



BSI Standards Publication

Smoke and heat control systems

Part 3: Specification for powered smoke and heat control ventilators (Fans)

National foreword

This British Standard is the UK implementation of EN 12101-3:2015. It supersedes BS EN 12101-3:2002 which is withdrawn.

The UK participation in its preparation was entrusted to Technical Committee FSH/25, Smoke, heat control systems and components.

A list of organizations represented on this committee can be obtained on request to its secretary.

This publication does not purport to include all the necessary provisions of a contract. Users are responsible for its correct application.

© The British Standards Institution 2015. Published by BSI Standards Limited 2015

ISBN 978 0 580 70906 7

ICS 13.220.99; 23.120

Compliance with a British Standard cannot confer immunity from legal obligations.

This British Standard was published under the authority of the Standards Policy and Strategy Committee on 30 September 2015.

Amendments issued since publication

Date	Text affected
------	---------------

EUROPEAN STANDARD
NORME EUROPÉENNE
EUROPÄISCHE NORM

EN 12101-3

August 2015

ICS 13.220.99

Supersedes EN 12101-3:2002

English Version

Smoke and heat control systems - Part 3: Specification for powered smoke and heat control ventilators (Fans)

Systèmes pour le contrôle des fumées et de la chaleur -
Partie 3 : Spécifications relatives aux ventilateurs pour le
contrôle de fumées et de chaleur

Rauch- und Wärmefreihaltung - Teil 3: Bestimmungen für
maschinelle Rauch- und Wärmeabzugsgeräte

This European Standard was approved by CEN on 12 January 2015.

CEN members are bound to comply with the CEN/CENELEC Internal Regulations which stipulate the conditions for giving this European Standard the status of a national standard without any alteration. Up-to-date lists and bibliographical references concerning such national standards may be obtained on application to the CEN-CENELEC Management Centre or to any CEN member.

This European Standard exists in three official versions (English, French, German). A version in any other language made by translation under the responsibility of a CEN member into its own language and notified to the CEN-CENELEC Management Centre has the same status as the official versions.

CEN members are the national standards bodies of Austria, Belgium, Bulgaria, Croatia, Cyprus, Czech Republic, Denmark, Estonia, Finland, Former Yugoslav Republic of Macedonia, France, Germany, Greece, Hungary, Iceland, Ireland, Italy, Latvia, Lithuania, Luxembourg, Malta, Netherlands, Norway, Poland, Portugal, Romania, Slovakia, Slovenia, Spain, Sweden, Switzerland, Turkey and United Kingdom.



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

CEN-CENELEC Management Centre: Avenue Marnix 17, B-1000 Brussels

© 2015 CEN All rights of exploitation in any form and by any means reserved
worldwide for CEN national Members.

Ref. No. EN 12101-3:2015 E

Contents

Page

European foreword	7
Introduction	8
1 Scope	10
2 Normative references	10
3 Terms and definitions, symbols and abbreviations	11
4 Requirements	13
4.1 Response delay (response time)	13
4.1.1 Opening under wind load within a given time	13
4.1.2 Opening under snow load within a given time	13
4.2 Operational reliability	13
4.2.1 General	13
4.2.2 Application categories	13
4.2.3 Motor rating	14
4.3 Effectiveness of smoke / hot gas extraction	14
4.3.1 General	14
4.3.2 Gas flow and pressure maintenance during smoke and heat extraction test	15
4.4 Resistance to fire	15
4.5 Ability to open under environmental conditions	15
4.5.1 Opening under wind load within a given time	15
4.5.2 Opening under snow load within a given time	15
4.6 Durability of operational reliability	15
5 Testing, assessment and sampling methods	15
5.1 General	15
5.2 Test of response delay (response time) opening under wind, snow load within a given time ..	16
5.2.1 Wind load	16
5.2.2 Snow load	16
5.3 Operational reliability	17
5.3.1 Application categories	17
5.3.2 Motor rating	17
5.4 Effectiveness of smoke / hot gas extraction – Gas flow and pressure maintenance during smoke and heat extraction test	17
5.5 Resistance to fire	17
5.6 Ability to open under environmental conditions: opening under wind, snow load within a given time	17
5.7 Durability of operational reliability	17
6 Assessment and verification of constancy of performance – AVCP	17
6.1 General	17
6.2 Type Testing	17
6.2.1 General	17
6.2.2 Test samples, testing and compliance criteria	18
6.2.3 Test reports	19
6.3 Factory production control (FPC)	19
6.3.1 General	19
6.3.2 Requirements	20
6.3.3 Product specific requirements	27
6.3.4 Initial inspection of factory and of FPC	27
6.3.5 Continuous surveillance of FPC	28
6.3.6 Procedure for modifications	28

6.3.7	One-off products, pre-production products (e.g. prototypes) and products produced in very low quantity	28
7	Marking, labelling and packaging	29
Annex A	(normative) Criteria to determine family of fans in order to select the sizes to be tested	31
A.1	Reduction of numbers of tests for PSHC ventilators forming a product range.....	31
A.2	Motors	33
A.2.1	General.....	33
A.2.2	Motor Type 1: Motor out of airstream and Impeller not mounted on shaft	34
A.2.3	Motor Type 2: Centrifugal fans with impeller mounted on the motor shaft	35
A.2.4	Motor Type 3: Fans with motor inside the airstream without cooling	35
A.2.5	Motor Type 4: Motors out of airstream but within fan casing.....	36
A.2.5.1	General.....	36
A.2.5.2	Motor Type 4.1	36
A.2.5.3	Motor Type 4.2	37
A.3	Combined testing	37
A.3.1	General rule	37
A.3.2	Specific rule for an axial fan.....	38
A.4	Determination of highest stresses in impellers	38
A.4.1	PSHC Ventilators with geometrically similar impellers	38
A.4.2	Fans with impellers that are not geometrically similar.....	40
A.4.2.1	Axial impellers	40
A.4.2.1.1	Centrifugal force	40
A.4.2.1.2	Fastenings or welds.....	42
A.4.2.1.3	Hub/back-plate/shroud stresses	43
A.4.2.2	Centrifugal impellers	45
A.4.2.2.1	Centrifugal force	45
A.4.2.2.2	Blade bending moment	46
A.4.2.2.3	Comparative blade stresses	46
A.4.2.2.4	Blade joint stress	48
A.5	Assessment of changes in a fan family	48
A.5.1	Assessment of motor change	48
A.5.2	Assessment of fan component change.....	49
Annex B	(normative) Criteria to determine a family of motors in order to select the sizes to be tested.....	51
B.1	Reduction of numbers of tests for a motor family	51
B.2	Assessment of changes in a motor family.....	51
B.2.1	Assessment for changing a family of motors in a family of fans	51
B.2.2	Assessment for changing components in a family of motors.....	51
B.2.3	Assessment of changes using Annex D	56
B.2.4	Normative list of motor components.....	56

Annex C (normative) Test method for the determination of fire resistance of powered smoke and heat control ventilators (fans)	61
C.1 Principle	61
C.2 Apparatus	61
C.3 Preparation	63
C.3.1 Axial Fan running (tip) clearance	63
C.3.2 Measuring of running clearance	63
C.3.3 Installation in furnace depending on the intended application categories	64
C.4 Procedure	66
C.4.1 General conditions	66
C.4.2 Warm up period.....	66
C.4.3 Heat up period.....	66
C.4.4 High temperature test.....	66
C.4.5 High temperature test in accordance with temperature time curve	67
C.5 Compliance criteria.....	67
C.6 Test report	67
C.6.1 Prepare a test report after completion of each test including the following information:.....	67
Annex D (normative) Test methods for electric motors to determine the impact of the changes on the product characteristics	70
D.1 Principle	70
D.2 Tests in association with a generator or another load	70
D.2.1 Modulated Frequency Method (MFM)	70
D.2.2 Apparatus for testing with a generator	71
D.2.2.1 Test installation.....	71
D.2.2.2 Specifications for bearing load	71
D.2.2.3 Temperature measurements.....	72
D.2.2.4 Electrical measurements	72
D.2.3 Test specimens	72
D.2.4 Test procedure	72
D.2.4.1 General conditions	72
D.2.4.2 Warm up period.....	72
D.2.4.3 High temperature test.....	73
D.3 Test report	73
Annex E (normative) Test method for assessing the response delay and ability to open under environmental conditions	75
E.1 Objective of test	75
E.2 Test apparatus	75
E.3 Test specimen	75
E.4 Test procedure	75
E.5 Evaluation of test results	75

Annex F (informative) Explanatory notes	76
F.1 General.....	76
F.2 Explanation for A.4.4.3	76
F.3 Origin of power coefficients in D.2.4.2	79
F.4 Consideration about frequency converter driving	80
F.5 Consideration regarding A.1, f) – scaling factors	82
F.6 Consideration regarding B.2.2: change of type of bearing	82
F.6.1 General.....	82
F.6.2 Bearing ability to pass the smoke venting test	82
F.6.3 Parameters to consider during the heat up test.....	83
F.6.4 How to select motor sizes.....	84
F.6.5 How to select motor size in vertical position.....	84
F.7 Consideration for changing material inside the fan	85
F.7.1 Material features	85
F.7.1.1 Mechanical properties	85
F.7.1.2 Technological properties	85
F.7.1.3 Physical properties.....	85
F.7.1.4 Tensile strength	86
F.7.1.5 Compression stress, shear stress and twisting.....	86
F.7.1.6 Hardness	86
F.7.1.7 Creep.....	86
F.7.1.8 Behaviour at low temperatures	86
F.7.1.9 Fatigue	86
F.7.2 Technological properties	87
F.7.2.1 Abrasive resistance.....	87
F.7.2.2 Formability	87
F.7.3 Physical properties.....	87
F.7.3.1 Density	87
F.7.3.2 Coefficient of thermal expansion	87
F.7.3.3 Thermal diffusivity.....	87
F.7.3.4 Elastic properties.....	87
F.8 Complementary information on Installation / Application	88
Annex G (informative) General guidance for installation and maintenance	91
G.1 Product, installation and maintenance information (documentation)	91
G.1.1 Product specification	91
G.1.2 Installation information	91
G.1.3 Maintenance information	91
Annex ZA (informative) Clauses of this European Standard addressing the provisions of the EU Construction Products Regulation	92

ZA.1	Scope and relevant characteristics	92
ZA.2	Procedure for AVCP of the powered heat and smoke control ventilators (fans).....	93
ZA.2.1	System(s) of AVCP	93
ZA.2.2	Declaration of performance (DoP)	94
ZA.2.2.1	General	94
ZA.2.2.2	Content.....	95
ZA.2.2.3	Example of DoP	95
ZA.3	CE marking and labelling	97
	Bibliography	100

European foreword

This document (EN 12101-3:2015) has been prepared by Technical Committee CEN/TC 191 “Fixed firefighting systems”, the secretariat of which is held by BSI.

This European Standard shall be given the status of a national standard, either by publication of an identical text or by endorsement, at the latest by February 2016, and conflicting national standards shall be withdrawn at the latest by May 2017.

Attention is drawn to the possibility that some of the elements of this document may be the subject of patent rights. CEN [and/or CENELEC] shall not be held responsible for identifying any or all such patent rights.

This document supersedes EN 12101-3:2002.

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 Directive(s) and/or EU Regulation(s).

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

This European Standard is part of the package of the European Standards EN 12101 covering smoke and heat control systems.

EN 12101, *Smoke and heat control systems*, consists of the following parts:

- *Part 1: Specification for smoke barriers — Requirements and test methods*
- *Part 2: Specification for natural smoke and heat control ventilators*
- *Part 3: Specification for powered smoke and heat control ventilators*
- *Part 4: Natural smoke and heat control ventilation systems — Installation and test methods* (published as CEN/TR 12101-4)
- *Part 5: Design and calculation for smoke and exhaust ventilation systems* (published as CEN/TR 12101-5)
- *Part 6: Specification for pressure differential systems- kits*
- *Part 7: Smoke duct sections*
- *Part 8: Smoke control dampers*
- *Part 10: Power supplies*
- *Part 11: Smoke control in car parks*
- *Part 12: SHEVS – Time dependent fires*
- *Part 13: Pressure differential systems (PDS) design and calculation methods, acceptance testing, maintenance and routine testing of installation*

According to the CEN/CENELEC Internal Regulations, the national standards organisations of the following countries are bound to implement this European Standard: Austria, Belgium, Bulgaria, Croatia, Cyprus, Czech Republic, Denmark, Estonia, Finland, Former Yugoslav Republic of Macedonia, France, Germany, Greece, Hungary, Iceland, Ireland, Italy, Latvia, Lithuania, Luxembourg, Malta, Netherlands, Norway, Poland, Portugal, Romania, Slovakia, Slovenia, Spain, Sweden, Switzerland, Turkey and the United Kingdom.

Introduction

Smoke and heat control ventilation systems create a smoke free layer above the floor by removing smoke and thus improve the conditions for the safe escape and/or rescue of people and animals and the protection of property and permit the fire to be fought while still in its early stages. They also exhaust hot gases released by a fire in the developing stage.

In specific cases some fans are used to convey smoke (e.g. in tunnels or car parks). These fans, called jet fans or impulse fans are also within the scope of this standard.

The use of smoke and heat control ventilation systems to create smoke free areas beneath a buoyant smoke layer has become widespread. Their value in assisting in the evacuation of people from construction works, reducing fire damage and financial loss by preventing smoke logging, facilitating fire fighting, reducing roof temperatures and retarding the lateral spread of fire is firmly established. For these benefits to be obtained it is essential that smoke and heat control ventilators operate fully and reliably whenever called upon to do so during their installed life. A heat and smoke control ventilation system is a scheme of safety equipment intended to perform a positive role in a fire emergency.

Components for smoke and heat control systems should be installed as part of a properly designed smoke and heat control system.

Smoke and heat control ventilation systems help to:

- keep the escape and access routes free from smoke;
- facilitate fire fighting operations by creating a smoke free layer;
- delay and/or prevent flashover and thus full development of the fire;
- protect equipment and furnishings;
- reduce thermal effects on structural components during a fire;
- reduce damage caused by thermal decomposition products and hot gases.

Depending on the design of the system and the ventilator, powered or natural smoke and heat ventilators can be used in a smoke and heat control system. Powered smoke and heat control ventilators (fans) can be installed in the roof or upper part of walls of building or in a ducted system with the ventilator inside or outside the smoke reservoir or in a plant room.

Powered smoke and heat control ventilation systems should operate based on powered ventilators (fans). The performance of the powered smoke and heat control system depends on:

- the temperature of the smoke;
- size, number and location of the exhaust openings;
- the wind influence;
- size, geometry and location of the inlet air openings;
- the time of actuation;
- the location and conditions of the system (for example arrangements and dimensions of the building).

Smoke and heat control ventilation systems are used in buildings or construction works where the particular (large) dimensions, shape or configuration make smoke control necessary.

Typical examples are:

- single and multi-storey shopping malls;
- single and multi-storey industrial buildings and warehouses;
- atria and complex buildings;
- enclosed car parks;
- stairways;
- tunnels;
- theatres.

1 Scope

This European Standard specifies the products characteristics of powered smoke and heat control ventilators (fans) intended to be used as part of a powered smoke and heat control ventilation system in construction works.

It provides test and assessment methods of the characteristics and the compliance criteria of the test assessment results.

This European Standard applies to the following:

- a) fans for smoke and heat control ventilation;
- b) impulse/jet fans for smoke and heat control ventilation;

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 1363 (all parts), *Fire resistance tests*

EN 13501-4, *Fire classification of construction products and building elements — Part 4: Classification using data from fire resistance tests on components of smoke control systems*

EN 60034-1, *Rotating electrical machines - Part 1: Rating and performance (IEC 60034-1)*

EN 60034-2-1, *Rotating electrical machines - Part 2-1: Standard methods for determining losses and efficiency from tests (excluding machines for traction vehicles) (IEC 60034-2-1)*

EN 60034-18-41, *Rotating electrical machines - Part 18-41: Partial discharge free electrical insulation systems (Type I) used in rotating electrical machines fed from voltage converters - Qualification and quality control tests (IEC 60034-18-41)*

EN 60085, *Electrical insulation - Thermal evaluation and designation (IEC 60085)*

CLC/TS 60034-17, *Rotating electrical machines - Part 17: Cage induction motors when fed from converters - Application guide (IEC 60034-17)*

EN ISO 204, *Metallic materials - Uniaxial creep testing in tension - Method of test (ISO 204)*

EN ISO 5167 (all parts), *Measurement of fluid flow by means of pressure differential devices*

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

EN ISO 6892-1, *Metallic materials - Tensile testing - Part 1: Method of test at room temperature (ISO 6892-1)*

EN ISO 6892-2, *Metallic materials - Tensile testing - Part 2: Method of test at elevated temperature (ISO 6892-2)*

ISO 281, *Rolling bearings — Dynamic load ratings and rating life*

ISO 834-1, *Fire-resistance tests — Elements of building construction — Part 1: General requirements*

ISO 1099, *Metallic materials — Fatigue testing — Axial force-controlled method*

3 Terms, definitions, symbols and abbreviations

For the purposes of this document, the following terms and definitions apply.

3.1

ventilator

term covering both natural or powered ventilators (fans)

3.2

powered smoke and heat control ventilator

PSHC ventilator

smoke-ventilating fan that is suitable for handling smoke and hot gases for a specified time/temperature profile

3.3

dual purpose PSHC ventilator

smoke-ventilating fan that has provision to allow its use for comfort (i.e. day to day) ventilation

3.4

emergency PSHC ventilator

smoke-ventilating fan that is not used for comfort (i.e. day to day) ventilation

3.5

smoke reservoir

region within a building limited or bordered by smoke curtains or structural elements and which will in the event of a fire retain a thermally buoyant smoke layer

3.6

powered roof ventilator

fan designed for mounting on a roof and having exterior weather protection

3.7

thermal insulated ventilator

ventilator insulated to limit the external surface temperature to reduce the danger of injury to persons or damage to materials (see 5.3.1)

3.8

smoke reservoir ventilator

ventilator suitable for operation fully immersed in a smoke reservoir

3.9

non smoke reservoir ventilator

ventilator not suitable for operation fully immersed in a smoke reservoir

3.10

series-produced powered ventilator product family

physically similar fans using the same form of construction and materials throughout, with the same methods of impeller construction, motor mounting and construction, and electrical connection in which the following may vary across the range:

- overall dimensions of the fans; and/or
- the impeller diameter and width, hub size, blade length and number of blades of the impeller; and/or;
- the motor details, as per 3.12, 3.13, 3.14 and 3.15

3.11

impulse/jet fans for smoke and heat control ventilation

fan used for producing a jet of air in a space and unconnected to any ducting

Note 1 to entry The air jet may be used, for example, for adding momentum to the air within a duct, a tunnel or other space, or for intensifying the heat transfer in a determined zone.

3.12

non-series produced fans for smoke and heat control ventilation

fans that are:

- individually designed and manufactured, upon request and for specific purposes, needing to readjust the production machines for their manufacture in order to be used in the work concerned; or
- custom-made for a specific order to obtain one or several end use performances different from products manufactured in series, even if produced according to the same manufacturing process/system design.

Note 1 to entry These are products of individual design that are ordered for and installed in one and the same known work. They should neither be part of a range of equal products, which is manufactured in series of the same kind combining usual components in the same way, nor should they and their field of application (e.g. dimensions, weight) be offered on the general initiative of the manufacturer (e.g. by means of published catalogues or other ways of advertising).

3.13

three phase motor family

motors which are physically similar, using the same form of construction i.e. same materials and manufacturing method for carcass, cooling impeller, when fitted, and end covers; same insulation materials which includes sheet insulation used for coil separation and slot insulation, winding impregnation material (varnish or resin etc., lead insulation, terminal blocks and any other materials that could affect the integrity of the insulation); same bearing type, class of fit, lubricant and arrangement, with motor windings based on the same maximum winding temperature and class of insulation; in which the following may vary across the range:

- frame size;
- the rotational speed;
- the electrical windings, including multi-speed;
- the form of mounting, e.g. foot, flange, pad, clamp, etc.

3.14

single phase motor family

motors which are physically similar, using the same form of construction i.e. same materials and manufacturing method for carcass, cooling impeller, when fitted, and end covers; same insulation materials which includes sheet insulation used on for coil separation and slot insulation, winding impregnation material (varnish or resin etc., lead insulation, terminal blocks and any other materials that could affect the integrity of the insulation); same bearing type, class of fit, lubricant and arrangement, with motor windings based on the same maximum winding temperature and class of insulation, same capacitor type and same location of the capacitor; in which the following may vary across the range:

- the frame size;
- the rotational speed;
- the electrical windings, including multi-speed;
- the form of mounting, e.g. foot, flange, pad, clamp, etc.

3.15

motor rating

motor rating (rated power) is the maximum power that the motor will deliver continuously without exceeding the allowable temperature rise

3.16

fire open position

position of a component to be reached and maintained while venting smoke and heat

4 Requirements

4.1 Response delay (response time)

4.1.1 Opening under wind load within a given time

If the fan is designed to be installed at the atmospheric termination of a smoke control system (e.g. powered roof ventilator) and is fitted with a fan shutter flaps or louvers which project above the wind deflectors (cowl or wind shield), the shutter, flaps or louvers shall open in less than 30 s when tested in accordance with 5.2.1.

4.1.2 Opening under snow load within a given time

If the fan is designed to be installed at the atmospheric termination of a smoke control system (e.g. powered roof ventilator) and is fitted with a fan shutter flaps or louvers which project above the wind deflectors (cowl or wind shield), the shutter, flaps or louvers shall open in less than 30 s when tested in accordance with 5.2.2.

4.2 Operational reliability

4.2.1 General

Operational reliability of a PSHC ventilator (fan) shall be demonstrated by verification against application categories and by verification of motor ratings.

4.2.2 Application categories

To demonstrate its operational reliability, a PSHC ventilator (fan) has to be verified against categories:

The following Table 1 shows the relevant method to allocate the results in the corresponding category:

Table 1 — Application categories

Clause of the test method	Application category	Compliance criteria
5.3.1	Thermally insulated	When tested in accordance with Annex C: — The outer surface temperature of a thermal insulated fan shall not increase by more than 180 K for any individual value. — The cooling air expelled from the unit shall not exhibit an increase of temperature of more than 180 K from the initial room temperature.
5.3.1	Thermally uninsulated	-
Annex C, C.3.3	Installation inside the smoke reservoir	-
Annex C, C.3.3	Installation outside the smoke reservoir	-
Annex A, A.1.i)	Horizontal direction of motor shaft	-
Annex A, A.1.i)	Vertical direction of motor shaft	-
Annex A, A.1.n)	Converter feed (driven by frequency converter)	-
Annex A, A.1.n)	Direct feed (no speed variation)	-
Annex C, C.4.2.1	Dual purpose use	-
Annex C, C.4.2.1, C.4.2.2	Emergency only use	-
Annex C, C.3.3	Ducted cooling air required	-

4.2.3 Motor rating

Since the PSHC ventilator (fan) may be operated at different temperatures (current or emergency), motors shall be selected for operation at the power required for normal ambient temperature and not just for operation at high temperature.

Selection of the motors shall comply with the following requirements:

- Motors shall comply with the requirements of EN 60034-1.
- Motor ratings shall be limited by the temperature rise for one class lower than the insulation class of the motor, as defined in EN 60085.
- The fan tested in accordance with 5.3.2, shall comply with the stability requirement in Annex C, C.4.2.2.

4.3 Effectiveness of smoke / hot gas extraction

4.3.1 General

The effectiveness of smoke / hot gas extraction of the fan is the ability to continue to extract the required volume flow at high temperature.

4.3.2 Gas flow and pressure maintenance during smoke and heat extraction test

The effectiveness of smoke / hot gas extraction is demonstrated by compliance with the performance requirements in Annex C, C.5, when tested according to 5.4.

4.4 Resistance to fire

The fan is shown to be functioning satisfactorily by its continued ability to provide the initial volume or pressure within the defined limits in C.5, when tested according to 5.5.

The test result shall be classified in accordance with EN 13501-4.

4.5 Ability to open under environmental conditions

4.5.1 Opening under wind load within a given time

When the fan is fitted with shutter, louvers or dampers, their ability to open under environmental conditions shall be demonstrated by fulfilling the requirements in Annex E, E.5 when tested in accordance with 5.6.

4.5.2 Opening under snow load within a given time

When the fan is fitted with shutter, louvers or dampers, their ability to open under environmental conditions shall be demonstrated by fulfilling the requirements in Annex E, E.5 when tested in accordance with 5.6.

4.6 Durability of operational reliability

Durability of operational reliability is demonstrated by motor rating according to 4.2.3 when tested according to 5.7.

5 Testing, assessment and sampling methods

5.1 General

PSHC ventilator (fan), tests shall be carried out in accordance with Annexes A, B, C, E.

For each test, a test report shall be prepared in accordance with Annex C.

A fan can be tested completely assembled with ancillaries, for example:

- flexible connection elements;
- anchors (fastenings for mounting to external structure);
- airflow operated dampers or external powered dampers;
- shock absorber (anti-vibration mount);
- sound absorber (silencer or acoustic attenuator);
- support construction (e.g. for powered roof or partition fans);
- thermal protection (e.g. PTC thermistor, Thermocouple, Pt100...);
- ON-OFF switch and other electrical ancillaries (e.g. electrical safety box) which are directly mounted on the fan;
- guide vanes;
- flow deflectors;

- a jet fan shall be tested completely assembled and suspended from a supporting construction in accordance with the manufacturer's installation instruction.

For testing of motors alone, tests shall be carried out and test reports prepared in accordance with Annex D.

5.2 Test of response delay (response time) opening under wind, snow load within a given time

5.2.1 Wind load

The fan shutter, flaps or louvers shall open in less than 30 s against a horizontally applied load of 200 Pa, simulated by means of an additional fan blowing on the flap at a suitable velocity, or by any suitable mechanical means when the fan is tested in accordance with annex E and / or C.

Warning: For fans which use the air pressure from the fan to open flaps or louvers:

Due to the temperature rise the density of air decreases, resulting in a corresponding decrease in the pressure developed. This pressure is needed to open the termination system (flaps or louvers).

In this case, the laboratory shall perform the wind load test also during the high temperature test.

If fans selected according to Annex A and tested according to Annex C are intended for use with external, air-pressure operated shutters, the combination shall also be tested with a wind load according to Annex E.

The operating position can be considered as reached if the volume flow exhausted by the fan working under wind loads did not decrease by more than 10 % of that exhausted by the fan working without these loads.

If a fan intended for mounting on an external wall is fitted with external shutters, flaps or louvers and/or is not protected from wind force acting against it by a deflector or cowl, it shall be tested in accordance with this clause. Otherwise, the manufacture shall include a statement in his instructions that suitable wind guarding shall be fitted by the installer.

5.2.2 Snow load

The fan shutter, flaps or louvers shall open in less than 30 s against a vertically applied load shown in Table 2, simulated by any suitable mechanical means, when the fan is tested in accordance with Annex E, at ambient temperature only.

Table 2 — Snow load classes

Class	Load (Pa)
SL 0	0
SL 125	125
SL 250	250
SL 500	500
SL 1000	1000
SL A	A

NOTE The operating position can be considered as reached if the volume flow exhausted by the fan working under snow loads did not decrease by more than 10 % of that exhausted by the fan working without these loads.

Where the minimum angle of installation recommended by the supplier exceeds 45° from the horizontal, the fan takes the classification SL 1000 without a test; except where the snow will be prevented from slipping from the fan e.g. by wind deflectors, in which case the fan shall be tested for a snow load classification which shall not be less than $SL = 2000 \cdot d$ where d is the depth of snow, in metres, which can be contained within the confines of the deflectors.

5.3 Operational reliability

5.3.1 Application categories

The relevant test methods are those indicated in Table 1 in 4.2.2.

5.3.2 Motor rating

The test method to be applied is in Annex C, C.4.2.

5.4 Effectiveness of smoke / hot gas extraction – Gas flow and pressure maintenance during smoke and heat extraction test

The test method is given in Annex C.

5.5 Resistance to fire

The test method is given in Annex C.

5.6 Ability to open under environmental conditions: opening under wind, snow load within a given time

The test method is given in Annex E.

5.7 Durability of operational reliability

Durability of operational reliability is demonstrated by the test method given in 5.3.2.

6 Assessment and verification of constancy of performance – AVCP

6.1 General

The compliance of powered smoke and heat control ventilators (fans) with the requirements of this 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. (e.g. use of previously existing data, classified without further testing (CWFT) and conventionally accepted performance).

Assessment 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.

NOTE Same AVCP system means testing by an independent third party, under the responsibility of a notified product certification body.

For the purposes of assessment, the manufacturer's products may be grouped into families, where it is considered that the results for one or more characteristics from any one product within the family are representative for that same characteristics for all products within that same family.

Products may be grouped in different families for different characteristics.

Reference to the assessment method standards should be made to allow the selection of a suitable representative sample.

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 powered smoke and heat control ventilators (fans) (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 powered smoke and heat control ventilators (fans) 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 powered smoke and heat control ventilators (fans) manufacturer to ensure that the powered smoke and heat control ventilators (fans) 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 powered smoke and heat control ventilators (fans) to be tested /assessed shall be in accordance with Table 3.

Table 3 — Number of samples to be tested and compliance criteria

Characteristic	Requirement	Assessment method	No. of samples	Compliance criteria
Response delay: - Opening under wind load within a given time; - Opening under snow load within a given time.	4.1.1 4.1.2	Annex E	m	4.1.1 4.1.2
Operational reliability: Application categories; Motor rating.	4.2.2 4.2.3	4.2.2 Table 1 Annex C	n n	4.2.2, Table 1 C.4.2.1 and C.4.2.2
Effectiveness of smoke / hot gas extraction: Gas flow and pressure maintenance during smoke and heat extraction test.	4.3	Annex C	n	C.5
Resistance to fire	4.4	Annex C	n	EN 13501-4
Ability to open under environmental conditions: - Opening under wind load within a given time, - Opening under snow load within a given time.	4.5.1 4.5.2	Annex E	n	E.5
Durability of operational reliability.	4.6	5.7	n	4.6
m is calculated in accordance with provisions of Annex E. n is calculated in accordance with provisions of Annex A.				

6.2.3 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 the powered smoke and heat control ventilators (fans) to which they relate.

6.3 Factory production control (FPC)

6.3.1 General

The manufacturer shall establish, document and maintain an 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 control raw and other incoming materials or components, equipment, the production process and the product.

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 6.3.4 and 6.3.5.

6.3.2 Requirements

6.3.2.1 General

The manufacturer is responsible for organizing the effective implementation of the FPC system in line with the content of this product standard. Tasks and responsibilities in the production control organization shall be documented and this documentation shall 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 shall draw up and keep up-to-date documents defining the factory production control. The manufacturer's documentation and procedures should be appropriate to the product and manufacturing process. The FPC system should achieve an appropriate level of confidence in the constancy of performance 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 technical specification to which reference is made;
- b) the effective implementation of these procedures and instructions;
- c) the recording of these operations and their results;
- d) the 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 according to documented procedures, frequencies and criteria.

6.3.2.2.2 Manufacturing

All equipment used in the manufacturing process shall be regularly inspected and maintained to ensure use, wear or failure does not cause inconsistency in the manufacturing process. Inspections and maintenance shall be carried out and recorded in accordance with the manufacturer's written procedures and the records retained for the period defined in the manufacturer's FPC procedures.

6.3.2.3 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.

Table 4

Acceptance check	Test/Assessment Method	Requirement	Recommended minimum frequency	Record
Raw material: Metal sheet for casing, motor mounting, flanges, steel mesh, mineral wool...(for silencer), metal blocks for impeller casting	Measurement and or raw material certificate	Conformity of delivery with order specification	Each reception	yes
Compulsory components: top cover, electric cable and terminal box if so, belt and pulleys, bearings and transmission shaft, motor, blades/hub/ impeller, fastenings (screws, bolts, rivets, nuts, weldings), flexible joint if so,	Visual / Data sheet/ motor rating plate	Conform with range report list of approved components	See manufacturer operating procedure	yes
Optional accessories: Isolator/ON-OFF switch, electrical safety box, converter, pressure controller, flaps, damper, silencer, shock absorber, protection grill, electrical cables associated, motor covering, inlet nozzle, flexible joints/sleeves, guide vanes, guide cone.	Visual / Data sheet	Conform with range report list of approved ancillaries	See manufacturer operating procedure	yes
Product control- impeller				
Main dimensions (at least these ones used for stress calculations in EN 12101-3:2015, Annex A)	Measurements	Reference conform with range report	See operating procedure	yes
Material (blades, hub and taper lock-bush)	Material test report		See operating procedure	yes
Fastening: material, size and number (rivets, nuts, welding, bolts, tabs,)	Measurements	Reference conform with range report	See operating procedure	yes
Balancing	Test report / or balancing operation	Reference conform with range report	See operating procedure	yes
Balancing loads fastening	Visual check	Reference conform with range report	See operating procedure	yes
Motor	Motor manufacturer declaration and/or inspection body report	Conformity of delivery with order specification and/or in case of changing of component inside the motor, inspection body report	Each reception	yes

The on-going compliance of a motor for installation within a smoke control fan with the requirements of this European Standard can be demonstrated by a factory production control by the manufacturer evaluated by a body notified according to the following rules:

- 1) The motor manufacturer selects a body notified for inspection and a body notified for tests.

- 2) Only the selected inspection body performs the assessment of the factory product control by the motor manufacturer and writes an inspection report at least in English language.
- 3) The motor manufacturer can therefore transmit the inspection report to all this customers which are fan manufacturer or directly to the notified body of the customer for confidentiality reasons.
- 4) If the motor manufacturer shall change or wants to change some components, he shall inform the selected test laboratory so that it can assess or perform, if required by the rules indicated in the standard (see annex B), the additional test(s). Then the test report is also written in English language and provided by the motor manufacturer to the inspection body so that he reports these changes in the inspection report.

The factory product control done by motor manufacturer shall focus on components listed in Table 5:

Table 5

Section 1: Material control					
Ref.	Material inspection or test	Recommended method	Requirement	Recommended minimum frequency	Record
1.1	Incoming material				
1.1.1	<u>Raw material:</u> All components listed in Table B.1 or necessary to manufacture components of the list (e.g. aluminium for casting, metal sheets...etc.)	Measurement and or raw material certificate	Conform with range report drawing and/or material specification of tested samples available by the manufacturer	See manufacturer operating procedure	yes
1.1.2	<u>Compulsory components:</u> all components which are not manufactured on site (e.g. bearings, steel rod for shaft, casing if purchased, terminal board...etc.)	Visual / Data sheet/ motor rating plate	Conform with range report list of approved components	See manufacturer operating procedure	yes

Ref.	Material inspection or test	Recommended method	Requirement	Recommended minimum frequency	Record
1.1.3	Rotor Balancing	Certificate/ or balancing operation	Reference conform with range report	See operating procedure	yes
1.1.4	<u>Optional accessories:</u> temperature sensors, anti-condensation heaters, terminal box, gland, cooling impeller, balancing disc...etc.	Visual / Data sheet	Conform with range report list of approved ancillaries	See manufacturer operating procedure	yes
Section 2: Production control					
2.1	Process control				
2.1.1	Production method (e.g. for casting or rolling or welding or impregnation method)	Control the used method	The same method as the method used for production of tested samples	See manufacturer operating procedure	yes
2.1.2	Components manufactured by the sponsor	Control dimension and assembly quality of each component	Conform with range report drawing and especially tolerances (see material specification of tested samples available by the manufacturer)	See manufacturer operating procedure	yes
2.1.3	Components assembling	Mounting gauges, torque requirements, tip clearance, balancing of rotor	Conform with range report drawing and especially tolerances see material specification of tested samples available by the manufacturer Test or balancing certificate	See manufacturer operating procedure	yes
2.1.4	Arrangements to distinguish standard production and fire protection purposes	Depending on each manufacturer	Avoid mixing	See manufacturer operating procedure	Yes

Ref.	Material inspection or test	Recommended method	Requirement	Recommended minimum frequency	Record
Section 3: Product control					
3.1	Product control				
3.1.1.	Fireproof Electrical cables and terminal board when mounted	Visual check	Reference conform with range report	See operating procedure	yes
3.1.2.	Material of capacitor when mounted	Visual check	Reference and location conform with range report	See operating procedure	yes
3.1.3.	Material of cooling impeller when mounted	Visual check	Reference and location conform with range report	See operating procedure	yes
3.1.4.	Protection sleeve/conduit when mounted	Visual check	Reference and location conform with range report	See operating procedure	yes
3.1.5	Marking	Visual check	Reference conform with range report	See operating procedure	yes

6.3.2.4 Traceability and marking

Individual power and heat control system ventilators (fans) 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.

6.3.2.5 Controls during manufacturing process

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

Table 6

Process	Test/assessment method	Requirement	Frequency	Record
Production method (e.g. for casting or rolling or welding)	Control the used method	The same or equivalent method as the method used for production of tested samples	See manufacturer operating procedure	yes
Components manufactured by the manufacturer	Control dimension and assembly quality of each component	Conform with range report drawing and especially tolerances (see material specification of tested samples available by the manufacturer)	See manufacturer operating procedure	yes
Components assembling	Mounting gauges, torque requirements, tip clearance, balancing of impeller	Conform with range report drawing and especially tolerances see material specification of tested samples available by the manufacturer Test or balancing certificate	See manufacturer operating procedure	yes
Arrangements to distinguish standard production and fire protection purposes production	Depending on each manufacturer	Avoid mixing	See manufacturer operating procedure	yes

Table 7

Final product characteristic	Recommended method	Requirement	Recommended minimum frequency	Record
Working clearance(s)	Gauge or equivalent	conform with range report	See operating procedure	yes
Section of cooling air entry/exit	Measuring section	conform with range report	See operating procedure	yes
Electrical cables and connections which are part of the product	Visual check	Reference conform with range report	See operating procedure	yes
Approved accessories (switch, flexible joint...)	Visual check	Reference and location conform with range report	See operating procedure	yes
Mounted motor	Visual check/checking of plate if possible	Reference conform with approved motors in the range report	See operating procedure	yes
Arrangement (transmission) between motor and impeller	Pulley aligning, belt tension, visual check of belt nature and pulley dimensions/type	Aligning, tension, conformity of arrangement with range report	See operating procedure	yes
Marking	Visual check	Reference conform with range report	See operating procedure	yes

6.3.2.6 Product testing and evaluation

The manufacturer shall establish procedures to ensure that the stated values of the characteristics he declares are maintained. The characteristics, and the means of control, are:

- Response delay shall be subject to the test indicated in Annex E, done at ambient temperature;
- Motor rating shall be subject to the test indicated in Annex C (C.4.2);
- Ability to open under environmental conditions at ambient temperature shall be subject to the test indicated in Annex E.

6.3.2.7 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.

6.3.2.8 Corrective action

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

6.3.2.9 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 once per year. However, if after 2 years from the date of the first surveillance there is no evidence of non-compliance, further surveillances shall be undertaken once every 2 years. 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 6.2.1.

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.

6.3.7 One-off products, pre-production products (e.g. prototypes) and products produced in very low quantity

The powered smoke and heat control ventilators (fans) produced as a one-off, prototypes assessed before full production is established, and products produced in very low quantities (less than 10 per year) shall be assessed as follows.

For type assessment, the provisions of 6.2.1, apply, together with the following additional provisions:

- in case of prototypes, the test samples shall be representative of the intended future production and shall be selected by the manufacturer;
- on request of the manufacturer, the results of the assessment of prototype samples may be included in a certificate or in test reports issued by the involved third party.

The FPC system of one-off products and products produced in very low quantities shall ensure that raw materials and/or components are sufficient for production of the product. The provisions on raw materials and/or components shall apply only where appropriate. The manufacturer shall maintain records allowing traceability of the product.

For prototypes, where the intention is to move to series production, the initial inspection of the factory and FPC shall be carried out before the production is already running and/or before the FPC is already in practice. The following shall be assessed:

- the FPC-documentation; and
- the factory.

In the initial assessment of the factory and FPC it shall be verified:

- a) that all resources necessary for the achievement of the product characteristics included in this European standard will be available, and
- b) that the FPC-procedures in accordance with the FPC-documentation will be implemented and followed in practice, and
- c) that procedures are in place to demonstrate that the factory production processes can produce a product complying with the requirements of this European standard and that the product will be the same as the samples used for the determination of the product type, for which compliance with this European standard has been verified.

Once series production is fully established, the provisions of 6.3 shall apply.

7 Marking, labelling and packaging

The PSHC ventilator (fan) shall be marked as follows:

- with the manufacturer's name or trademark;
- with the resistance to fire classification;
- with the number of this European Standard and the year of its publication (i.e. EN 12101-3:2015), followed by the generic name of the product "Powered Smoke and Heat Control ventilator";
- with the model/type;
- with power requirements, e.g. power, current, voltage and rotational speed; the snow load class where applicable;
- with the flow direction inside the fan (motor upstream, downstream or both);
- with direction of motor shaft (vertical, horizontal or both);
- with minimum flow and maximum temperature of cooling air where applicable;
- with information about electrical connections of motor (e.g. Y or Δ);
- with the text "This Powered Smoke and Heat Control ventilator shall be installed as per the manufacturer's instruction";
- with the manufacturer's installation instructions or a reference to a document held by the manufacturer giving these instructions;
- with the date of manufacture (month and year).

Where regulatory marking provisions require information on some or all items listed in this clause, the requirements of this clause concerning those common items are deemed to be met.