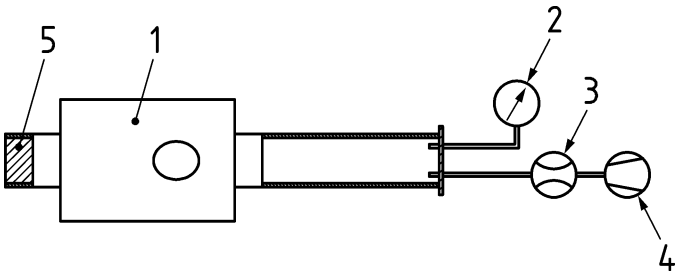
Deliver air from the air supply to the fan at a rate necessary to achieve and maintain the required test pressure given in Table 2. Measure the gas leakage at ambient temperature.

Subject the test sample to thermal conditions appropriate to the designation.

Measure the gas leakage again at ambient temperature.

5.3.1.5 Test results

The results are expressed by the leakage rate related to the inner surface area of the test sample.



Key

1 inline fan
2 gauges
3 flow meter
4 fan
5 plug

Figure 6 — Test rig for gas tightness

5.3.2 Flow resistance after thermal tests

5.3.2.1 General

The flow resistance of the chimney fan shall be tested after the thermal test.

5.3.2.2 Test apparatus

The test rig (see Figure 7) and chimney fan after tests in 5.2.5 and 5.2.6 shall be used.

5.3.2.3 Test sample

The test sample is the chimney fan which has been exposed to tests 5.2.5 and, if appropriate, 5.2.6 in accordance with the designated temperature.

5.3.2.4 Measuring parameters

For measuring parameters use a device with an accuracy of:

— for the pressure difference, ± 0,5 Pa;

— for the air velocity, ± 5 %;

— for the ambient air, ± 1,0 °C; and

— for the static ambient pressure, ± 5 %.

5.3.2.5 Test procedure

Place pressure measurement points in the flue duct at a distance of approximately three times the nominal diameter from the exhaust fan. For inline fans also place a pressure measuring point at a distance of approximately three times the nominal diameter after the inline fan. For this purpose, at least three openings, with a diameter of 1 mm, shall be distributed evenly around the circumference of the duct, in a plane perpendicular to the duct axis. The openings shall be free of burrs on the inside of the duct. These openings shall be used to determine the average static pressure within the duct.

With the chimney fan mounted in the thermal test rig in accordance with Figure 6, deliver air by means of a fan at three velocities in the flue of 2 m/s ± 10 %, 4 m/s ± 10 % and 6 m/s ± 10 %, and take the average ζ - value.

For exhaust fans measure the pressure difference between static pressure in the flue duct and the pressure in the test room.

For inline fans measure the pressure difference between static pressure in the flue duct before the inline fan and the pressure in the flue duct after the inline fan. The pressure difference is measured at equilibrium (see Formula (1)).

$$\zeta = \frac{2 \cdot \Delta\rho}{\rho \cdot w^2} \tag{1}$$

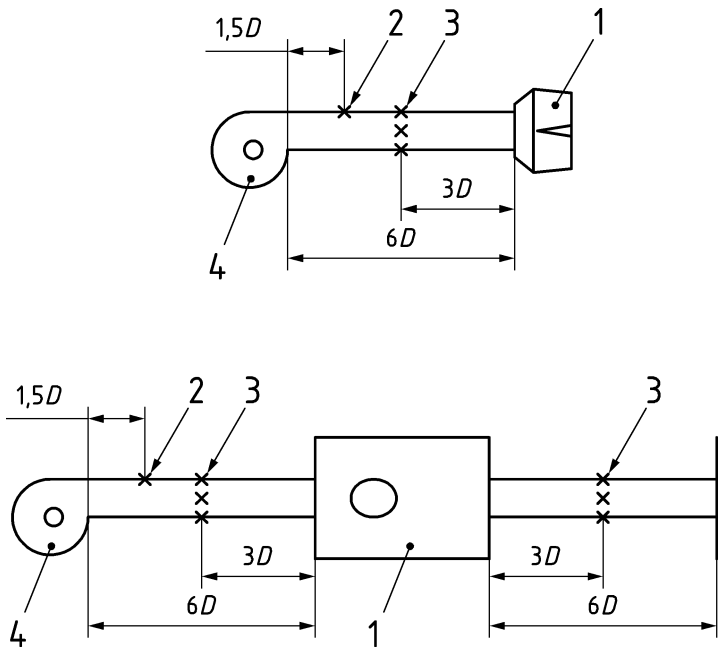
where

Δp is the pressure difference, in Pascal;

ρ is the density of air, in kilograms per cubic metre;

W is the velocity, in metres per second;

ζ is the coefficient of flow resistance.



Key

1 exhaust and inline fan
2 volume probes
3 pressure probes
4 flow assist fan
D diameter of the hot gas connecting pipe

Figure 7 — Test rig for flow resistance and volume

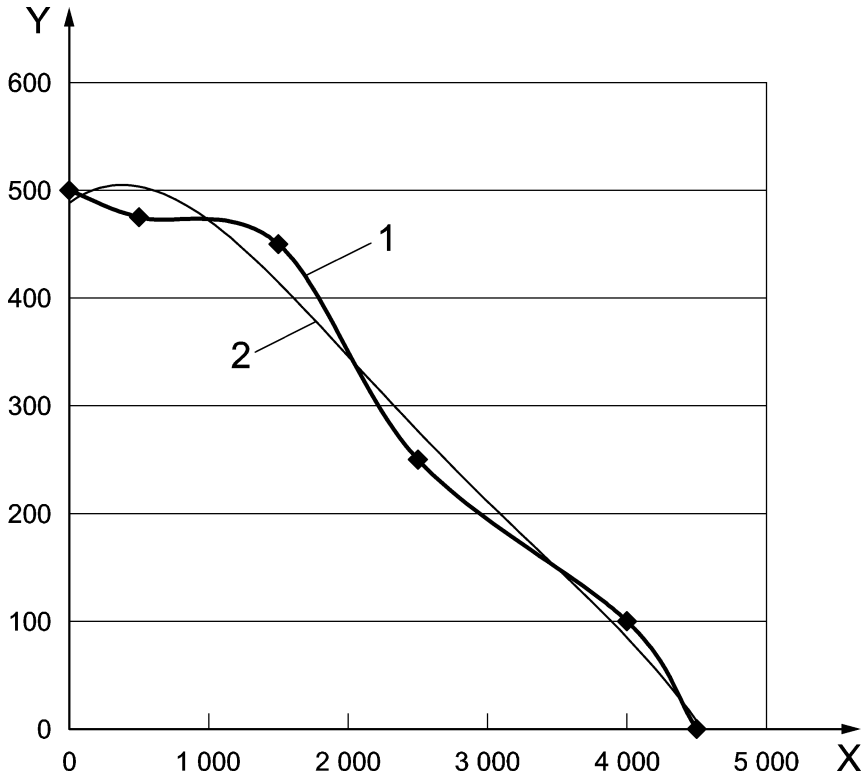
5.3.3 Flow characteristic, capacity

The volume flows shall be determined at maximum operating power in accordance with EN ISO 5801 for at least 6 different pressures, which shall be distributed evenly within the operational area of the fan. The results shall be plotted in a chart, see example in Figure 8.

To determine the flow characteristic the same equipment as for the flow resistant test shall be used. The measuring point is shown in Figure 7. The flow measurement shall have an accuracy of ± 5 %.

For additional information on computer calculation data see Annex B.

NOTE 1 The results are based on a density of 1,2 kg/m^3.



Key

1 measured values

2 generated polynomial graph determined by least square method

X volume

Y pressure

NOTE Capacity curve measured at a temperature of 20 °C.

Figure 8 — Example of capacity chart

The characteristic shall be expressed with coefficients in accordance with Formula (2):

$$Y = c_4 \cdot X^4 + c_3 \cdot X^3 + c_2 \cdot X^2 + c_1 \cdot X + c_0 \quad (2)$$

where

X is the pressure in Pa

Y is the capacity in m^3/s

c_0 is the characteristic value of the chimney fan, in Pa

c_1 is the characteristic value of the chimney fan, in $Pa/(m^3/s)$

c_2 is the characteristic value of the chimney fan, in $Pa/(m^3/s)^2$

c_3 is the characteristic value of the chimney fan, in $Pa/(m^3/s)^3$

c_4 is the characteristic value of the chimney fan, in $Pa/(m^3/s)^4$

The coefficients can be determined on the basis of the given points plotted in the chart with the method of least squares.

NOTE 2 The generated formula can then be used as a basis for calculation programs for chimney dimensioning in accordance with the EN 13384 series.

5.3.4 Test method for icing behaviour for exhaust fans

5.3.4.1 Test apparatus

For the test, the following is necessary:

The test assembly shall consist of:

— a cooling chamber large enough to contain the fan and capable of maintaining a temperature of –15 °C with the heat load from the flue gas entering the room;

— a heat generator, see Figure 9 (4), may be used;

— a steam generator, see Figure 9 (3) suitable for injecting steam into the flue in order to maintain saturated flue gas. The relative humidity of the flue gas should be 90 % up to 100 % within the flue duct of the exhaust fan.

For more details, see Figure 9.

5.3.4.2 Test sample

The test shall be carried out with a test sample:

— as specified in the relevant product standards;

— the size shall be the largest size produced up to 200 mm flue diameter, in the range produced.

5.3.4.3 Measurement parameters

The test shall specify the following parameters with the given tolerances (see Table 3):

Table 3 — Parameters and tolerances for the icing test for exhaust fans

Measurement parameter	Tolerance
ambient air temperature in the test room in °C	±1 °C
atmospheric pressure value in Pa	±50 Pa
temperature of the cooling chamber in °C	±2 °C
flue gas temperature in the duct in °C	±2 °C
relative humidity in the duct in %	±5 %
flue gas velocity in m/s	±0,1 m/s
flue gas velocity in the duct in m/s	±0,2 m/s
dimensions of the free opening area of the exhaust fan in mm^2	±10 mm^2

5.3.4.4 Test condition

The following parameters are recommended for an assessment of the icing behaviour of a fan in a vertical position. Individual product standards may prefer additional orientations:

— ambient air temperature in the test room shall remain in the range between 10 °C and 30 °C;

— temperature of the flue gas at the entry = 60 °C ± 5 °C;

— flue gas velocity in the duct w_F = 2,0 m/s ± 0,25 m/s (Fan off) or fan dependant (Full speed)

— temperature in the climate chamber t_{CC} = - 15 °C ± 3 °C.

5.3.4.5 Test procedure

The test shall be carried out as follows:

Determine the free open exhaust area of the fan and mount it vertically in the test cooling chamber in accordance with the manufacturer's instructions. Connect the fan to the heat generator and adjust the fan speed (off or full speed). Test the fan in the worst case condition, i.e. at standstill or full speed.

Adjust the heat input to the heat generator so that hot air enters the flue inlet at a temperature of 60°C ± 5 °C and with a flow rate of 2 m/s ± 0,2 m/s.(Fan Off) Inject sufficient steam into the flue to ensure saturated flue gas. The relative humidity of the flue gas should be 90 % up to 100 % within the terminal.

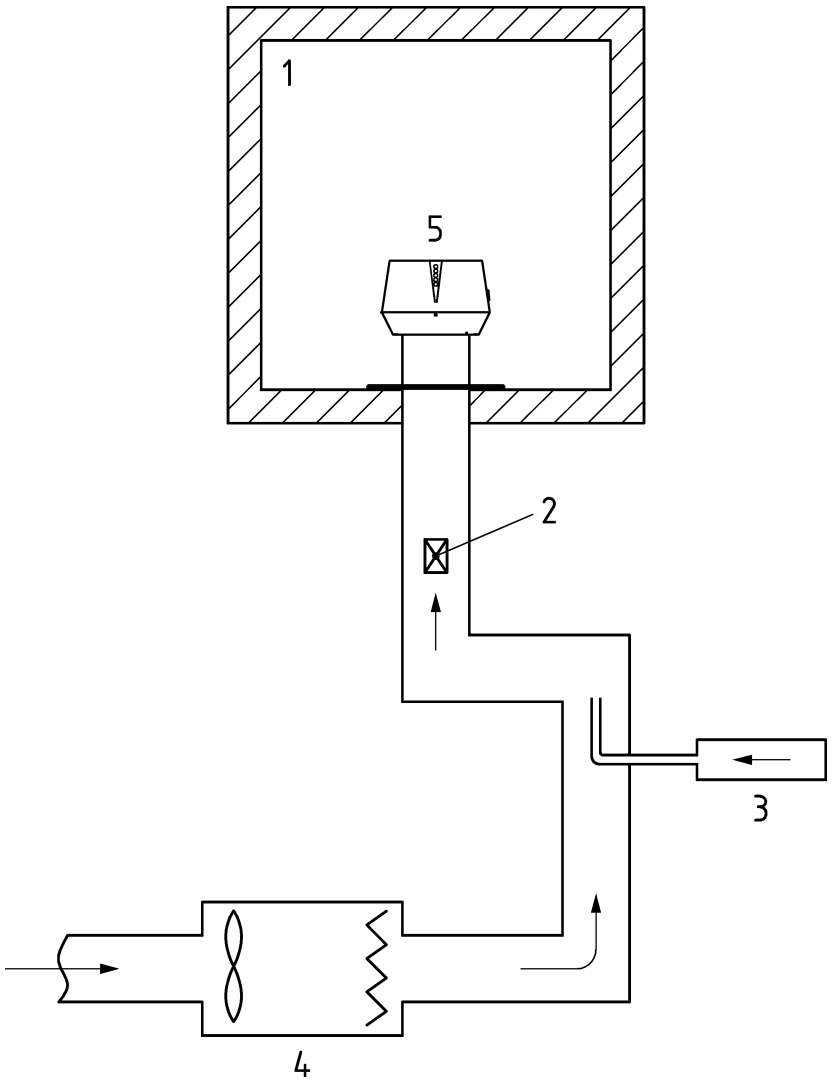
The hot air and steam injection are simultaneously cycled 3 min on and 7 min off for a period of 4 h or until maximum ice build-up has been reached. At the end of the test, before the ice starts to melt, measure the area of ice covering the free exhaust opening area.

5.3.4.6 Test result

The results shall be presented as:

— % of ice covering the free exhaust opening area.

NOTE For an example of the test rig see Figure 9.



Key

1 cooling chamber
2 measuring point
3 steam generator
4 hot gas generator
5 chimney fan

Figure 9 — Test rig to determine the icing behaviour

6 Assessment and verification of constancy of performance - AVCP

6.1 General

The compliance of a chimney fan with the requirements of this European Standard and with the performances declared by the manufacturer in the DoP shall be demonstrated by:

— Determination of the product type;

— factory production control by the manufacturer, including product assessment.

The manufacturer shall always retain the overall control and shall have the necessary means to take responsibility for the conformity of the product with its declared performance(s).

6.2 Type testing

6.2.1 General

All performances related to characteristics included in this standard shall be determined when the manufacturer intends to declare the respective performances unless the standard gives provisions for declaring them without performing tests.

Assessments previously performed in accordance with the provisions of this standard, may be taken into account provided that they were made to the same or a more rigorous test method, under the same AVCP system on the same product or products of similar design, construction and functionality, such that the results are applicable to the product in question.

In addition, the determination of the product type shall be performed for all characteristics included in the standard for which the manufacturer declares the performance:

— at the beginning of the production of a new or modified chimney fan (unless a member of the same product range), or

— at the beginning of a new or modified method of production (where this may affect the stated properties); or

they shall be repeated for the appropriate characteristic(s), whenever a change occurs in the chimney fan design, in the raw material or in the supplier of the components, or in the method of production (subject to the definition of a family), which would affect significantly one or more of the characteristics.

Where components are used whose characteristics have already been determined, by the component manufacturer, on the basis of assessment methods of other product standards, these characteristics need not be re-assessed. The specifications of these components shall be documented.

Products bearing regulatory marking in accordance with appropriate harmonized European specifications may be presumed to have the performances declared in the DoP, although this does not replace the responsibility on the chimney fan manufacturer to ensure that the chimney fan as a whole is correctly manufactured and its component products have the declared performance values.

6.2.2 Test samples, testing and compliance criteria

The number of samples of chimney fans to be tested/assessed shall be in accordance with Table 4.

Table 4 — Number of samples to be tested and compliance criteria

Characteristic	Requirement	Assessment method	No. of samples	Compliance criteria
Thermal performance	4.4	5.2	1	4.4
Fire resistance	4.4.4 4.4.5	5.2.5 5.2.6	1	4.4.4 4.4.5
Flow resistance	4.4.4 a) 4.4.5 a)	5.3.2	1	4.4.4 4.4.5
Gas tightness	4.5.1	5.3.1	1	4.5.1
Condensate resistance	4.5.2	EN 13216–1	1	4.5.2
Durability against corrosion	4.5.3	EN 1856–1 or 4.5.3.2 or 4.5.3.3	1	4.5.3
Dangerous substances	4.5.4	4.5.4	1	4.5.4
Flow characteristic	4.6.1	5.3.3	1	4.6.1

6.2.3 Choice of size for type test and sampling

6.2.3.1 Thermal testing

The largest size which can be installed in a chimney is up to and including a diameter of 200 mm. All diameters within a range of products of the same design and designation shall be deemed to meet the requirements met by the tested samples.

6.2.3.2 Gas tightness

The thermally tested fan shall be tested for gas tightness after the thermal test. Additionally, the smallest and largest fan in the series which is not thermally tested shall also be tested for gas tightness.

6.2.3.3 Condensate resistance

The condensate resistance shall be tested on a thermally tested sample in accordance with 4.5.2 (only inline fans).

6.2.3.4 Samples

The number of components to be supplied is determined by the units required for each applicable test.

6.2.3.5 Verification of samples

The factory production control system shall verify that normal production units are identical to the samples used for type testing.

6.2.3.6 Nature of changes requiring further type test

Further type testing is required when:

a) the material or the method of construction changes;

b) changes take place which affect the designation parameters as appropriate.

6.2.4 Test reports

The results of the determination of the product type shall be documented in test reports. All test reports shall be retained by the manufacturer for at least 10 years after the last date of production of draught regulator, standstill opening device or combined secondary air to which they relate.

6.2.5 Shared other party results

A manufacturer may use the results of the product type determination obtained by someone else (e.g. by another manufacturer, as a common service to manufacturers, or by a product developer), to justify his own declaration of performance regarding a product that is manufactured according to the same design (e.g. dimensions) and with raw materials, constituents and manufacturing methods of the same kind, provided that:

a) the results are known to be valid for products with the same essential characteristics relevant for the product performance;

b) in addition to any information essential for confirming that the product has such same performances related to specific essential characteristics, the other party who has carried out the determination of the product type concerned or has had it carried out, has expressly accepted[1)] to transmit to the manufacturer the results and the test report to be used for the latter's product type determination, as well as information regarding production facilities and the production control process that can be taken into account for FPC;

c) the manufacturer using other party results accepts to remain responsible for the product having the declared performances and he also:

   1) ensures that the product has the same characteristics relevant for performance as the one that has been subjected to the determination of the product type, and that there are no significant differences with regard to production facilities and the production control process compared to that used for the product that was subjected to the determination of the product type; and

   2) keeps available a copy of the determination of the product type report that also contains the information needed for verifying that the product is manufactured according to the same design and with raw materials, constituents and manufacturing methods of the same kind.

6.3 Factory production control (FPC)

6.3.1 General

The manufacturer shall establish, document and maintain a FPC system to ensure that the products placed on the market comply with the declared performance of the essential characteristics. The FPC system shall consist of procedures, regular inspections and tests and/or assessments and the use of the results to e.g. control raw materials, equipment, the production process and the product.

1) The formulation of such an agreement can be done by licence, contract, or any other type of written consent.

All the elements, requirements and provisions adopted by the manufacturer shall be documented in a systematic manner in the form of written policies and procedures.

This factory production control system documentation shall ensure a common understanding of the evaluation of the constancy of performance and enable the achievement of the required product performances and the effective operation of the production control system to be checked. Factory production control therefore brings together operational techniques and all measures allowing maintenance and control of the compliance of the product with the declared performances of the essential characteristics.

In case the manufacturer has used shared or cascading product type results, the FPC shall also include the appropriate documentation as foreseen in 6.2.4 and 6.2.5.

6.3.2 Requirements

6.3.2.1 General

The manufacturer is responsible for organizing the effective implementation of the factory production control system. Tasks and responsibilities in the production control organization should be documented and this documentation should be kept up to-date.

The responsibility, authority and the relationship between personnel that manages, performs or verifies work affecting product constancy, shall be defined. This applies in particular to personnel that need to initiate actions preventing product non-constancies from occurring, actions in case of non-constancies and to identify and register product constancy problems.

Personnel performing work affecting the constancy of performance of the product shall be competent on the basis of appropriate education, training, skills and experience for which records shall be maintained.

In each factory the manufacturer may delegate the action to a person having the necessary authority to:

— identify procedures to demonstrate constancy of performance of the product at appropriate stages;

— identify and record any instance of non-constancy;

— identify procedures to correct instances of non-constancy.

The manufacturer should draw up and keep up-to-date documents defining the factory production control which he applies. The manufacturer's documentation and procedures should be appropriate to the product and manufacturing process. All FPC systems should achieve an appropriate level of confidence in the conformity of the product. This involves:

a) the preparation of documented procedures and instructions relating to factory production control operations, in accordance with the requirements of the reference technical specification;

b) the effective implementation of these procedures and instructions;

c) the recording of these operations and their results;

d) use of these results to correct any deviations, repair the effects of such deviations, treat any resulting instances of non-conformity and, if necessary, revise the FPC to rectify the cause of non-constancy of performance.

Where subcontracting takes place, the manufacturer shall retain the overall control of the product and ensure that he receives all the information that is necessary to fulfil his responsibilities according to this European Standard.

If the manufacturer has part of the product designed, manufactured, assembled, packed, processed and/or labelled by subcontracting, the FPC of the subcontractor may be taken into account, where appropriate for the product in question.

The manufacturer who subcontracts all of his activities may in no circumstances pass the above responsibilities on to a subcontractor.

NOTE Manufacturers having an FPC system, which complies with EN ISO 9001 standard and which addresses the provisions of the present European standard, are considered as satisfying the FPC requirements of the Regulation (EU) No 305/2011.

6.3.2.2 Equipment

6.3.2.2.1 Testing

All weighing, measuring and testing equipment shall be calibrated and regularly inspected in accordance with documented procedures, frequencies and criteria.

6.3.2.2.2 Raw materials and components

The specifications of all incoming raw materials and components shall be documented, as shall the inspection scheme for ensuring their compliance. In case supplied kit components are used, the constancy of performance system of the component shall be that given in the appropriate harmonized technical specification for that component.

a) Materials, including coatings:

   1) type – composition;

   2) thickness;

   3) finish.

Supplier's declaration for material type and properties is allowed, provided that the supplier has an appropriate quality assurance system.

b) Seals and sealants:

   1) type - Including identification or composition, when the conformity certificate is not available;

   2) dimensions.

Supplier's declaration for material type and properties is allowed, provided that the supplier has an appropriate quality assurance system.

6.3.2.3 Traceability and marking

6.3.2.3.1 General

Individual products shall be identifiable and traceable with regard to their production origin. The manufacturer shall have written procedures ensuring that processes related to affixing traceability codes and/or markings are inspected regularly.

6.3.2.3.2 Controls during manufacturing process

The manufacturer shall plan and carry out production under controlled conditions.

Dimensions of critical parts shall be confirmed during the manufacturing and/or on completion:

1) material thickness;

2) size;

3) construction characteristic (e.g. rivets).

6.3.2.3.3 Other checks

These checks are product-dependent and to be carried out during the manufacturing process.

6.3.2.3.4 Finished goods checks

At the end of the manufacturing process, prior to the packaging, each unit shall be visually inspected for damage. When boxed, the carton is stamped with the date of manufacture.

6.3.2.4 Product testing and evaluation

The manufacturer shall establish procedures to ensure that the stated values of the characteristics are maintained.

6.3.2.5 Non-complying products

The manufacturer shall have written procedures which specify how non-complying products shall be dealt with. Any such events shall be recorded as they occur and these records shall be kept for the period defined in the manufacturer's written procedures.

Where the product fails to satisfy the acceptance criteria, the provisions for non-complying products shall apply, the necessary corrective action(s) shall immediately be taken and the products or batches not complying shall be isolated and properly identified.

Once the fault has been corrected, the test or verification in question shall be repeated.

The results of controls and tests shall be properly recorded. The product description, date of manufacture, test method adopted, test results and acceptance criteria shall be entered in the records under the signature of the person responsible for the control/test.

With regard to any control result not meeting the requirements of this European standard, the corrective measures taken to rectify the situation (e.g. a further test carried out, modification of manufacturing process, throwing away or putting right of product) shall be indicated in the records.

6.3.2.6 Corrective action

The manufacturer shall have documented procedures that instigate action to eliminate the cause of non-conformities in order to prevent recurrence.

6.3.2.7 Handling, storage and packaging

The manufacturer shall have procedures providing methods of product handling and shall provide suitable storage areas preventing damage or deterioration.

6.3.3 Product specific requirements

The FPC system shall address this European Standard and ensure that the products placed on the market comply with the declaration of performance.

The FPC system shall include a product specific FPC, which identifies procedures to demonstrate compliance of the product at appropriate stages, i.e.:

a) the controls and tests to be carried out prior to and/or during manufacture according to a frequency laid down in the FPC test plan,

and/or

b) the verifications and tests to be carried out on finished products according to a frequency laid down in the FPC test plan.

If the manufacturer uses only finished products, the operations under b) shall lead to an equivalent level of compliance of the product as if FPC had been carried out during the production.

If the manufacturer carries out parts of the production himself, the operations under b) may be reduced and partly replaced by operations under a). Generally, the more parts of the production that are carried out by the manufacturer, the more operations under b) may be replaced by operations under a).

In any case the operation shall lead to an equivalent level of compliance of the product as if FPC had been carried out during the production.

NOTE Depending on the specific case, it can be necessary to carry out the operations referred to under a) and b), only the operations under a) or only those under b).

The operations under a) refer to the intermediate states of the product as on manufacturing machines and their adjustment, and measuring equipment, etc. These controls and tests and their frequency shall be chosen based on product type and composition, the manufacturing process and its complexity, the sensitivity of product features to variations in manufacturing parameters, etc.

The manufacturer shall establish and maintain records that provide evidence that the production has been sampled and tested. These records shall show clearly whether the production has satisfied the defined acceptance criteria and shall be available for at least three years.

6.3.4 Initial inspection of factory and of FPC

Initial inspection of factory and of FPC shall be carried out when the production process has been finalized and in operation. The factory and FPC documentation shall be assessed to verify that the requirements of 6.3.2 and 6.3.3 are fulfilled.

During the inspection it shall be verified:

a) that all resources necessary for the achievement of the product characteristics included in this European standard are in place and correctly implemented;

and

b) that the FPC-procedures in accordance with the FPC documentation are followed in practice;

and

c) that the product complies with the product type samples, for which compliance of the product performance to the DoP has been verified.

All locations where final assembly or at least final testing of the relevant product is performed, shall be assessed to verify that the above conditions a) to c) are in place and implemented. If the FPC system covers more than one product, production line or production process, and it is verified that the general requirements are fulfilled when assessing one product, production line or production process, then the assessment of the general requirements does not need to be repeated when assessing the FPC for another product, production line or production process.

All assessments and their results shall be documented in the initial inspection report.

6.3.5 Continuous surveillance of FPC

Surveillance of the FPC shall be undertaken annually every 12 months. The surveillance of the FPC shall include a review of the FPC test plan(s) and production processes(s) for each product to determine if

any changes have been made since the last assessment or surveillance. The significance of any changes shall be assessed.

Checks shall be made to ensure that the test plans are still correctly implemented and that the production equipment is still correctly maintained and calibrated at appropriate time intervals.

The records of tests and measurement made during the production process and to finished products shall be reviewed to ensure that the values obtained still correspond with those values for the samples submitted to the determination of the product type and that the correct actions have been taken for non-compliant products.

6.3.6 Procedure for modifications

If modifications are made to the product, production process or FPC system that could affect any of the product characteristics declared according to this standard, then all the characteristics for which the manufacturer declares performance, which may be affected by the modification, shall be subject to the determination of the product type, as described in 6.2.

Where relevant, a re-assessment of the factory and of the FPC system shall be performed for those aspects, which may be affected by the modification.

All assessments and their results shall be documented in a report.

7 Designation

7.1 General

The chimney fan shall be designated in accordance with 7.2 or 7.3 if appropriate.

7.2 Exhaust fans

All exhaust fans shall be designated in accordance with the following designation system:

EXAMPLE Exhaust fan EN 16475–2 – T250 – NR* – D1 – As(400).

a) product description;

b) standard number;

c) temperature level (see Table 1);

d) pressure level. For exhaust fans always NR (Not Relevant);

e) condensate resistance (W: wet or D: dry);

f) corrosion resistance (durability against corrosion, category 1,2 or 3) (see 4.5.3);

g) sootfire resistent (G), sootfire safe (As) or not soot fire safe/resistant (O);

h) distance to combustible material in [mm] and (see 4.4.2 and 4.4.3.2.1).

7.3 Inline fans

All Inline fans shall be designated in accordance with the following designation system:

EXAMPLE Inline fans EN 16475–2 – T400 – P1 – D2 – O(400).

a) product description;

b) standard number;

c) temperature level (see Table 1);

d) pressure level (N or P or H);

e) condensate resistance (W: wet or D: dry);

f) corrosion resistance (durability against corrosion, category 1, 2 or 3) (see 4.5.3);

g) sootfire resistent (G), Sootfire safe (As) or not soot fire safe/resistant O);

h) distance to combustible material in [mm] and (see 4.4.2 and 4.4.3.2.1).

8 Marking, labelling and packaging

8.1 Marking chimney components

All chimney components shall be marked on the product itself or on the packaging. The text on the component shall be readable during its lifetime.

NOTE For CE-Marking see Annex ZA.

The following minimum information shall be stated on the component and/or on a label:

— name or trademark of the manufacturer;

— manufacturing batch or product reference of manufacturer;

— temperature class;

— material (in combination with 4.5.3);

— number of this standard.

8.2 Chimney fan plate

The manufacturer shall provide an indelibly marked plate made of a durable material that shall include the following information:

— name or trademark of the manufacturer;

— designation in accordance with Clause 7;

— product name/type;

— space for product data (Watt, Amperage, Supply voltage and frequency).

8.3 Manufacturer's instructions

8.3.1 General

The manufacturer's instructions shall be provided in the language of every country of the EU where the chimney fan is intended to be put on the market.

8.3.2 Minimum information to be included in the manufacturer's instructions

a) Description of the fan;

b) allowed use;

c) installation information:

   1) how the exhaust fan is installed as a terminal, it shall be ensured that the chimney is properly supported, additional supports might therefore be necessary;

   2) how to ensure that the chimney capacity is safe in case of fan failure.

NOTE 1 Chimneys fans in accordance with this European Standard are also usable in accordance with EN 13384–1:2015, 9.1, first indent, and/or EN 13384–2:2015, 16.1, first indent, if an additional cut-off of the appliance in case of failure is given by a control function class B or C respectively in accordance with EN 13611:2015, 4.3. If applicable, the manufacturer provides relevant information.

d) commissioning information;

e) operating information including how to check if the fan is in operation;

NOTE 2 This includes information if it is allowed to stop the fan during operation.

f) for As-designated fans a description of the checking procedure after sootfire;

g) maintenance information;

h) safety information and information about safety precautions to be taken at fan installation (e.g. installation of smoke detector or CO detector).

8.3.3 Product data

a) Flow characteristics in accordance with 5.3.3;

b) maximum power consumption [Watt];

c) maximum load [Amperage];

d) voltage level [Volt];

e) sound data to surroundings in accordance with EN ISO 3744 and to flue in accordance with EN ISO 5136;

NOTE An example for sound data in given in Annex A.

f) flow resistance of fan.

Annex A
(informative)

Example of sound chart showing sound levels to surroundings

A.1 Sound levels to external surroundings

Sound levels to external surroundings should be measured in accordance with EN ISO 3744 and to flue in accordance with EN ISO 5136. The result should be documented in a table, for an example see Table A.1.

Table A.1 — Example of a sound chart

Fan model	**L_w[a]** dB							**L_p**[b] dB (A)
	125 Hz	**250** Hz	**500** Hz	**1 000** Hz	**2 000** Hz	**4 000** Hz	**8 000** Hz	
A	54	50	47	43	38	31	25	21
B	64	60	55	52	48	42	34	30
C	75	69	65	62	57	51	44	41
D	81	76	72	69	64	58	52	47
NOTE The tolerance is ± 3 dB.								
a L_w = sound effect level in dB (reference 1 pW), measured in accordance with EN ISO 3744.								
b L_p = sound pressure level in dB (A) at a distance of 10 m from the fan at half-spherical sound distribution.								

EXAMPLES

— L_p (5 m) = L_p (10 m) + 6 dB

— L_p (20 m) = L_p (10 m) - 6 dB

Annex B
(informative)

Data for calculation programs

To consider chimney fans in computer programs for the dimensioning of chimney systems, the following formula in accordance with EN 13384-1 may be used.

The pressure gain created by the chimney fan P_{Fan} can be calculated with the following formula:

$$P_{Fan} = \left[c_0 + c_1 \cdot \dot{V}_{Fan} + c_2 \cdot \dot{V}_{Fan}^2 + c_3 \cdot \dot{V}_{Fan}^3 + c_4 \cdot \dot{V}_{Fan}^4 \right] \cdot \frac{\rho_{Fan}}{1,2}, \text{ in Pa} \quad \text{(B.1)}$$

$$\dot{V}_{Fan} = \frac{\dot{m}}{\rho_{Fan}}, \text{ in m}^3/\text{s} \quad \text{(B.2)}$$

$$\rho_{Fan} = \frac{p_L}{R \cdot T_{Fan}}, \text{ in kg/m}^3 \quad \text{(B.3)}$$

where

c_0 is the characteristic value of the chimney fan, in Pa

c_1 is the characteristic value of the chimney fan, in Pa/(m³/s)

c_2 is the characteristic value of the chimney fan, in Pa/(m³/s)²

c_3 is the characteristic value of the chimney fan, in Pa/(m³/s)³

c_4 is the characteristic value of the chimney fan, in Pa/(m³/s)⁴

$\dot{V}_{Fan}$ is the flue gas volume flow at the chimney fan, in m³/s;

ρ_{Fan} is the flue gas density at the chimney fan, in kg/m³;

$\dot{m}$ is the flue gas mass flow, in kg/s;

p_L is the external air pressure, in Pa;

R is the gas constant of the flue gas, in J/(kg · K);

T_{Fan} is the flue gas temperature at the chimney fan, in K.

The characteristic values of the chimney fan c_0 to c_4 shall be given by the fan manufactures or by the literature.

For a non-permanent used chimney fan the calculation shall be done without taking into account the pressure gain created by the chimney fan but its flow resistance.

Annex C
(normative)

Methods for combustible wood surface temperature measurements

Use thermocouples made from wire not more than 0,56 mm in diameter. The thermocouples shall have (13 ± 2) mm of wire exposed and passed through holes in those parts of the structure where they should be placed. The exposed portions of the thermocouples shall be bent over, depressed flush with the surface and held in contact with the surface by staples passing over the wires close to the thermocouple junction.

Dimensions in millimetres

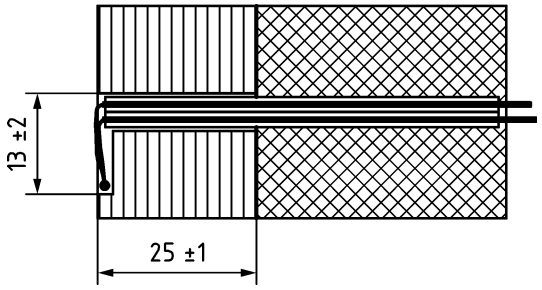


Figure C.1 — Position of thermocouples

Annex D
(normative)

Methods for exhaust fan surface temperature measurements

Use thermocouples made from wire not more than 0,56 mm in diameter. The thermocouples shall have (13 ± 2) mm of wire exposed and passed through holes in those parts of the structure to receive them. The thermocouples shall be attached to the relevant fan parts with suitable methods, ensuring that the correct surface temperature of the material is measured.

Annex E
(normative)

Ambient temperature

Shield a calibrated thermocouple by placing it centrally within a length of aluminium painted metal tube, (150 ± 2) mm long and 50 mm in nominal diameter, open at each end. The tube shall be located (1 000 ± 5) mm away from the test fan surface and the height shall be (1 000 ± 5) mm above floor, see Figures 1 and 2. The shielded thermocouple shall be placed vertically to avoid direct radiation to the thermocouple.

Annex ZA
(informative)

Relationship of this European Standard with Regulation (EU) No.305/2011

(When applying this standard as a harmonized standard under Regulation (EU) No. 305/2011, manufacturers and Member States are obliged by this regulation to use this Annex)

ZA.1 Scope and relevant characteristics

This European Standard has been prepared under standardization request M/105 'Chimneys, flues and specific products', the horizontal Mandate M/117 and its subsequent revisions given to CEN and CENELEC by the European Commission (EC) and the European Free Trade Association (EFTA).

When this European Standard is cited in the Official Journal of the European Union (OJEU), under Regulation (EU) No 305/2011, it shall be possible to use it as a basis for the establishment of the Declaration of Performance (DoP) and the CE marking, from the date of the beginning of the co-existence period as specified in the OJEU.

Regulation (EU) No 305/2011, as amended, contains provisions for the DoP and the CE marking.

Table ZA.1.1 — Relevant clauses for chimney fans (exhaust fans) and intended use to supply the chimney with needed draft for the attached appliance

Product: Chimney fans – exhaust fans Intended use: To supply the chimney with the needed draft for the attached appliance.			
Essential Characteristics	**Clauses of this European Standard related to essential characteristics**	**Classes and/or threshold levels**	**Notes**
Compressive strength	4.3 Mechanical resistance and stability	–	Pass/fail criteria
Fire resistance	4.4.2 Resistance to fire	– O or G or As	T class Pass/fail criteria Declared classes (O or G or As) determined by heat load according to designation
Thermal shock resistance	4.4.4 Heat stress 4.4.5 Sootfire	– O or G or As	T class Pass/fail criteria Maintenance of flow resistance and shape Declared classes (O or G or As) determined by heat load according to designation
Flow resistance	4.4.4 a) Flow resistance 4.4.5 a) Flow resistance	–	Declared value
Durability against corrosion	4.5.2 Condensate resistance 4.5.3 Corrosion resistance	–	D or W according to EN 1443 Class
Dangerous substances	4.5.4 Dangerous substances	–	Relevant national regulations

Table ZA.1.2 — Relevant clauses for chimney fans (inline fans) and intended use to supply the chimney with needed draft for the attached appliance

Product: Chimney fans – inline fans Intended use: To supply the chimney with needed draft for the attached appliance.			
Essential Characteristics	**Clauses of this European Standard related to essential characteristics**	**Classes and/or threshold levels**	**Notes**
Compressive strength	4.3 mechanical resistance and stability	–	Pass/fail criteria Determined by a threshold load
Fire resistance	4.4.4 Heat stress resistance 4.4.5 Sootfire resistance	- O or G or As	T class Pass/fail criteria Declared classes (O or G or As) determined by heat load according to designation
Thermal shock resistance	4.4.4 Heat stress resistance 4.4.5 Sootfire resistance	– O or G or As	T class Pass/fail criteria Declared classes (O or G or As) determined by heat load according to designation
Flow resistance	4.4.4 a) Flow resistance 4.4.5 a) Flow resistance	–	Declared value
Durability against corrosion	4.5.3 Durability against corrosion 4.5.2 Condensate resistance	–	Class 1, 2 or 3 D or W
Gas tightness	4.5.1 Gas tightness	–	N1, P1, P2, H1, H2
Dangerous substances	4.5.4 Dangerous substances	–	Relevant national regulations

ZA.2 System of Assessment and Verification of Constancy of Performance (AVCP)

The AVCP system of chimney fans indicated in Tables ZA.1.1 to ZA.1.2, can be found in the EC legal act(s) adopted by the EC: EU Decisions 95/467/EC as amended by 01/596/EC and 2010/679/EU of 8 November 2010 (published as C (2010) 7542 L 292/55.

Micro-enterprises are allowed to treat products under AVCP system 3 covered by this standard in accordance with AVCP system 4, applying this simplified procedure with its conditions, as foreseen in Article 37 of Regulation (EU) No. 305/2011.

ZA.3 Assignment of AVCP tasks

The AVCP system of chimney fans as provided in Tables ZA.1.1 to ZA.1.2 is defined in Tables ZA.3.1 to ZA.3.2 resulting from application of the clauses of this or other European Standards indicated therein. The content of the tasks assigned to the notified body shall be limited to those essential characteristics, if any, as provided for in Annex III of the relevant standardization request and to those that the manufacturer intends to declare.

Taking into account the AVCP systems defined for the products and the intended uses the following tasks are to be undertaken by the manufacturer and the notified body respectively for the assessment and verification of the constancy of performance of the product.

Table ZA.3.1 — Assignment of AVCP tasks for chimney fans (exhaust fans) under system 2+

Tasks		Content of the task	AVCP clauses to apply
Tasks for the manufacturer	An assessment of the performance of the construction product carried out on the basis of testing (including sampling), calculation, tabulated values or descriptive documentation of the product	Essential characteristics of Table ZA.1.1 relevant for the intended use which are declared	6.2
	Factory production control (FPC)	Parameters related to essential characteristics of Table ZA.1.1 relevant for the intended use which are declared	6.3
	Testing of samples taken at factory according to the prescribed test plan	Essential characteristics of Table ZA.1.1 relevant for the intended use which are declared	6.2 6.2.2
Tasks for the notified factory production control certification body	Initial inspection of the manufacturing plant and of FPC	Parameters related to essential characteristics of Table ZA.1.1, relevant for the intended use which are declared. Documentation of the FPC.	6.3.4
	Continuing surveillance, assessment and evaluation of FPC	Parameters related to essential characteristics of Table ZA.1.1, relevant for the intended use which are declared. Documentation of the FPC.	6.3, 6.3.5

Table ZA.3.2 — Assignment of AVCP tasks for chimney fans (inline fans) under system 2+

Tasks		Content of the task	AVCP clauses to apply
Tasks for the manufacturer	An assessment of the performance of the construction product carried out on the basis of testing (including sampling), calculation, tabulated values or descriptive documentation of the product	Compressive strength, fire resistance, thermal shock resistance, flow resistance, durability against corrosion, gas tightness, dangerous substances of Table ZA.1.2 relevant for the intended use which are declared	6.2
	Factory production control (FPC)	Parameters related to compressive strength, fire resistance, thermal shock resistance, flow resistance, durability against corrosion, gas tightness, dangerous substances of Table ZA.1.2 relevant for the intended use which are declared	6.3
	Testing of samples taken at factory according to the prescribed test plan	Compressive strength, fire resistance, thermal shock resistance, flow resistance, durability against corrosion, gas tightness, dangerous substances of Table ZA.1.2 relevant for the intended use which are declared	6.2 6.2.2
Tasks for the notified factory production control certification body	Initial inspection of the manufacturing plant and of FPC	Parameters related to compressive strength, fire resistance, thermal shock resistance, flow resistance, durability against corrosion, gas tightness, dangerous substances of Table ZA.1.2, relevant for the intended use which are declared, namely chimneys. Documentation of the FPC.	6.3.4
	Continuing surveillance, assessment and evaluation of FPC	Parameters related to compressive strength, fire resistance, thermal shock resistance, flow resistance, durability against corrosion, gas tightness, dangerous substances of Table ZA.1.2, relevant for the intended use which are declared, namely chimneys. Documentation of the FPC.	6.3.5

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[1] EN 1859, *Chimneys — Metal chimneys — Test methods*

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[5] EN 13611:2015, *Safety and control devices for burners and appliances burning gaseous and/or liquid fuels — General requirements*

[6] EN ISO 9001, *Quality management systems — Requirements (ISO 9001)*

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