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Fire detection and fire alarm system

Part 28: Non-resettable line-type heat detectors

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bsi.

National foreword

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Fire detection and fire alarm system - Part 28: Non-resettable line-type heat detectors

Systèmes de détection et d'alarme incendie - Partie 28 : Détecteurs de chaleur de type linéaire non réenclenchables

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European foreword

This document (EN 54-28:2016) has been prepared by Technical Committee CEN/TC 72 “Fire detection and fire alarm 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of an identical text or by endorsement, at the latest by August 2016, and conflicting national standards shall be withdrawn at the latest by February 2020.

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This document has been prepared under a mandate given to CEN by the European Commission and the European Free Trade Association, and supports the basic requirements of Regulation (EU) 305/2011.

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

EN 54, *Fire detection and fire alarm systems* consists of the following parts:

— *Part 1: Introduction*

— *Part 2: Control and indicating equipment*

— *Part 3: Fire alarm devices – Sounders*

— *Part 4: Power supply equipment*

— *Part 5: Heat detectors – Point detectors*

— *Part 7: Smoke detectors – Point detectors using scattered light, transmitted light or ionization*

— *Part 10: Flame detectors – Point detectors*

— *Part 11: Manual call points*

— *Part 12: Smoke detectors – Line detectors using an optical beam*

— *Part 13: Compatibility assessment of system components*

— *Part 14: Guidelines for planning, design, installation, commissioning, use and maintenance*

— *Part 15: Point detectors using a combination of detected phenomena*

— *Part 16: Voice alarm control and indicating equipment*

— *Part 17: Short-circuit isolators*

— *Part 18: Input/output devices*

— *Part 20: Aspirating smoke detectors*

— *Part 21: Alarm transmission and fault warning routing equipment*

— *Part 22: Resettable line-type heat detectors*

— *Part 23: Fire alarm devices – Visual alarm devices*

— *Part 24: Components of voice alarm systems – Loudspeakers*

— *Part 25: Components using radio links*

— *Part 26: Carbon monoxide detectors – Point detectors*

— *Part 27: Duct smoke detectors*

— *Part 28: Non-resettable line-type heat detectors*

— *Part 29: Multi-sensor fire detectors - Point detectors using a combination of smoke and heat sensors*

— *Part 30: Multi-sensor fire detectors - Point detectors using a combination of carbon monoxide and heat sensors*

— *Part 31: Multi-sensor fire detectors – Point detectors using a combination of smoke, carbon monoxide and optionally heat sensors*

— *Part 32: Guidelines for the planning, design, installation, commissioning, use and maintenance of voice alarm systems*

NOTE This list includes standards that are in preparation and other standards may be added. For current status of published standards refer to www.cen.eu.

According to the CEN-CENELEC Internal Regulations, the national standards organizations 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

Non-resettable line-type heat detectors (NLTHD) have been used for a considerable number of years and are incorporated into fire detection systems and in some countries even into fire alarm systems if accepted by the relevant authorities. These detectors are typically used in areas where point type heat detectors are presented with challenging environmental characteristics and also, where access to the detectors, may significantly influence the fire alarm system design.

This standard defines the minimum system functionality for NLTHD products.

Due to the various applications for NLTHD, it is necessary to devise separate environmental classification tests for the sensing element and the sensor control units of these systems. It is not the purpose of this standard to define applications or how NLTHD should be used in applications.

Generally NLTHD operate on using the same basic principle. However, they can have different performance with respect to the temperature response. Therefore they have been differentiated by a type code which reflects the nominal alarm temperature, the tolerance range and the maximum ambient temperature at which they could be used.

1 Scope

This European Standard applies to non-resettable line-type heat detectors consisting of a sensing element using an electrical sensor cable which can be connected to a sensor control unit or either directly or through an interface module to a control and indicating equipment intended for use in fire detection and fire alarm systems installed in and around buildings and civil engineering works (see EN 54-1:2011).

The non-resettable sensing element has a fixed temperature alarm threshold and does not distinguish between short circuit and alarm condition.

This European Standard specifies the requirements and performance criteria, the corresponding test methods and provides for the Assessment and Verification of Constancy of Performance (AVCP) of non-resettable line- type heat detectors to this European Standard.

This European Standard also covers non-resettable line-type heat detectors intended for use in the local protection of plant and equipment.

Non-resettable line-type heat detectors with special characteristics and developed for specific risks are not covered by this standard.

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 54-1:2011, *Fire detection and fire alarm systems - Part 1: Introduction*

EN 50130-4:2011, *Alarm systems - Part 4: Electromagnetic compatibility - Product family standard: Immunity requirements for components of fire, intruder, hold up, CCTV, access control and social alarm systems*

EN 60068-1:2014, *Environmental testing - Part 1: General and guidance (IEC 60068-1:2013)*

EN 60068-2-1:2007, *Environmental testing - Part 2-1: Tests - Test A: Cold (IEC 60068-2-1:2007)*

EN 60068-2-2:2007, *Environmental testing - Part 2-2: Tests - Test B: Dry heat (IEC 60068-2-2:2007)*

EN 60068-2-27:2009, *Environmental testing - Part 2-27: Tests - Test Ea and guidance: Shock (IEC 60068-2-27:2009)*

EN 60068-2-30:2005, *Environmental testing - Part 2-30: Tests - Test Db: Damp heat, cyclic (12 h + 12 h*

EN 60068-2-42: , *Environmental testing - Part 2-42: Tests - Test Kc: Sulphur dioxide test for contacts and connections (IEC 60068-2-42:2003)*

EN 60068 -2-6:2008, *Environmental testing - Part 2-6: Tests - Test Fc: Vibration (sinusoidal) (IEC 60068-2-6:20 8)*

EN 60068-2-75:1997, *Environmental testing - Part 2-75: Tests - Test Eh: Hammer tests (IEC 60068-2-75:1997)*

EN 60068-2-78:2013, *Environmental testing - Part 2-78: Tests - Test Cab: Damp heat, steady state (IEC 60068-2-78:2012)*

3 Terms, definitions and abbreviations

For the purposes of this document, the terms and definitions given in EN 54-1:2011 and the following apply.

3.1 Terms and definitions

3.1.1

detectors,**igitaldetector**thesensing element of which can be either of two states: standby or alarm

Note 1 to entry: In this type of detector the alarm threshold is inherent to the construction of the sensing element.

3.1.2

part of a line-type heat detector in addition to the sensor control unit and the sensing element which is

functional unit

essential for the function of the line-type heat detector

EXAMPLE Terminating device, filter, switch.

3.1.3

application**localprotection**inwhich**application**thesensing element is installed in relatively close proximity to the potential fire risk

EXAMPLE Pipelines, conveyor belts, combustion engines/turbines, rolling stock, transformers, process dryers, cable trays, escalators, chemical process equipment, electrical equipment cabinets, ventilation systems (dust collector, hood extractor, etc.), switch gear (e.g. printing press).

3.1.4

non-resettable line-type heat detectors

detector**NLTHD** which responds to heat sensed in the vicinity of a continuous line, and which can only respond once

Note 1 to entry: A non-resettable line-type heat detector may consist of a sensor control unit, a sensing element and functional units.

3.1.5

heat**snsing**sensing**element**part of the line-type heat detector which can be a fibre optic cable, a pneumatic tube or an electrical cable

Note 1 to entry: A sensing element may consist of different segments separated, e.g. by functional units or splices.

Note 2 to entry: The sensing element may be connected directly to control and indicating equipment approved to EN 54–2, an input/output device approved to EN 54–18 or via a dedicated sensor control unit (see 3.1.6).

3.1.6

unit**sensor**that**control**supervises**unit**the sensing element and communicates to the control and indicating equipment

Note 1 to entry: The unit can be remote or an integral part of the control and indicating equipment as defined by EN 54–2.

3.2 Abbreviations

For the purposes of this document, the following abbreviation

applies. NLTHD: non-resettable line-type heat detector

4 Product characteristics

4.1 General

4.1.1 Compliance

In order to comply with the present standard, detectors NLTHD shall comply with the requirements of Clause 4, which shall be verified by visual inspection or engineering assessment as described in Clause 5 and shall meet the requirements of the tests.

4.1.2 NLTHD performance type

To simplify/standardize/rationalize product marking (see Clause 8), the performance type of the NLTHD is described using the following format, Txxx-Vyy-Azzz, where:

— Txxx is the nominal alarm temperature in the range 54 °C to 160 °C;

— Vyy is the variance of the nominal alarm temperature in ± %, which is either 05 or 10;

— Azzz is the maximum ambient temperature in °C, i.e. the maximum environment temperature at which the sensing element of the NLTHD could be installed and operated without generating an alarm.

EXAMPLE T085- V10-A066 means a NLTHD with a nominal alarm temperature of 85 °C having a variance of 10 % (i.e. a minimum alarm temperature of 76,5 °C and a maximum alarm temperature of 93,5 °C) which can be used for an application in which the ambient temperature is no greater than 66 °C.

The difference between the maximum ambient temperature and the minimum alarm temperature is to be at least 4°C.

4.1.3 Environmental groups

Different environmental groups are necessary to reflect the different service environment of the components of an NLTHD:

The sensing element is in either environmental group II or III.

The sensor control unit and the functional unit are in either environmental group I, II or III.

premises but for which the avoidance of extreme environmental conditions can be taken into account in the selection of the mounting site. Environmental group II covers equipment likely to be installed indoors in commercial/industrial premises in all general areas. Environmental group III covers equipment which is intended to be installed outdoors.

4.2 Nominal activation conditions/sensitivity

4.2.1 Individual alarm indication

Each sensor control unit shall be provided with an integral latched red visual indicator, by which the individual sensor control unit, which released an alarm, can be identified, until the alarm condition is reset. Where other conditions of the sensor control unit can be visually indicated, they shall be clearly distinguishable from the alarm indication, except when the sensor control unit is switched into a service

mode. The visual indicator shall be visible from a distance of 6 m in the direct line of sight perpendicular to the surface, in an ambient light intensity up to 500 lux.
If more than one sensing element is connected to the sensor control unit, there shall be separate alarm indication for each sensing element.
To confirm this, the detector shall be assessed in accordance with 5.2.1.

4.2.2 Signalling
The NLTHD shall signal the alarm and fault status to the control and indicating equipment.

If more than one sensing element is connected to a sensor control unit, there shall be separate alarm and fault signals for each sensing element.
To confirm this, the detector shall be assessed in accordance with 5.2.2.

4.3 Operational reliability
4.3.1 Maximum ambient temperature
The sensing element of the NLTHD shall be capable of withstanding long term exposure to temperatures as specified in 5.3.1.

4.3.2 Connection of ancillary devices
Where the NLTHD provides for connections to ancillary devices (e.g. remote indicators, RS 485 interface), open or short-circuit failures of these connections shall not prevent the correct operation of the NLTHD.
Where such connections are present the detector shall be assessed in accordance with 5.3.2.

4.3.3 Manufacturer's adjustments
It shall not be possible to change the manufacturer's settings except by special means (e.g. the use of a key, a code or a special tool or by breaking or removing a seal).
To confirm this, the detector shall be assessed in accordance with 5.3.3.

4.3.4 Software controlled detectors
4.3.4.1 General
For NLTHD, which rely on software control in order to fulfil the requirements of this standard, the requirements of 4.3.4.2, 4.3.4.3 and 4.3.4.4 shall be met.

4.3.4.2 Software documentation
The manufacturer shall submit documentation, which gives an overview of the software design. This documentation shall provide sufficient detail for the design to be inspected for compliance with this standard and shall include the following as a minimum:

4.3.4.2

1

a) a functional description of the main program flow (e.g. as a flow diagram or structogram) including;

1) a brief description of the modules and the functions that they perform,

2) the way in which the modules interact,

3) the overall hierarchy of the program,

4) the way in which the software interacts with the hardware,

5) the way in which the modules are called, including any interrupt processing,

b) a description of which areas of memory are used for the various purposes (e.g. the program, site specific data and running data);

c) a designation, by which the software and its version can be uniquely identified.

The manufacturer shall have available detailed design documentation, which only needs to be provided if required by the testing laboratory. It shall comprise at least the following:

a) an overview of the whole system configuration, including all software and hardware components;

b) a description of each module of the program, containing at least:

1) the name of the module,

2) a description of the tasks performed,

3) a description of the interfaces, including the type of data transfer, the valid data range and the checking for valid data,

c) full source code listings, as hard copy or in machine -readable form (e.g. ASCII-code), including all global and local variables, constants and labels used, and sufficient comment for the program flow to be recognized;

d) details of any software tools used in the design and implementation phase (e.g. CASE-tools, compilers).

4.3.4.2 Software design

In order to ensure the reliability of the NLTHD, the following requirements for software design shall apply:

a) the software shall have a modular structure;

b) the design of the interfaces for manually and automatically generated data shall not permit invalid data to cause error in the program operation;

c) the software shall be designed to avoid the occurrence of deadlock of the program flow.

The program necessary to comply with this standard and any preset data, such as manufacturer's settings, shall be held in non-volatile memory. Writing to areas of memory containing this program and data shall only be possible by the use of some special tool or code and shall not be possible during normal operation of the NLTHD.

Site- specific data shall be held in memory which will retain data for at least two weeks without external power to the detector, unless provision is made for the automatic renewal of such data, following loss of power, within 1 h of power being restored.

To confirm this, the detector shall be assessed in accordance with 5.3.4.

4.3.5 Sensing element faul**fault**

The NLTHD shall signal a condition when the sensing element is interrupted. To

confirm this, the detector shall be assessed in accordance with 5.3.5.

4.3.6 On-site adjustment of response behaviour

The effective response behaviour of a NLTHD is dependent upon both the sensitivity settings of the sensor control unit and the heat sensing element. Some types of NLTHD therefore may have facilities to adjust the sensitivity of the NLTHD to suit the application.

If there is provision for on-site adjustment of the response behaviour of the detector then:

a) for each setting, at which the manufacturer claims compliance with this standard, the detector shall comply with the requirements of this standard, and access to the adjustment means shall only be possible by the use of a code or special tool;

b) any setting(s), at which the manufacturer does not claim compliance with this standard, shall only be accessible by the use of a code or special tool, and it shall be clearly marked on the detector or in the associated data, that if these setting(s) are used, the detector does not comply with the standard.

These adjustments may be carried out at the sensor control unit or at the control and indicating equipment.

To confirm this, the detector shall be assessed in accordance with 5.3.6.

4.4 Tolerance to supply voltage

4.4.1 Variation in supply parameters

The NLTHD shall function correctly within the specified range(s) of the supply parameters as specified

in 5.4.1.

The shall signal a fault condition when its input power supply falls below the minimum voltage

specified by the manufacturer as specified in 5.4.2.

4.5 Performance parameters under fire condition

The response temperature of the tested NLTHD's shall be within the manufacturer's performance type

declaration as specified in 5.5.

4.6 Durability of Performance parameters under fire condition

4.6.1 Temperature resistance

4The**.6.1**sensor**.1Dry**control**heat(operational)**unitoftheNLTHD**forsensor**shall

function**conrol unit**correctly at high ambient temperatures as specified in 5.6.1.1.

4.6.1.2 Cold (operational) for sensing element

The sensing element of the NLTHD shall function correctly at low ambient temperatures as specified in 5.6.1.2.

4.6.1sensor**.3Cld (operational) for sensor control unit**

The control unit of the NLTHD shall function correctly at low ambient temperatures as specified in

5.6.1.3

4.6.2 Humidity resistance

4.6.2.1 Damp heat, steady-state (endurance) for sensor control unit and sensing element

The NLTHD shall be capable of withstanding long term exposure to a high level of continuous humidity

as specified in 5.6.2.1.

4.6.2.2 Damp heat, cyclic (operational) for sensing element

The sensing element of the NLTHD shall function correctly at high relative humidity (with

condensation) as specified in 5.6.2.2.

4.6.2.3 Damp heat, cyclic (operational) for sensor control unit

The sensor control unit of the NLTHD shall function correctly at high relative humidity (with

condensation) as specified in 5.6.2.3.

4.6.2.4 Damp heat, steady-state (operational) for sensor control unit

The sensor control unit of the NLTHD shall function correctly high relative humidity (without

condensation) as specified in 5.6.2.4.

4The**.6.2**NLTHD**.5Damp**shall**heat,**be**cyclic**capable**(ndurance)**ofwithstanding**forsensor**thelong**control**term

uniteffect**and**of**sensing**cyclichigh**element**humidity levels (with condensation) as specified in 5.6.2.5.

4.6.3 Shock and vibration resistance

4.6.3.1 Shock (operatunit**onal) for sensor control unit**

The sensor control of the NLTHD shall function correctly when submitted to mechanical shocks which

are likely to occur in the service environment as specified in 5.6.3.1.

4.6.3.2 Impact (operational) for sensor control unit

The sensor control unit of the NLTHD shall operate correctly when submitted to mechanical impacts as

specified in 5.6.3.2.

4The**.6.3**sensing**.3Impact**element**(operational)**oftheNLTHD**forsensing**shalloperate**elment**correctly

when submitted to mechanical impacts as specified in 5.6.3.3.

4The**.6.3**sensor**.4Vibration,**control **si**unit**usoidal**ofthe NLTHD**(operational)**shalloperate**forsensor**correctly

when submitted to sinusoidal vibration as specified in 5.6.3.4.

4.6.3.5 Vibration, sinusoidal (operational) for sensing eleme_t

The sensing element of the NLTHD shall operate correctly submitted to sinusoidal vibration as specified

4The**.6.3**sensor**.6Vibration,**control **si**unit**usoidal**ofthe

NLTHD**(endurance)**shallbe**for**capable**sensor**of**con**withsta**rolunit**nding the effect of sinusoidal vibration as specified in 5.6.3.6.

4.6.3.7 Vibration, sinusoidal (endurance) for sensing element

The sensing element of the NLTHD shall be capable of withstanding the effect of sinusoidal vibration as specified in 5.6.3.7.

4.6.4 Corrosion resistance

4.6.4.1 Sulphur dioxide (SO_2) corrosion (enduranc) for sensing element

The sensing element of the NLTHD shall be capable of withstanding exposure to an SO_2 corrosive atmosphere as specified in 5.6.4.1.

4.6.4.2 Sulphur dioxide (SO_2) corrosion (endurance) f r sensor control unit

The sensor control unit of the NLTHD shall be capable of withstanding exposure to an SO_2 corrosive atmosphere as specified in 5.6.4.2.

4.6.5 Electrical stability

The NLTHD shall operate correctly when submitted to electromagnetic interference as specified in 5.6.5.

5 Testing, assessment and sampling methods

5.1 General

5.1.1 Atmospheric conditions for tests

Unless otherwise stated in a test procedure, the testing shall be carried out after the test specimen has been allowed to stabilize in the standard atmospheric conditions for testing as specified in EN 60068-1:2014 and as follows:

a) temperature: (15 to 35) °C;

b) relative humidity: (25 to 75) %;

c) air pressure: (86 to 106) kPa.

If variations in these parameters have a significant effect on a measurement, then such variations should be kept to a minimum during a series of measurements carried out as part of one test on one specimen.

5.1.2 Operating conditions for tests

If a test method requires a specimen to be operational, then the specimen shall be connected to suitable supply and monitoring equipment, with characteristics as required by the manufacturer's data. Unless otherwise specified in the test method, the supply parameters applied to the specimen shall be set within the manufacturer's specified range(s) and shall remain substantially constant throughout the tests. The value chosen for each parameter shall normally be the nominal value, or the mean of the specified range. If a test procedure requires a specimen to be monitored to detect any alarm or fault signals, then connections shall be made to any necessary ancillary devices (e.g. through wiring to an end-of-line device for conventional detectors to allow a fault signal to

The details of the supply and monitoring equipment and the alarm criteria used should be given in the test report.

5Unless**.1.3M**otherwise stated, the specimen shall be mounted by its normal means of attachment in accordance with the manufacturer's instructions. If these instructions describe more than one method of mounting, then the method considered to be most unfavourable shall be chosen for each test.

Unless**5.1.4T**otherwise**lerances** stated, the tolerances for the environmental test parameters shall be as specified in the basic reference standards for the test (e.g. the relevant part of EN 60068).
If a specific tolerance or deviation limit is not specified in a requirement or test procedure, then a deviation limit of ± 5 % shall be applied.

5.1.5 Procedure for measurement of response temperature

This procedure is to verify the manufacturer's performance type declaration and to establish any deviation in system response temperature following the environmental tests.

The NLTHD shall be connected to a suitable supply and monitoring equipment in accordance with 5.1.2.

The response temperature of the NLTHD shall be measured using the heat tunnel described in Annex A and Annex B.

The orientation of the sensing element in the heat tunnel shall be chosen arbitrarily.

Before the measurement, stabilize the temperature of the air stream and the section of sensing element to be heated to a temperature 25°C below the manufacturer's declared maximum ambient temperature, Azzz or to 25°C, whichever is the higher. The measurement is then made by increasing the air temperature in the tunnel, linearly with respect to time and at the rate of rise specified in the applicable test procedure, until the supply and monitoring equipment indicates an alarm or the manufacturer's limits have been exceeded at least by 5 K.

During the measurement, the airflow in the tunnel shall be maintained at a constant mass flow, equivalent to (0,8 ± 0,1) m/s at 25 °C. The air temperature shall be controlled to within ± 2 K of the nominal temperature required at any time during the test.

The response temperature, , shall be recorded at the moment an alarm is indicated.

and from a stabilized or alarm temperature.

The length of sensing element, used, , shall be 10 m, unless specified otherwise in the appropriate test. placed in the centre of the heat tunnel (see Annex A), perpendicular to the air flow.

L

The remaining section of the sensing element ($L_1 - L_{test}$) not exposed to the induced test temperature individual tests.

To facilitate the test procedure, it may be necessary to introduce easily detachable connections between different sections of the sensing element. The losses introduced by these connections should be taken into account when determining 1.
and/or after the section of the sensing element being heated (L_{test}).

5.1.6 Provision for tests

Two continuous samples of at least 300 m of sensing element and one continuous sample of sensing element of the maximum length as defined by the manufacturer (all taken from different production batches numbered from 1 to 3) shall be provided to conduct the tests in 5.1.7. If applicable, at least three specimens of sensor control unit and/or, at least three specimens of each functional unit shall also be provided. The exact length of sensing elements and the number of sensor control units and/or functional units shall be agreed between the manufacturer and the testing laboratory. If more than three sensor control units and/or functional units are provided then the test schedule (see 5.1.7.) can be modified as appropriate.

If there are different types of sensor control units, sensing elements and/or functional units (e.g. with different environment groups), at least three specimens/samples shall be provided for each type

The specimens/batches submitted shall be deemed representative of the manufacturer's normal production with regard to their construction and calibration.

The mean response temperature of the three specimens, as found in the reproducibility tests, should represent the production mean. The limits specified in the reproducibility test should also be applicable to the manufacturer's production.

5The**.1.7**specimens**Testschedu**shall**e**be tested according to the following test schedule (see Table 1).

Table 1 —Test schedule

Test [d]	Clause	Specimen No		
		Specimen No of sensor control unit	Specimen No of sensing element	Specimen No of functional unit [a]
			[b]	[b]
element	[c]			
	[c]			
supply)	[c]			
			each specimen	
	[c]		1 to 3	
	[c]			
and sensing element				
	[c]			
	[c]			
sensing element	[c]			
	[c]			
	[c]			
	[c]			
element [2]				
[2]	[c]			
unit	[c, e]			

functional unit is in separate housing, it shall be tested with the same methods as used for the sensor control unit but with severities appropriate to its environmental class; tests for functional units shall be combined with the other test if possible.

[b] If more than one sensing element may be connected to the sensor control unit and/or there are sensing elements for different environment groups, then the number of tests shall be agreed between the manufacturer and the testing laboratory.

[c] These tests. are not required if the sensing element is connected directly to control and indicating equipment complying with EN 54–2 However, if a functional unit is required it may be necessary to do these tests with it (see footnote a).

[d] The test order remains open to allow optimization of test program to minimize test time and cost.

[e] The EMC tests specified in 5.6.5 are not required for NLTHDs which do not rely on active electronic components for their operation.

5.2 Test procedures nominal activation conditions/sensitivity

5.2.1 Individual alarm indication

The visual indicator(s) shall be visually inspected from a distance of 6 m, in a line through the indicator perpendicular to the mounting surface of the enclosure, in an ambient light intensity up to 500 lux as specified in 4.2.1.

5.2.2 Signalling

An engineering assessment shall be carried out for the correct signalling of the alarm and fault signal(s).
The following test methods shall apply to generate the alarm or fault status:
a) Sensing element faults (see 5.3.5);

b) Low voltage (see 5.4.2);

c) Procedure for measuring response temperature (see 5.1.5).

If there is more than one sensing element the assessment shall be carried out for every sensing element.

5.3 Test procedures operational reliability

5.3.1 Maximum ambient temperature test (endurance) for sensing element

5To**.3**demonstrate**.1.1Objectof**the**the**ability**test** of the NLTHD to withstand the maximum ambient temperature declared by the manufacturer, Azzz (see 4.1.2), without generating an alarm condition.

5The**.3.1**three**.2Mou**lengths**ting** **of** 10**the**m**sensing**ofsensing**element**element shall be mounted in a heat chamber in a way that allows the sensing element to be heated homogeneously. A suitable test arrangement shall be agreed between the testing laboratory and the manufacturer and shall be supplied by the manufacturer.

5.3.1.3 Test procedure

5.3.1.3.1 Reference

The test apparatus and procedure shall be as described in EN 60068-2-2:2007 Test B, and as indicated below

5.3.1.3.2 State of the specimen during conditioning

The specimen shall not be supplied with power during conditioning and tests for non heat-dissipating specimens shall apply (i.e. Tests Ba or Bb).
Test Ba (with sudden changes in temperature) may be used, to improve test economy, if it is known that the sudden change in temperature will not be detrimental to the specimen.
The test configuration shall be as specified in 5.1.5.

5.3.1.3.3 Conditioning

The following conditions shall be applied:

— temperature: Azzz (maximum ambient temperature);

— duration: 21 d.

al measurements

After the conditioning and a recovery period of at least 1 h, the functional test as described in 5.1.5 shall be conducted at a rate of rise of 3 Kmin^{-1}

The response temperature shall be recorded as T_a.

5.3.1.4 Requirements

No alarm or fault signal shall be given after powering the sensing element at the end of the conditioning and recovery periods.

The response temperature, , shall be within the limits of the performance type defined by the manufacturer, Txxx ± Vyy (see T_a 4.1.2).

Open and short-circuit of ancillary shall be applied at the connections for ancillary devices.

An engineering assessment shall be carried out to demonstrate the correct operation of the detector as required in 4.3.2.

A visual inspection of a specimen shall be conducted to verify that the detector meets the requirements for manufacturer adjustments as specified in 4.3.3.

For detectors that rely on software for their operation, a visual inspection of samples of documentation provided by the manufacturer shall be conducted to verify that the device complies with the requirements specified in 4.3.4.

5.3.5 Sensing element fault

5.3.5.1 Object of the test

To ensure that an interruption in the sensing element which may prevent the proper function of the NLTHD is monitored and signalled.

5.3.5.2 Test procedure

The following fault conditions on the sensing element shall be generated while the NLTHD is monitored:

— interruption of individual conductors,

— interruption of all conductors simultaneously.

5.3.5.3 Requirements

Any interruption of individual and/or all conductors that prevents the NLTHD from proper function shall be detected and signalled within 100 s.

No alarm signal shall be triggered.

5.3.6 On-site adjustment of response behaviour

A visual inspection shall be conducted to verify that the detector meets the requirements for on-site adjustment of response behaviour as specified in 4.3.6.

5.4 Tolerance to supply voltage

5.4.1 Variation in supply parameters

5.4.1.1 Object

To show that, within the specified range(s) of the supply parameters (e.g. voltage), the performance of the NLTHD is not unduly dependent on these parameters.

5.4.1.2 Test procedure

The response temperature of the specimen to be tested shall be measured as described in 5.1.5 at a rate of rise of temperature of 3 $Kmin^{-1}$ and at the upper and lower limits of the supply parameter (e.g. voltage) range(s) specified by the manufacturer.

For each test the alarm temperature shall be recorded as T_a.

5.4.1.3 Requirements

For each test the response temperature , shall be within the limits of the performance type defined by the manufacturer, Txxx ± Vyy (see 4.1.2) T_a.

5.4.2 Low voltage fault (sensor control unit with external power supply)

5.4.2.1 Object

To show that, the sensor control unit is able to signal a fault condition when its input power supply falls below the minimum voltage specified by the manufacturer.

5.4.2.2 Test procedure

The specimen shall be mounted as described in 5.1.3 and shall be connected to supply and monitoring equipment as described in 5.1.2. The sensor control unit shall be operated at its maximum loading and at the lower voltage specified by the manufacturer (as tested in 5.4.1.).

The supply voltage to the sensor control unit shall then be lowered by 15 %.

NOTE Maximum loading can include optional cards, power consuming sensor cables, etc.

5.4.2.3 Requirements

The sensor control unit shall signal a fault condition within 100 s following the voltage being lowered.

5.5 Performance parameters under fire condition

5.5.1 Object

To verify that the response temperature is in accordance with the manufacturer's performance type and to show that this response temperature does not vary unduly from specimen to specimen.

5.5.2 Test procedure

The response temperature of the specimens tested shall be measured as described in 5.1.5. at a rate of rise of temperature of 3 $Kmin^{-1}$. For each specimen the alarm temperature shall be recorded as T_a.

5.5.3 Requirements

For each specimen the response temperature, , shall be within the limits of the performance type defined by the manufacturer, Txxx ± Vyy (see 4.1.2)[a].

5.6 Durability of performance parameters under fire condition

5.6.1 Temperature resistance

5.6.1.1 Dry heat (operational) test for sensor control unit

5.6.1.1.1 Object

To demonstrate the ability of the sensor control unit to function correctly at high ambient temperatures appropriate to the anticipated service environment.

5.6.1.1.2 Test procedure

5.6.1.1.2.1 Reference

The test apparatus and procedure shall be as described in EN 60068-2-2:2007 Test B, and as indicated below.

5.6.1.1.2.2 State of the specimen during conditioning

The specimen shall be mounted as described in 5.1.3 and shall be connected to supply and monitoring equipment as described in 5.1.2.

The test configuration shall be as specified in 5.1.5.

The sensing element shall be maintained at normal atmospheric conditions (see 5.1.1).

5.6.1.1.2.3 Conditioning

The conditioning shall be applied to the sensor control unit in accordance with the applicable environmental group shown in Table 2.

Table 2 — Conditions for dry heat (operational) test for sensor control unit

Environmental group	Temperature	Duration
I	°C	h
II		
III		
carried out for the most severe group.		

5.6.1.2.4 The specimen shall be monitored during conditioning during the conditioning period to detect any fault or alarm condition. During the last hour of the conditioning simulate an alarm condition by means agreed with the manufacturer.

5.6.1.2.5 Final measurements

After the conditioning and a recovery period at standard laboratory conditions of at least 1 h, simulate an alarm condition by means agreed with the manufacturer.

5.6.1.3 Requirements

Except during the functional test in 5.6.1.1.2.4, no alarm or fault signal shall be given during the conditioning.

An alarm shall be generated during the functional tests in 5.6.1.1.2.4. and 5.6.1.1.2.5.

5.6.1.2 Cold (operational) for sensing element

5.6.1.2.1 Object

To demonstrate the ability of the NLTHD sensing element to function correctly at low ambient temperatures appropriate to the anticipated service environment.

5.6.1.2.2 Test procedure

5.6.1.2.2.1 Reference

The test apparatus and procedure shall be as described in EN 60068-2-1:2007, test Ab.

5.6.1.2.2.2 State of the specimen during conditioning

The specimen shall be mounted as described in 5.1.3 and shall be connected to supply and monitoring equipment as described in 5.1.2.

The test configuration shall be as specified in 5.1.5.

The sensor control unit shall be maintained at normal ambient conditions defined in 5.1.1.

5.6.1.2.2.3 Conditioning

Conditioning shall be applied to the specimen as indicated in the Table 3.

Table 3 — Conditions for cold (operational) test for sensing element

Environmental group	Temperature °C	Duration h
II		
III		

[a] If the sensor control unit and the sensing element belong to the same environmental group the test may be done concurrently with 5.6.1.3.

[5] The 6.1 specimen 2.2.4 Measurements shall be monitored during during conditioni the **conditioning** period to detect any fault or alarm condition.

5.6.1.2.2.5 Final measurements

After the conditioning at standard laboratory conditions and a recovery period of at least 1 h, the functional test as described in 5.1.5 shall be conducted on the sensing element which has been conditioned (see 5.6.1.2.2.2.) at a rate of rise of 3 Kmin^{-1}.

The response temperature shall be recorded as T_a.

5.6.1.2.3 Requirements

No alarm or fault signal shall be given during the period that the temperature is decreasing to the conditioning temperature or during the stabilized period.

The response temperature, , shall be within the limits of the performance type defined by the manufacturer, Txxx ± Vyy (see T_a 4.1.2).

5.6.1.3 Cold (operational) for sensor control unit

5.6.1.3.1 Object

To demonstrate the ability of the NLTHD sensor control unit to function correctly at low ambient temperatures appropriate to the anticipated service environment.

5.6.1.3.2 Test procedure

5.6.1.3.2.1 Reference

The test apparatus and procedure shall be as described in EN 60068-2-1:2007.

The tests with gradual changes in temperature shall be used. Test Ad shall be used for heat-dissipating specimens (as defined in EN 60068-2-1) and Test Ab for non heat-dissipating specimens.

5.6.1.3.2.2 State of the specimen during conditioning

The specimen shall be mounted as described in 5.1.3 and shall be connected to supply and monitoring equipment as described in 5.1.2.

The test configuration shall be as specified in 5.1.5.

The sensing element shall be maintained at normal atmospheric conditions (see 5.1.1).

5.6.1.3.2.3 Conditioning

Conditioning shall be applied to the specimen as indicated in the Table 4.

Table 4 — Conditions for cold (operational) test for sensor control unit

Environmental group	Temperature °C	Duration h
I		
II		
III		

[a] If the sensor control unit and the sensing element belong to the same environmental group the test may be done concurrently with 5.6.1.2.

5The **.6.1**specimen **.3.2.4Measurements**shallbemonitored **during**during **conditioni**the **conditioning** period to detect any fault or alarm condition. During the last hour of the conditioning simulate an alarm condition by means agreed with the manufacturer.

5.6.1.3.2.5 Final measurements

After the conditioning at standard laboratory conditions and a recovery period of at least 1 h, simulate an alarm condition by means agreed with the manufacturer.

5.6.1.3.3 Requirements

Except during the functional test in 5.6.1.3.2.4, no alarm or fault signal shall be given during the conditioning.

An alarm shall be generated during the functional tests in 5.6.1.3.2.4 and 5.6.1.3.2.5.

5.6.2 Humidity resistance

5.6.2.1 Damp heat, steady-state (endurance) for sensor control unit and sensing element
5.6.2.1.1 Object
To demonstrate the ability of the NLTHD (sensor control unit and sensing element) to withstand the long-term effects of humidity in the service environment (e.g. changes in electrical properties of materials, chemical reactions involving moisture, galvanic corrosion, etc.).

5.6.2.1.2 Test procedure
5.6.2.1.2.1 Reference
The test apparatus and procedure shall be as described in EN 60068-2-78:2013, Test Cab.

5.6.2.1.2.2 State of the specimen during conditioning
The specimen shall be mounted as described in 5.1.3 but shall not be supplied with power during the conditioning.
The test configuration shall be as specified in 5.1.5.

5.6.2.1.2.3 Conditioning
Conditioning shall be applied to the specimen as indicated in the Table 5.

Table 5 — Conditions for damp heat, steady-state (endurance) test

Environmental group	Temperature	Relative humidity %	Dur tion
I, II and III	°C		days

5.6.2.1.2.4 Final measurements
After the conditioning and a recovery period of at least 1 h at standard laboratory conditions, the functional test as described in 5.1.5 shall be conducted at a rate of rise of 3 Kmin-1.
The response temperature shall be recorded as T_a.

5.6.2.1.3 Requirements
No alarm or fault signal shall be given after powering the NLTHD at the end of the conditioning and recovery periods.
The response temperature, , shall be within the limits of the performance type defined by the manufacturer, Txxx ± Vyy (see T_a 4.1.2).

5.6.2.2 Damp heat, cyclic (operational) for sensing element
5.6.2.2.1 Object of the test
To demonstrate the ability of the NLTHD sensing element to function correctly at high relative humidity which may occur for short periods during the anticipated service environment.

5.6.2.2.2 Test procedure

5.6.2.2.2.1 Principle

The lower severity (with an upper temperature of 40 °C) is intended for areas where light condensation may infrequently occur for short periods (e.g. during the warming up of storage areas with limited or no temperature control).

The higher severity (with an upper temperature of 55 °C) is intended for areas where heavy and/or frequent condensation can occur (e.g. outdoors or in wet rooms, etc.).

5.6.2.2.2 Reference

The test apparatus and procedure shall be as described in EN 60068-2-30:2005, using the Variant 2 test cycle and controlled recovery conditions.

NOTE The test consists of exposing the specimen to cyclic temperature variations between 25 °C and the appropriate upper temperature (40 °C or 55 °C) . The relative humidity is maintained at (93 ± 3) % during the high temperature phase and above 95 % during the low temperature and temperature changing phases. The rates of increase of temperature are such that condensation should occur on the surface of the specimen.

5.6.2.2.3 State of the specimen shall be as described in 5.1.3 and shall be connected to the supply and monitoring equipment as described in 5.1.2.

The test configuration shall be as specified in 5.1.5.

The sensor control unit shall be maintained at normal ambient conditions defined in 5.1.1.

5.6.2.2.2.4 Conditioning

Conditioning shall be applied to the specimen as indicated in the Table 6.

Table 6 — Conditions for damp heat, cyclic (operational) test for sensing element

Environmental group	Lower temperature	Upper temperature	Relative humidity %		Number of cycles
			temperature	temperature	
II III					

If the sensor control unit and the sensing element belong to the same environmental group the test may be done concurrently with 5.6.2.3.

5.6.2.2.5 Measurements shall be monitored during during conditioning the conditioning period to detect any fault or alarm condition.

5.6.2.2.2.6 Final measurements

After the conditioning at standard laboratory conditions and a recovery period of at least 1 h, the functional test as described in 5.1.5 shall be conducted at a rate of rise of 3 $Kmin^{-1}$ and the response time recorded.

The response temperature shall be recorded as T_a.

5.6.2.2.3 Requirements

No alarm or fault signal shall be given during the conditioning and the following recovering period.

The response temperature, , shall be within the limits of the performance type defined by the manufacturer, Txxx ± Vyy (see T_a 4.1.2).

5.6.2.3 Damp heat, cyclic (operational) for sensor control unit

5.6.2.3.1 Object of the test

To demonstrate the ability of the NLTHD sensor control unit to function correctly at high relative humidity which may occur for short periods during the anticipated service environment.

5.6.2.3.2 Test procedure

5.6.2.3.2.1 Principle

The lower severity (with an upper temperature of 40 °C) is intended for areas where light condensation may infrequently occur for short periods (e.g. during the warming up of storage areas with limited or no temperature control).

The higher severity (with an upper temperature of 55 °C) is intended for areas where heavy and/or frequent condensation can occur (e.g. outdoors or in wet rooms, etc.).

5.6.2.3.2.2 Reference

The test apparatus and procedure shall be as described in EN 60068-2-30:2005 using the Variant 2 test cycle and controlled recovery conditions.

NOTE The test consists of exposing the specimen to cyclic temperature variations between 25 °C and the appropriate upper temperature (40 °C or 55 °C) . The relative humidity is maintained at (93 ± 3) % during the high temperature phase and above 95 % during the low temperature and temperature changing phases. The rates of increase of temperature are such that condensation should occur on the surface of the specimen.

5The **.6.2** specimen **.3.2.3State** shall **ofthe** be **specim** **mounted** as described in 5.1.3 and shall be connected to the supply and monitoring equipment as described in 5.1.2.

The test configuration shall be as specified in 5.1.5.

The sensing element shall be maintained at normal atmospheric conditions (see 5.1.1).

5.6.2.3.2.4 Conditioning

Conditioning shall be applied to the specimen as indicated in the Table 7.

Table 7 — Conditions for damp heat, cyclic (operational) test for sensor control unit

Environmental group	Lower Temperature	Upper Temperature	Relative humidity %		Number of cycles
			temperature	temperature	
I					
II					
III					

If the sensor control unit and the sensing element belong to the same environmental group the test may be done concurrently with 5.6.2.2.

NOTE If the sensor control unit is classified in environmental group I then the damp heat, steady- state (operational) test for sensor control units is conducted instead.

5The.6.2specimen.3.2.5Measurementsshallbemonitoredduringduringconditionithe**conditioning**

period to detect any fault or alarm condition. During the last hour of the conditioning simulate an alarm condition by means agreed with the manufacturer.

5.6.2.2.4 Final measurements

After the conditioning at standard laboratory conditions and a recovery period of at least 1 h, simulate an alarm condition by means agreed with the manufacturer.

5.6.2.3.3 Requirements

Except during the functional test in 5.6.2.3.2.5, no alarm or fault signal shall be given during the conditioning.

An alarm shall be generated during the functional tests in 5.6.2.3.2.5 and 5.6.2.3.2.6.

5.6.2.4 Damp heat, steady-state (operational) for sensor control unit

5.6.2.4.1 Object of the test

To demonstrate the ability of the sensor control unit to function correctly at high relative humidity's (without condensation) which may occur for short periods in the service environment.

5.6.2.4.2 Test Procedure

1 Pr nciple

5The.6.2test.4.2.consists of exposing the specimen to a constant temperature and a constant high relative humidity, in such a manner that condensation does not occur on the specimen.

The period of exposure is chosen to allow surface effects due to adsorption to be identified.

5.6.2.4.2.2 Reference

The test apparatus and procedure shall be as described in EN 60068-2-78:2013 Test Cab.

during conditioning

5The.6.2specimen.4.2.3Stateshallofthebespecim**mounted** as described in 5.1.3 and shall be connected to the supply and monitoring equipment as described in 5.1.2.

The test configuration shall be as specified in 5.1.5.

The sensing element shall be maintained at normal atmospheric conditions (see 5.1.1).

5.6.2.4.2.4 Conditioning

Conditioning shall be applied to the specimen as indicated in the Table 8.

Table 8 —Conditions for damp heat, steady-state (operational) test for sensor control unit

Environmental group	Temperature	Relative humidity	Dur tion
I			
II, III			

NOTE If the sensor control unit is classified in environmental group II or III then the damp heat, cyclic (operational) test for sensor control units is conducted instead.

5The**.6.2**specimen**.4.2.5Measurements**shallbemonitored**during**during**conditioni**the**conditioning**

period to detect any fault or alarm condition. During the last hour of the conditioning simulate an alarm condition by means agreed with the manufacturer.

5.6.2.4.2.6 Final measurements

After the conditioning at standard laboratory conditions and a recovery period of at least 1 h, simulate an alarm condition by means agreed with the manufacturer.

5.6.2.4.3 Requirements

Except during the functional test in 5.6.2.4.2.5, no alarm or fault signal shall be given during the conditioning.

An alarm shall be generated during the functional tests in 5.6.2.4.2.5 and 5.6.2.4.2.6.

5.6.2.5 Damp heat, cyclic (endurance) for sensor control unit and sensing element

5.6.2.5.1 Object

To demonstrate the ability of the NLTHD to withstand the long-term effects of high humidity in the service environment (e.g. changes in electrical properties of materials, chemical reactions involving moisture, galvanic corrosion, etc.).

5.6.2.5.2 Test procedure

5.6.2.5.2.1 Principle

The conditioning to this test is applicable to the sensing element and/or sensor control unit of environmental group III.

5.6.2.5.2.2 Reference

The test apparatus and procedure shall be as described in EN 60068-2-30:2005 using the Variant 2 test cycle and controlled recovery conditions.

NOTE The test consists of exposing the specimen to cyclic temperature variations between 25 °C and 55 °C. The relative humidity is maintained at (93 ± 3) % during the high temperature phase and above 95 % during the low temperature and temperature changing phases. The rates of increase of temperature are such that condensation should occur on the surface of the specimen.

5.6.2.5.2.3 State of the specimen during conditioning

The specimen shall be mounted as described in 5.1.3 but shall not be supplied with power during the conditioning.

The test configuration shall be as specified in 5.1.5.

5.6.2.5.2.4 Conditioning

Conditioning shall be applied to the specimen as indicated in the Table 9.

Table 9 — Damp heat, cyclic (endurance)

Environmental group	Lower Temperature °C	Upper Temperature °C	Relative humidity %		Number of cycles
I and II			temperature	temperature	
III					

5.6.2.5.2.5 Final measurements

After the conditioning and a recovery period of at least 1 h at standard laboratory conditions, the functional test as described in 5.1.5 shall be conducted at a rate of rise of 3 Kmin-1.

The response temperature shall be recorded as T_a.

5No**.6.**alarm**2.5.3Requireme**orfaultsignal**ts** shall be given after powering the NLTHD at the end of the conditioning and recovery periods.

The response temperature, , shall be within the limits of the performance type defined by the manufacturer, Txxx ± Vyy (see T_a 4.1.2).

5.6.3 Shock and vibration resistance

5.6.3.1 Shock (operational) for sensor control unit

5.6.3.1.1 Object

To demonstrate the immunity of the NLTHD sensor control unit to mechanical shocks, which are likely to occur, albeit infrequently, in the anticipated service environment.

5.6.3.1.2 Test procedure

5.6.3.1.2.1 Reference

The test apparatus and procedure shall be as described in EN 60068-2-27:2009, Test Ea, except that the conditioning shall be as described below.

5The**.6.3** specimen**.1.2.2State** shall**ofthe** be **specim** **mounted** as described in 5.1.3 and shall be connected to the supply and monitoring equipment as described in 5.1.2.

The test configuration shall be as specified in 5.1.5.

The sensing element shall be maintained at normal atmospheric conditions (see 5.1.1).

5.6.3.1.2.3 Conditioning

For specimens with a mass ≤ 4,75 kg conditioning shall be applied to the specimen as indicated in the Table 10. For specimens with a mass > 4,75 kg no test shall be applied.

Table 10 — Shock (operational) test for sensor control unit

Environmental group	Pulse type	Pulse duration	Max. acceleration related to the specimen mass	Number of shock directions	Number of pulses per direction
I	ms				
II and III				axis)	

5.6.3.1.2.4 Measurements during condi^{the}ioning

The specimen shall be monitored during conditioning period and for a further 2 min to detect any change.

5.6.3.1.2.5 Final measurements

After the conditioning simulate an alarm condition by means agreed with the manufacturer.

5.6.3.1.3 Requirements

No alarm or fault signal shall be given during the conditioning and the further 2 min.

An alarm shall be generated during the functional test in 5.6.3.1.2.5.

5.6.3.2 Impact (operational) for sensor control unit

5.6.3.2.1 Object

To demonstrate the immunity of the NLTHD sensor control unit to mechanical impacts upon its surface, which it may sustain in the normal service environment, and which it can reasonably be expected to withstand.

5.6.3.2.2 Test procedure

5.6.3.2.2.1 Reference

The test apparatus and procedure shall be as described in EN 60068-2-75:1997, Test Eh for Test Ehb.

5$_{The}$.6.3.$_{specimen}$2.2.2State$_{shall}$ofthe$_{be}$specimen$_{mounted}$uring$_{asdescribed}$condition$_{in}$ g

5.1.3 to a rigid structure, as required by EN 60068-2-75:1997, and shall be connected to its supply and monitoring equipment as described in 5.1.2.

The test configuration shall be as specified in 5.1.5.

The sensing element shall be maintained at normal atmospheric conditions (see 5.1.1).

5.6.3.2.2.3 Conditioning

Impacts shall be applied to all accessible surfaces of the specimen. For all such surfaces three blows shall be applied to any point(s) considered likely to cause damage to or impair the operation of the specimen.

Care should be taken to ensure that the results from a series of three blows do not influence subsequent series. In case of doubts, the defect shall be disregarded and a further three blows shall be applied to the same position on a new specimen.

Conditioning shall be applied to the specimen as indicated in the Table 11.

Table 11 — Impact (operational) test for sensor control unit

Environmental group	Impact energy	Number of impacts per point
I, II and III	J	

5.6.3.2.2.4 Measurements during condi^{the}ioning

The specimen shall be monitored during conditioning period and for a further 2 min to detect any change.

5.6.3.2.2.5 Final measurements

After the conditioning simulate an alarm condition by means agreed with the manufacturer.

5.6.3.2.3 Requirements

No alarm or fault signal shall be given during the conditioning and the further 2 min.

An alarm shall be generated during the functional test in 5.6.3.2.2.5.

5.6.3.3 Impact (operational) for sensing element

5.6.3.3.1 Object

To demonstrate the immunity of the sensing element to mechanical impacts upon its surface, which it may sustain in the normal service environment, and which it can reasonably be expected to withstand.

5.6.3.3.2 Test procedure

5.6.3.3.2.1 Apparatus

The test apparatus shall be as shown in Annex E.

5$_{The}$**.6.3**$_{specimen}$**.3.2.2State**$_{shall}$**ofthe**$_{be}$**specim**$_{mounted}$**n(s)**$_{as}$ **during**$_{described}$**conditioning**$_{in5.1.3and}$ shall be connected to its supply and monitoring equipment as described in 5.1.2.

The test configuration shall be as specified in 5.1.5.

The sensor control unit shall be maintained at normal ambient conditions defined in 5.1.1.

5.6.3.3.2.3 Conditioning

A section of the sensing element shall be placed on the base of the apparatus described in Annex E either under a round edged intermediate piece or, at a right angle, under the chisel edged intermediate piece. The section of the sensing element shall be chosen as that most likely to impair the normal functioning of the specimen.

The first part of the conditioning is to be conducted using the round edged intermediate piece with the sensing element placed beneath it. Allow the hammer to fall from a height of (200 ± 10) mm.

After a period of at least 2 min the second part of the conditioning is to be applied to a different position of the sensing element, using the chisel edged intermediate piece with the sensing element placed in a right angle beneath it. Allow the hammer to fall from a height of (200 ± 10) mm.

Conditioning shall be applied to the specimen as indicated in the Table 12.

Table 12 — Impact (operational) test for sensing element

Environmental group	Intermediate piece	Fall height	Hammer weight	Number of impacts
II and III		mm	g	
II and III				

5.6.3.3.2.4 Measurements during conditioning

The specimen(s) shall be monitored during the conditioning period and for a further 2 min to detect any alarm or fault signals.

5.6.3 .3.2.5 Final measurem nts

After the conditioning and the further 2 min, the functional test as described in 5.1.5 shall be conducted at a rate of rise of 3 K min^{-1}. The section subjected to the impact shall be placed in the centre of the test tunnel.

The response temperature shall be recorded as T_a.

5.6.3.3.3 Requirements

No alarm or fault signal shall be given during conditioning and the further 2 min.

Although there may be visible distortion to the sheath of the sensing element where it was impacted, there shall be no visible cracking or cutting of the sheath.

The response temperature, T_a, shall be within the limits of the performance type defined by the

5.6.3.4 Vibration, sinusoidal (operational) for sensor control unit

5.6.3.4.1 Object

To demonstrate the immunity of the NLTHD sensor control unit to vibration at levels considered appropriate to the normal service environment.

5.6.3.4.2 Test procedure

5.6.3.4.2.1 Reference

The test apparatus and procedure shall be as described in EN 60068-2-6:2008.

5.6.3.4.2.2 State of the specimen during conditioning

The specimen shall be mounted on a rigid fixture as described in 5.1.3 and shall be connected to its supply and monitoring equipment as described in 5.1.2. The vibration shall be applied in each of three mutually perpendicular axes, in turn. The specimen shall be mounted so that one of the three axes is perpendicular to its normal mounting plane.

The test configuration shall be as specified in 5.1.5.

The sensing element shall be maintained at normal atmospheric conditions (see 5.1.1).

5.6.3.4.2.3 Conditioning

Conditioning shall be applied to the specimen as indicated in the Table 13.

Table 13 — Vibration, sinusoidal, (operational) test for sensor control unit

Environmental group	Frequency range	Acceleration a plitude	Number of axes	Sweep rate	Number of sweep cycles per axis
II and III					

The vibration operational and endurance tests may be combined such that the specimen is subjected to the operational test conditioning followed by the endurance test conditioning in one axis before changing to the next axis. Only one final measurement needs to be made.

5 The 6.3 specimen 4.2.4 Measurements shall be monitored during during conditioni the conditioning period to detect any fault or alarm condition.

5.6.3.4.2.5 Final measurements

After the conditioning simulate an alarm condition by means agreed with the manufacturer.

5.6.3.4.3 Requirements

No alarm or fault signal shall be given during the conditioning.

An alarm shall be generated during the functional test in 5.6.3.4.2.5.

5.6.3.5 Vibration, sinusoidal (operational) for sensing element

5.6.3.5.1 Object

To demonstrate the immunity of the NLTHD sensing element to vibration at levels considered appropriate to the normal service environment.

5.6.3.5.2 Test procedure

5.6.3.5.2.1 Reference

The test apparatus and the procedure shall be as described in EN 60068-2-6:2008 and as defined below.

5.6.3.5.2.2 State of the specimen during conditioning

The test configuration shall be as specified in 5.1.5.

A section of approximately 2 m of the sensing element shall be mounted on the test apparatus as described in Annex D and shall be connected to its supply and monitoring equipment as described in 5.1.2. The vibration shall be applied in the vertical axis.

5.6.3.5.2.3 Conditioning

Conditioning shall be applied to the specimen as indicated in the Table 14.

Table 14 — Vibration, sinusoidal, (operational) for sensing element

Environmental group	Frequency range	Acceleration a plitude -2 g	Number of axes	Sweep rate -1	Number of sweep cycles per axis
II and III	Hz	ms $\{_n\}$		octaves x min	

The vibration operational and endurance tests may be combined such that the specimen is subjected to the operational test conditioning followed by the endurance test conditioning. Only one final measurement needs to be made.

5The 6.3specimen 5.2.4Measurements shallbemonitored during during conditioni the **conditioning** period to detect any fault or alarm condition.

5.6.3.5.2.5 Final measur the ments

After the conditioning functional test as described in 5.1.5 shall be conducted at a rate of rise of 3 Kmin-1 and the response time recorded. The centre of the section subjected to the vibration shall be placed in the test tunnel.

The response temperature shall be recorded as T_a.

5.6.3.5.3 Requirements

No alarm or fault signal shall be given during conditioning.

The response temperature, , shall be within the limits of the performance type defined by the manufacturer, Txxx ± Vyy (see T_a 4.1.2).

5.6.3.6 Vibration, sinusoidal (endurance) for sensor control unit

5.6.3.6.1 Object

To demonstrate the ability of the NLTHD sensor control unit to withstand the long term effects of vibration at levels appropriate to the service environment.

5.6.3.6.2 Test procedure

5.6.3.6.2.1 Reference

The test apparatus and procedure shall be as described in EN 60068-2-6:2008.

5.6.3.6.2.2 State of the specimen during conditioning

The specimen shall be mounted on a rigid fixture as described in 5.1.3, but shall not be supplied with power during conditioning. The vibration shall be applied in each of three mutually perpendicular axes, in turn. The specimen shall be mounted so that one of the three axes is perpendicular to its normal mounting plane.

The test configuration shall be as specified in 5.1.5.

5.6.3.6.2.3 Conditioning

Conditioning shall be applied to the specimen as indicated in the Table 15.

Table 15 — Vibration, sinusoidal (endurance) for sensor control unit

Environmental group	Frequency range	Acceleration a plitude	Number of axes	Sweep rate	Number of sweep cycles per axis
II and III					

The vibration operational and endurance tests may be combined such that the specimen is subjected to the operational test conditioning followed by the endurance test conditioning in one axis before changing to the next axis. Only one final measurement needs to be made.

5.6.3.6.2.4 Final measurements
An alarm condition shall be simulated by means agreed with the manufacturer.

5.6.3.6.3 Requirements
No alarm or fault signal shall be given after powering the sensor control unit at the end of the conditioning period.
An alarm shall be generated during the functional tests in 5.6.3.6.2.4.

5.6.3.7 Vibration, sinusoidal (endurance) for sensing element
5.6.3.7.1 Object
To demonstrate the ability of the NLTHD sensing element to withstand the long term effects of vibration at levels appropriate to the service environment.

5.6.3.7.2 Test procedure
5.6.3.7.2.1 Reference
The test apparatus and the procedure shall be as described in EN 60068-2-6:2008 and as described below.
5.6.3.7.2.2 State of the specimen during conditioning
The test configuration shall be as specified in 5.1.5.
A section of approximately 2 m of the sensing element shall be mounted on the test apparatus as described in Annex D. The vibration shall be applied in the vertical axis.
The specimen shall not be supplied with power during the conditioning.

5.6.3.7.2.3 Conditioning
Conditioning shall be applied to the specimen as indicated in the Table 16.

Table 16 — Vibration, sinusoidal, (endurance) for sensing element

Environmental group	Frequency range	Acceleration a plitude	Number of axes	Sweep rate	Number of sweep cycles per axis
II and III					

The vibration operational and endurance tests may be combined such that the specimen is subjected to the operational test conditioning followed by the endurance test conditioning. Only one final measurement needs to be made.

5.6.3.7.2.4 Final measurements
After the conditioning period, the functional test as described in 5.1.5 shall be conducted on the sensing element at a rate of rise of 3 Kmin^{-1}. The centre of the section subjected to the vibration shall be placed in the test tunnel.
The response temperature shall be recorded as T_a.

5.6.3.7.3 Requirements
No alarm or fault signal shall be given after powering the sensing element at the end of the conditioning period.

The response temperature, , shall be within the limits of the performance type defined by the manufacturer, Txxx ± Vyy (see[T a]4.1.2).

5.6.4 Test of corrosion resistance

5.6.4.1 Sulphur dioxide (SO2) corrosion (endurance) for sensing element

5.6.4.1.1 Object

To demonstrate the ability of the NLTHD sensing element to withstand the corrosive effects of sulphur dioxide as an atmospheric pollutant.

5.6.4.1.2 Test procedure

5.6.4.1.2.1 Reference

The test apparatus and procedure shall be as described in EN 60068-2-42:2003, test Kc, except that the conditioning shall be as described below.

5.6.4.1.2.2 State of the specimen during conditioning

The specimen shall be mounted as described in 5.1.3 but shall not be supplied with power during the conditioning.

The length of sensing element to be exposed to the corrosive atmosphere shall be 10 m. The open ends of the sensing element shall be sealed by a means agreed with the manufacturer.

5.6.4.1.2.3 Conditioning

Conditioning shall be applied to the specimen as indicated in the Table 17.

Table 17 — Sulphur dioxide (SO2) corrosion (endurance) test for sensing element

Environmental group	**Sulphur dioxide** µl/l **content**	**Temperature** °C	**Relative** **%** **humidity**	**Duration** days
II and III				

If the sensor control unit and the sensing element belong to the same environmental group the test may be done concurrently with 5.6.4.2.

5.6.4.1.2.4 Final measurements

Immediately after the conditioning, the specimen shall be subjected to a drying period of 16 h at (40 ± 2) °C, ≤ 50 % RH, followed by a recovery period of at least 1 h at the standard laboratory conditions.

After the recovery period the -sensing[1] element which has been exposed shall be tested as described in 5.1.5 at a rate of rise of 3 Kmin . *T*

The response temperature shall be recorded as .

5.6.4.1.3 Requireme ts a

No alarm or fault signal shall be given after powering the NLTHD at the end of the conditioning and recovery periods. *T*

The response temperature, a, shall be within the limits of the performance type defined by the

5.6.4.2 Sulphur dioxide (SO_2) corrosion (endurance) for sensor control unit
5.6.4.2.1 Object
To demonstrate the ability of the NLTHD sensor control unit to withstand the corrosive effects of sulphur dioxide as an atmospheric pollutant.

5.6.4.2.2 Test procedure
5.6.4.2.2.1 Reference
The test apparatus and procedure shall be as described in EN 60068-2-42:2003, Test Kc, except that the conditioning shall be as described below.

5.6.4.2.2.2 State of the specimen during conditioning
The specimen shall be mounted as described in 5.1.3 but shall not be supplied with power during the conditioning. Open cable glands shall be sealed by a means agreed with the manufacturer.

5.6.4.2.2.3 Conditioning
Conditioning shall be applied to the specimen as indicated in the Table 18.

Table 18 — Sulphur dioxide (SO_2) corrosion (endurance) test for sensor control unit

Environmental group	Sulphur dioxide content	Temperature	Relative Humidity	Duration
I				
II and III				

If the sensor control unit and the sensing element belongs to the same environmental group the test may be done concurrently with 5.6.4.1.

5.6.4.2.2.4 Final measurements
Immediately after the conditioning, the specimen shall be subjected to a drying period of 16 h at (40 ± 2) °C, ≤ 50 % RH, followed by a recovery period of at least 1 h at the standard laboratory conditions.

After the recovery period an alarm condition shall be simulated by means agreed with the manufacturer.
5.6.4.2.3 Requirements
No alarm or fault signal shall be given after powering the sensor control unit at the end of the conditioning period.
An alarm shall be generated during the functional tests in 5.6.4.2.2.4.

5.6.5 Electrical stability
5.6.5.1 General
The following EMC immunity tests as specified in EN 50130-4:2011 shall be carried out:

a) electrostatic discharge;

b) radiated electromagnetic fields;

c) conducted disturbances induced by electromagnetic fields;

d) fast transient bursts;

e) slow high energy voltage surges.

5The**.6.5**specimen**.2Stateof**shall**thesp**be**cimen**mounted**during**as described**condtioning**in 5.1.3 and shall be connected to the supply and monitoring equipment as described in 5.1.2.
The test configuration shall be as specified in 5.1.5 but a length of 25 m of sensing element shall be connected for EMC testing.
The sensing element and sensor control unit shall be maintained at normal atmospheric conditions (see 5.1.1).

5.6.5.3 Final measurements
After the conditioning, simulate an alarm condition by means agreed with the manufacturer.

5.6.5.4 Requirements
For these tests the criteria for compliance specified in EN 50130-4:2011 and the following shall apply.
Except during the functional test in 5.6.5.3 no alarm or fault signal shall be given during the conditioning.
An alarm shall be generated during the functional tests in 5.6.5.3.

6 Assessment and Verification of Constancy of Performance (AVCP)

6.1 General

The compliance of the NLTHD with the requirements of this Standard and with the performance declared by the manufacturer in the DoP shall be demonstrated by:
— determination of 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 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, 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 1 Same AVCP system means testing by an independent third party under the responsibility of a notified product certification body.

For the purpose of assessment 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.

NOTE 2 Products may be in different families for different characteristics.

NOTE 3 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 NLTHD (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 NLTHD 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 manufacturer to ensure that the NLTHD as a whole is correctly manufactured and its component products have the declared performance values.

The **6.2.2** number **Test samples,** of samples **testing** of NLTHD **and compliance** to be tested/assessed **critria** shall be in accordance with Table 19.

Table 19 — Number of samples to be tested and compliance criteria

Characteristic	Requirement	Assessment method	No. of samples	Compliance criteria
conditions/sensitivity				
fire conditions				
parameters under fire condition				
parties (e.g. approval body, testing laboratory, manufacturer, etc.) in order to improve the efficiency or cost of testing.				

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 NLTHD 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, tests and/or assessments,

— 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,

— enable the achievement of the required product performances,

— enable 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 performance(s) of the essential characteristics.

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 FPC. The manufacturer's documentation and procedures should be appropriate to the product and manufacturing process and 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 these responsibilities on to a subcontractor.

NOTE Manufacturers having an FPC system, which complies with EN ISO 9001 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 or verified or both and regularly inspected according to documented procedures, frequencies and criteria to ensure consistency with the monitoring and measuring requirements. All calibrated or verified equipment shall have identification in order to determine their status.

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.

6.3.2.4 Traceability and marking

Individual products (in case of sensor control unit) and batches (in case of sensing elements) 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.

6.3.2.6 Product testing and evaluation

The manufacturer shall establish procedures to ensure that the declared performance of the characteristics is maintained. The characteristics, and the means of control, are indicated in Clauses 4 and 5.

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 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.

6The.3.2manufacturer.9Handling,storageshallhaveandprocedurespakaging 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 test plan, 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 test

plan, and/or

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

If the manufacturer uses only finished products, the operations under b) shall lead to an equivalent level of conformity 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 conformity 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) centre as much on 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 FPC

Initial inspection of factory and FPC shall be carried out when the production process has been finalised 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 and European Standard, are in place and correctly implemented,

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.

Surveillance **6.3.5 Cotinuous** of the **surveillance** FPC shall be undertaken **of FPC** once a year.

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 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, prototypes and products produced in very low quantities

The NLTHD produced as a one-off, prototypes assessed before full production is established and products produced in very low quantities (less than 1 000 m of sensing element per year) are assessed as follows:

For type assessment, the provisions of 6.2.1, 3rd paragraph apply, together with the following additional provisions:

— in the 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 FPC-documentation and the factory shall be assessed.

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 required by 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 component complying with the requirements of this European Standard and that the component

will be the same 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 Classification and designation

No classification of non-resettable line-type heat detectors is specified in this European Standard.

8 Marking, labelling and packaging

8.1 Marking, labelling

8.1.1 General

The marking of non-resettable line-type heat detectors shall be visible during installation and shall be accessible during maintenance.

The marking shall not be placed on easily removable parts like screws.

Where any marking on the NLTHD uses symbols or abbreviations not in common use then these shall be explained in the data supplied with the NLTHD.

NOTE 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.

The **8.1.2** sensor **Marking** control **ofse** unit **sor** shall **control** beclearly **unit** marked with the following information: a) the number and date of this standard(i.e. EN 54- 28:2016);

b) environmental group (I, II or III);

c) the name or trademark of the manufacturer or supplier;

d) the model designation (type or number);

e) the wiring terminal designations;

f) some mark(s) or code(s) (e.g. serial number or batch code), by which the manufacturer can identify, at least, the date or batch and place of manufacture, and the version number(s) of any software, contained within the sensor control unit.

Each **8.1.3** sensing **Marking** element **ofsen** shall **ing ele** bemarked **ent** with the following information: a) the number and date of this standard(i.e. EN 54-28:2016);

b) the performance type of the NLTHD (e.g. T085-V10-A066);

c) name or trademark of the manufacturer or supplier;

d) model designation (type or number);

e) environmental group (II or III);

f) some mark(s) or code(s) (e.g. serial number or batch code), by which the manufacturer can identify, at least, the date or batch and place of manufacture, and the version number(s) of any software, contained within the sensing element, if applicable.

If it is not possible to mark directly on the sensing element then the marking shall be affixed to the coil or other packaging used to protect the sensing element during transport and the use of at least one label securely fixed to the sensing element once installed is permitted.

Each **8.1.4** functional **Markig of** unit **functional** shallbemarked **units** with the

following information: a) the number and date of this standard (i.e. EN 54-28:2016);

b) name or trademark of the manufacturer or supplier;

c) model designation (type or number);

d) environmental group (I, II or III);

e) the wiring terminal designations;

f) some mark(s) or code(s) (e.g. serial number or batch code), by which the manufacturer can identify, at least, the date or batch and place of manufacture, and the version number(s) of any software, contained within the functional unit.

8.2 Packaging

The NLTHD shall either be supplied with sufficient data to enable their correct operation or, if all of these data are not supplied with each NLTHD, reference to the appropriate data sheet(s) or technical manual shall be given on, or with each NLTHD.

Annex A (normative)

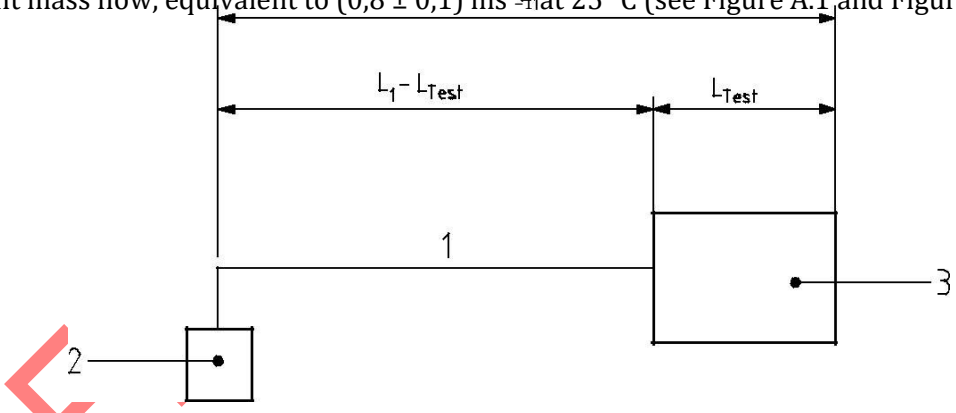
Mounting of the sensing element of NLTHD in the heat tunnel

A.1 General

This annex specifies those properties of NLTHD sensing element mounting arrangement which are of primary importance for making repeatable and reproducible measurements of response temperature (see 5.1.5).

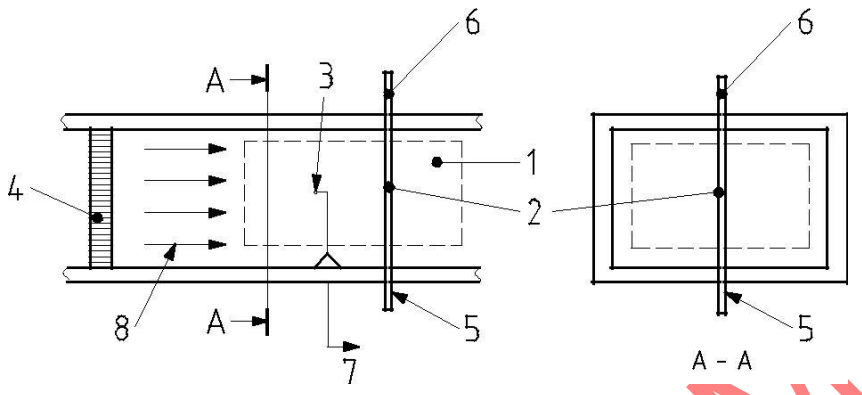
A.2 Mounting arrangement of sensing element

The sensing element shall be vertically placed in the working section in the middle of the heat tunnel. Means shall be provided for creating a stream of air through the working volume at the constant temperatures and rates of rise of air temperature in order that the manufacturer's declared performance of the detector can be tested. This air stream shall be essentially laminar and maintained at a constant mass flow, equivalent to (0,8 ± 0,1) ms $^{-1}$ at 25 °C (see Figure A.1 and Figure A.2).



Key

Figure A.1 — Test arrangement



Key

Figure A.2 — Heat tunnel - working section and cross-section showing the mounting arrangement for testing a sensing element

(normative) AnnexB

Heat tunnel for response temperature measurements

B.1 General

This annex specifies those properties of the heat tunnel which are of primary importance for making repeatable and reproducible measurements of response temperature of NLTHD (see 5.1.5 and 5.5). However, since it is not practical to specify and measure all parameters which may influence the measurements, the background information in Annex C should be carefully considered and taken into account when a heat tunnel is designed and used to make measurements in accordance with this part of EN 54.

B.2 Description of the heat tunnel

The heat tunnel shall have a horizontal working section containing a working volume. The working volume is a defined part of the working section, where the air temperature and air flow conditions are within ± 2 K and ± 0,1 ms^{-1}, respectively, of the nominal test conditions. Conformance with this requirement shall be regularly verified under both static and rate-of- rise conditions by measurements at an adequate number of points distributed within and on the imaginary boundaries of the working volume. The working volume shall be large enough to fully enclose the part of the sensing element under test and the temperature-measuring sensor.

The temperature-measuring sensor shall be positioned at least 50 mm upstream of the NLTHD. The air temperature shall be controlled to within ± 2 K of the nominal temperature required at any time during the test.

The air-temperature measuring system shall have an overall time constant of not greater than 2 s, when

measured in air with a mass flow equivalent to (0,8 ± 0,1) ms^{-1} at 25 °C.

(informative) **Annex C**

Construction of the heat tunnel

C.1 General

This annex gives information on the construction of a heat tunnel used in Annex B.

C.2 Heat tunnel construction

NLTHD respond when the signal(s) from one or more sensing elements fulfil(s) certain criteria. The temperature of the sensing elements is related to the air temperature surrounding it, but the relation is usually complex and dependent on several factors, such as orientation, mounting, air velocity, turbulence, rate of rise of air temperature, etc. Response temperature and its stability are the main parameters considered when the fire-detection performance of NLTHD is evaluated by testing in accordance with this part of EN 54.

Many different heat-tunnel designs are suitable for the tests specified in this part of EN 54 but the following points should be considered when designing and characterizing a heat tunnel.

There are two basic types of heat tunnels: recirculating and non-recirculating. All else being equal, a non-recirculating tunnel requires a higher -powered heater than a recirculating tunnel, particularly for the higher rates of rise of air temperature. More care is generally needed to ensure that the high-powered heater and control system of a non-recirculating tunnel are sufficiently responsive to the changes in heat demand necessary to attain the required temperature -versus- time conditions in the working section. On the other hand, maintaining a constant mass flow with increasing temperature is generally more difficult in a recirculating tunnel.

The temperature control system should be able to maintain the temperature within ± 2 K of the “ideal ramp” for all of the specified rates of rise of air temperature. Such performance can be achieved in different ways, e.g.:

— by proportional heating control, where more heating elements are used when generating higher rates of rise. Improved temperature control may be achieved by powering some of the heating elements continuously, while controlling others. With this control system the distance between the tunnel heater and the detector under test should not be so large that the intrinsic delay in the temperature-control feedback loop becomes excessive at an air flow of (0,8 ± 0,1) ms^{-1};

— by rate-controlled feed- forward heating control, assisted by proportional/integral (PI) feedback. This control system will permit greater distance between the tunnel heater and the detector under test.

The important point is that the specified temperature profiles are obtained with the required accuracy within the working section.

For a non- recirculating tunnel, the anemometer used for air flow control and monitoring may be placed in a section of the tunnel upstream of the heater, where it will be subject to a substantially constant temperature, thereby eliminating any need to temperature compensate its output. A constant velocity, indicated by an anemometer so positioned, should correlate with a constant mass flow through the working volume. However, to maintain a constant mass flow at normal atmospheric pressure in a recirculating tunnel, it is necessary to increase the air velocity as the air temperature is increased. Careful consideration should therefore be given to ensuring that there is an appropriate correction for

the temperature coefficient of the anemometer monitoring the air flow. It should not be assumed that an automatically temperature- compensated anemometer will compensate sufficiently quickly at high rates of rise of air temperature.

The air flow created by a fan in the tunnel will be turbulent, and will need to pass through a turbulence-reducer to create a nearly laminar and uniform air flow in the working volume. This may be facilitated by using a filter, honeycomb or both, in line with, and upstream of, the working section of the tunnel. Care should be taken to ensure that the air flow from the heater is mixed to a uniform temperature before entering.

It is not possible to design a tunnel where uniform temperature and flow conditions prevail in all parts of the working section. Deviations will exist, especially close to the walls of the tunnel where a boundary layer of slower and cooler air will normally be observed. The thickness of this boundary layer and the temperature gradient across it can be reduced by constructing or lining the walls of the tunnel with a low-thermal conductivity material.

Special attention shall be given to the temperature measuring system in the tunnel. The required overall time constant of not greater than 2 s in air means that the temperature sensor should have a very small thermal mass. In practice, only the fastest thermocouples and similar small sensors will be adequate for the measuring system. The effect of heat loss from the sensor via its leads can normally be minimized by exposing several centimetres of the lead to the air flow.

(normative) AnnexD

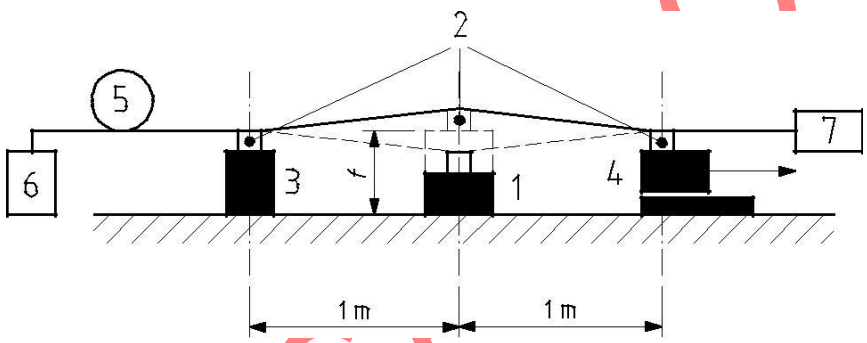
Test arrangement for vibration tests for sensing element

D.1 General

This annex specifies the test arrangement used in vibration tests (see 5.6.3.5 and 5.6.3.7).

D.2 Test setup

A typical arrangement which shall be used for vibration test is shown in Figure D.1.



Key

F

Figure D.1 — Vibration test arrangement

The test sample shall be fixed in place using mounting brackets in accordance with the manufacturer's instruction. Fixing points are the fixed support, the vibration apparatus and the end support. The end support shall be moveable to enable a length force to the sensing element of 20 N.

(normative) Annex E

Test apparatus for impact test on the sensing element

E.1 General

This annex specifies the test apparatus for the impact test (see 5.6.3.3). It gives parameters which are of primary importance for making repeatable and reproducible tests.

E.2 Test apparatus

The apparatus (Figure E.1) shall have a rigid steel base with a mass of at least 10 kg and a fixture to allow a (500 ± 10) g steel hammer to fall from a height of (200 ± 10) mm, guided by a triangular shaped steel rod as shown in Figure E.2.

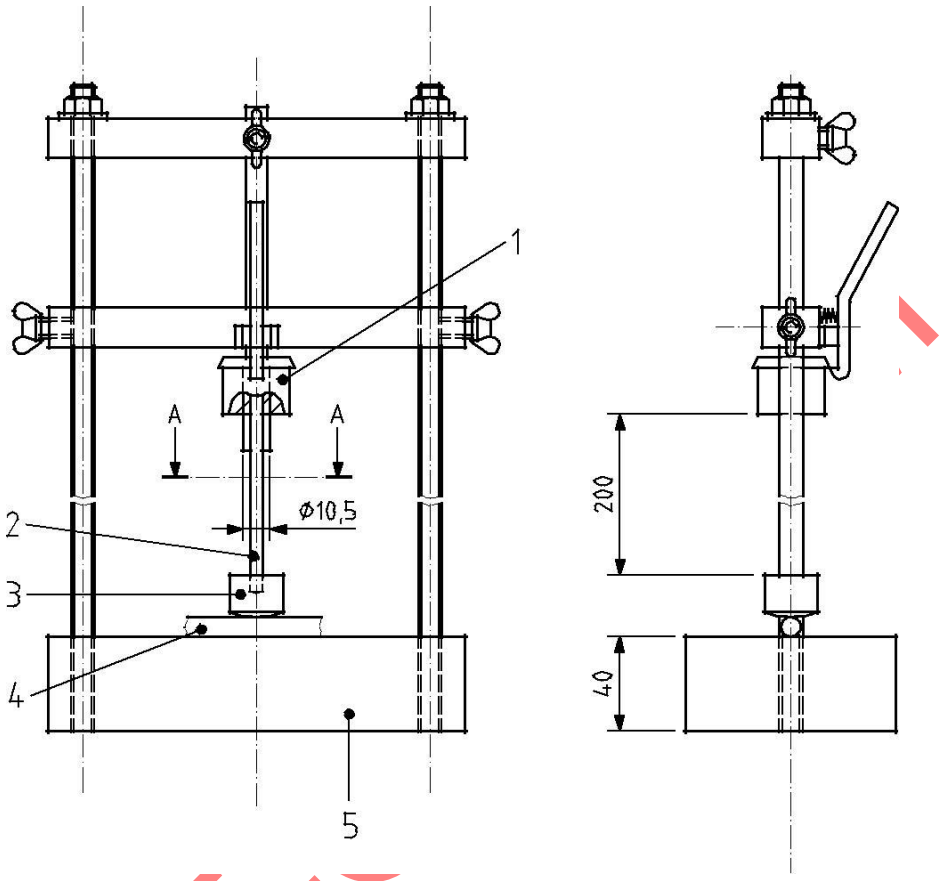
At its lower end the steel rod shall allow to adapt either a round edged intermediate piece as given in Figure E.3 or a chisel edged intermediate piece as specified in Figure E.4.

Both intermediate pieces shall be made of steel. The sensing element under test will be placed between the base of the test apparatus and the intermediate piece. Subsequently the intermediate piece shall be hit by the falling hammer.

E.3 Test setup

A typical arrangement which shall be used for the impact test is shown in Figure E.1.

Dimensions in millimetres



Key

Figure E.1— Impact test arrangement

Dimensions in millimetres

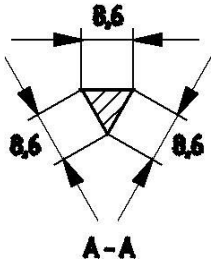


Figure E.2 — Cross section A – A of the steel rod

Dimensions in millimetres

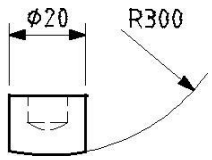


Figure E.3 — Round edged intermediate piece

Dimensions in millimetres

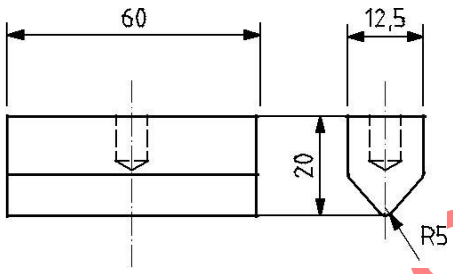


Figure E.4 — Chisel-edged intermediate piece

(informative) **AnnexZA**

Clauses of this European Standard addressing the provisions of the EU Construction Products Regulation

ZA.1 Scope relevant characteristics

This European **Standard** has been prepared under the mandate M/109 for fire alarm/detection, fixed firefighting, fire and smoke control and explosion suppression products given to CEN by the European Commission and the European Free Trade Association.

If this European Standard is cited in the Official Journal of the European Union (OJEU), the clauses of this standard, shown in this annex, are considered to meet the provisions of the relevant mandate, under the Regulation (EU) No. 305/2011.

This annex deals with the CE marking of the resettable line-type heat intended for the uses indicated in Table ZA.1 and shows the relevant clauses applicable.

This annex has the same scope as in Clause 1 of this standard related to the aspects covered by the mandate and is defined by Table ZA.1.

Table ZA.1 — Relevant clauses

Product installed in and around buildings and civil engineering works **Essential characteristics**	**Clauses in this and other European Standard(s) related to essential characteristics**	**Regulatory classes**	**Notes**
Signalling	4.2.2		description
Connection of ancillary devices Manufacturer's adjustments Software controlled detectors (when provided) Sensing element fault On-site adjustment of behaviour	2 4.3.3 4.3.4 4.3.5 4.3.6		description description description description
Low voltage fault	4.4.2		description
			%)

Product installed in and around buildings and civil engineering works **Essential characteristics**	**Clauses in this and other European Standard(s) related to essential characteristics**	**Regulatory classes**	**Notes**
control unit and sensing element			
sensor control unit and sensing element			
sensor control unit			
sensor control unit			
sensing element [2] sensor control unit [2]			

The declaration of the product performance related to certain essential characteristics is not required in those Member States (MS) where there are no regulatory requirements on these essential

In this case, manufacturers placing their products on the market of these MS are not obliged to determine nor declare the performance of their products with regard to these essential characteristics and the option "No performance determined" (NPD) in the information accompanying the CE marking and in the declaration of performance (see ZA.3) may be used for those essential characteristics.

ZA.2 Procedure for assessment and verification of constancy of performance (AVCP) of non-resettable line-type heat detectors

ZA.2.1 System of AVCP

The AVCP system(s) of non-resettable line-type heat detectors indicated in Table ZA.1, established by EC Decision 1996/577/EC (OJEU L254 of 1996-10-08), as amended by EC Decision 2002/592/EC (OJEU L192 of 2002-07-20) is shown in Table ZA.2 for the indicated intended use and relevant level(s) or class(es) of performance.

Table ZA.2 — System of AVCP

Product	Intended use	Levels or classes	AVCP system
~~resettable line-type heat detectors~~			

The AVCP of the non- resettable line-type heat detectors in Table ZA.1 shall be according to the AVCP procedures indicated in Table ZA.3 resulting from application of the clauses of this or other European Standard indicated therein. The content of tasks of the notified body shall be limited to those essential characteristics as provided for, if any, in Annex III of the relevant mandate and to those that the manufacturer intends to declare.

Table ZA.3 — Assignment of evaluation of conformity tasks for non-resettable line-type heat detector under system 1

Tasks		Content of the task	AVCP clauses to apply
Tasks for the manufacturer	Factory production control (FPC)	characteristics of Table ZA.1 relevant for the intended use which are declared	6.3
	taken at factory according to the prescribed test plan	relevant for the intended use which are declared	6.3.2.6
Tasks for the product certification body	type on the basis of type testing (including sampling), type calculation, tabulated values or descriptive documentation of the product	Essential characteristic of Table ZA.1 relevant for the intended use	6.2
	Initial inspection of the manufacturing plant and of FPC	characteristics of Table ZA.1 relevant for the intended use, which are declared, documentation of FPC	6.3.4
	Continuous surveillance, assessment and approval of FPC	characteristics Parameters related of Table to essential ZA.1 relevant for the intended use, which are declared, documentation of FPC	6.3.5

ZA.2.2 Declaration of performance (DoP)

ZA.2.2.1 General

The manufacturer shall draw up the DoP and affix the CE marking on the basis of AVCP system set out in Annex V of the Regulation (EU) No 305/2011:

— the factory production control and further testing of samples taken at the factory according to the prescribed test plan, carried out by the manufacturer; and

— the certificate of constancy of performance issued by the notified product certification body on the basis of determination of the product type on the basis of type testing (including sampling), type calculation, tabulated values or descriptive documentation of the product; initial inspection of the manufacturing plant and of factory production control and continuous surveillance, assessment and evaluation of factory production control.

ZA.2.2.2 Content

The model of the DoP is provided in Annex III of the Regulation (EU) No 305/2011. According to this Regulation, the DoP shall contain, in particular, the following information:

— the reference of the product-type for which the declaration of performance has been drawn up;

— the AVCP system or systems of the construction product, as set out in Annex V of the CPR;

— the reference number and date of issue of the harmonized standard which has been used for the assessment of each essential characteristic;

— where applicable, the reference number of the Specific Technical Documentation used and the requirements with which the manufacturer claims the product complies.

The DoP shall in addition contain:

a. the intended use or uses for the construction product, in accordance with the applicable harmonized technical specification;

b. the list of essential characteristics, as determined in the harmonized technical specification for the declared intended use or uses;

c. the performance of at least one of the essential characteristics of the construction product, relevant for the declared intended use or uses;

d. where applicable, the performance of the construction product, by levels or classes, or in a description, if necessary based on a calculation in relation to its essential characteristics determined in accordance with the Commission determination regarding those essential characteristics for which the manufacturer shall declare the performance of the product when it is placed on the market or the Commission determination regarding threshold levels for the performance in relation to the essential characteristics to be declared;

e. the performance of those essential characteristics of the construction product which are related to the intended use or uses, taking into consideration the provisions in relation to the intended use or uses where the manufacturer intends the product to be made available on the market;

f. for the listed essential characteristics for which no performance is declared, the letters “NPD” (No

Regarding the supply of the DoP, Article 7 of the Regulation (EU) No 305/2011 applies.

The information referred to in Article 31 or, as the case may be, in Article 33 of Regulation (EC) No

1907/2006, (REACH) shall be provided together with the DoP.

ZA.2.3 Example of DoP

The following gives an example of a filled-in DoP for a resettable line-type heat detector:

DECLARATION OF PERFORMANCE

[*Insert here the number of the DoP* - (to be given by the manufacturer)]

1. Unique identification code of the product-type:
   [Insert here the manufacturer] uniq manufacturer's identification code of the product to which the DoP applies to

   be given by

2. Type, batch or serial number or any other element allowing identification of the construction product as required under Article 11(4):

   to be given by the manufacturer

3. Intended use or uses of the construction product, in accordance with the applicable harmonized

   Fire technical *detection* specification, *and fire al* as *rm* foreseen *systems* by *installed* the manufacturer: *in and arou buildings and civil engineering works*

4. Name, registered trade name or registered trade mark and contact address of the manufacturer as

   required under Article 11(5), e.g.: AnyCo Ltd,
   PO Box 210
   CH 1234Anywhere-Switzerland
   Tel. +44207123456
   Fax: +44207123457
   Email: sales@anyco.ch

5. Where applicable, name and contact address of the authorized representative whose mandate covers the tasks specified in Article 12(2), e.g.: Anyone SA

   B-1050 Brussels, Belgium
   Tel. +32987654321
   Fax: +32123456789
   E-mail: anyone@provider.be

6. System or systems of assessment and verification of constancy of performance of the construction

   product as set out in CPR, Annex V: System 1

7. In case of the declaration of performance concerning a construction product covered by a harmonized standard: Notified factory production control certification body No1234 performed the initial inspection of the manufacturing plant and of factory production control and the continuous surveillance, assessment and evaluation of factory production control and issued the certificate of conformity of the factory production control.
8. Declared performance:

conditions/sensitivity

test (endurance) for sensing element applicable) applicable) controlled detectors (if applicable) behaviour (if applicable)	permitted / program deadlock avoided / site specific data in non-volatile memory with two-week retention	
condition test		
parameters under fire condition control unit element unit (endurance) for sensor control	(Group II) / at 70 °C (Group III); alarms given after simulation (Group III); meets manufacturer's declared values (Group II) / at –25 °C (Group III); alarms given after simulation manufacturer's declared values	

		technical specification
for sensing element	II) / 2 cycles at 55 °C and 93 % RH (Group III); meets manufacturer's declared values	
for sensor control unit (if applicable)	II) / 2 cycles at 55 °C and 93 % RH (Group III); alarms given after simulation	
(operational) for sensor control unit (if applicable)	alarms given after simulation	
sensor control unit and sensing	III); meets manufacturer's declared values	
element (if applicable) control unit (if applicable)	x M) m s (Group II and III); alarms given after simulation −2	
control unit	simulation	
element	the sheath; meets manufacturer's declared values	
(operational) for sensor control unit (operational) for sensing element	and 150 Hz at 1 m −2 (Group I) / at 5 m s−2 (Group II and III); alarms given after simulation and 150 Hz at 5 m s (Group II and III); meets manufacturer's declared values −2	
for sensor control unit for sensing element	and 150 Hz at 5 m −2 (Group I) / at 10 m s−2 (Group II and III); alarms given after simulation and 150 Hz at 10 m s (Group II and III); meets manufacturer's declared values −2	
(endurance) for sensing element	2 SO2content (Group II and III); meets manufacturer's declared values	
(endurance) for sensor contro l unit (if applicable)	2 SO2content (Group II and III); alarms given after simulation radiatedbyelectromagneticelectromagneticfields, fields,fasttransientconductedburstdisturbaandslowncesh inducedigh energy voltage surges; alarms given after simulation	

9. The performance of the product identified in points 1 and 2 is in conformity with the declared performance in point 8. This declaration of performance is issued under the sole responsibility of the manufacturer identified in point 4.

Signed for and on behalf of the manufacturer by:

……

(name and function)

ZA.3 CE marking and labelling

The CE marking symbol shall be in accordance with the general principles set out in Article 30 of Regulation (EC) No 765/2008 and shall be affixed visibly, legibly and indelibly together with the identification number of the certification body and the number of the DoP to the sensor control unit of the non-resettable line-type heat detector.

The CE marking symbol shall also be placed in the documents accompanying the non-resettable line-type heat detector and it shall be followed by:

a. the last two digits of the year in which it was first affixed;

b. the name and the registered address of the manufacturer, or the identifying mark allowing identification of the name and address of the manufacturer easily and without any ambiguity;

c. the unique identification code of the product type;

d. the reference number of the declaration of performance;

e. the level or class of the performance declared;

f. the dated reference to the harmonized technical specification applied, [EN 54-28:2016];

g. the identification number of the notified body;

h. the intended use as laid down in the harmonized technical specification applied.

The CE marking shall be affixed before the construction product is placed on the market. It may be followed by a pictogram or any other mark notably indicating a special risk or use.

Figure ZA.1 gives an example of the information related to be placed on the resettable line-type heat detector subject to AVCP under system 1.

Figure ZA.2 gives an example of the information related to be placed in the commercial documents

accompanying the non-resettable line-type heat detector. 1234 CE

CE marking, consisting of the "CE"-symbol given in Directive 93/68/EEC.
Identification number of the product certification body

Figure ZA.1 — Example of CE marking information to be affixed on the non-resettable .

BS EN 54-28:2016
EN 54-28:2016 (E)

CE

1234

AnyCoLtd, PO Box 21, B-1050

001DOP2017**16**–07–14

Fire detection and fire alarm systemsdetectors- non-resettable line-type heat

[insert here the unique identification code of the product- type]

Intended for use in and around buildings and civil engineering works

-**Nominal**Individual**activation**alarmindication:**conditions/sensitivity**RedLED
- Signalling: Alarm and fault status signalled

-**Oper**Maximum**tonal relia**ambient**ility** temperature test (endurance) for sensing element: Meets manufacturer's declared values (°C)
- Connection of ancillary devices: No functional effect -
Manufacturer's adjustments: Special means required
- Requirements for software controlled detectors: Documentation available / modular structure / invalid data not permitted / program deadlock avoided / site specific data in non-volatile memory with two-week retention
- Sensing element fault: Fault signal ≤ 100 s, no alarm
- On-site adjustment of response behaviour: Special means required, settings clearly marked

-**Tolerance**Variation**to** in**supply**supply**voltage**parameters: Meets manufacturer's declared values (V)
- Low voltage fault: Fault signal ≤ 100 s -
Performancepar**and**meters**reproducibility**underfcondition**test:Meets manufacturer's declared values (°C, %) -
DurabilityDryheat**of**(operational)**formnce**sensor**parame**control**ers**unit:**under**No**fire**false**condition:**operation during 16 h at 40 °C (Group I) / at 55 °C (Group II) / at 70 °C (Group III); alarms given after simulation

64

- Cold (operational) sensing element: No false operation during 16 h at −10 °C (Group II) / at −25 °C (Group III); meets manufacturer's declared values
- Cold (operational) for sensor control unit: No false operation during 16 h at −5 °C (Group I) / at −10 °C (Group II) / at −25 °C (Group III); alarms given after simulation

CE marking, consisting of the "CE"-symbol given in Directive 93/68/EEC.
Identification number of the product certification body

Name or identifying mark and registered address of the producer or identifying mark
Last two digits of the year in which the marking was first affixed
Reference number of the DoP
No. of European Standard as referenced in the OJEU
Unique identification code of the product-type as given by the manufacturer
Intended use as laid down in the European standard applied
Level or class of the performance declared

- Damp heat, steady -state (endurance) for sensor control unit and

Humidity r sistance:

sensing element: No false operation after 21 d at 40 °C and 93 % RH; meets manufacturer's declared values

- Damp heat, cyclic (operational) for sensing element:No false operation during 2 cycles at 40 °C and 93 % RH (Group II) / 2 cycles at 55 °C and 93 % RH (Group III); meets manufacturer's declared values
- Damp heat, cyclic (operational) for sensor control unit: No false operation during 2 cycles at 40 °C and 93 % RH (Group II) / 2 cycles at 55 °C and 93 % RH (Group III); alarms given after simulation
- Damp heat, steady-state (operational) for sensor control unit: No false operation during 4 d at 40 °C and 93 % RH (Group I); alarms given after simulation
- Damp heat, cyclic (endurance) for sensor control unit and sensing element: No false operation after 6 cycles at 55 °C and 93 % RH (Group III); meets manufacturer's declared values

- Shock (operational) for sensor control unit: No -false operation

Shock and vib resistance:

during 18 6 ms shock pulses of 1 000 - (200 x M) m s (Group II and III); alarms given after simulation

- Impact (operational) for sensor control unit: No false operation after three 0,5 J impacts; alarms given after simulation
- Impact (operational) for sensing element: No false operation during impact; no visible cracking or cutting of the sheath; meets manufacturer's declared values
- Vibration, sinusoidal (operational) for sensor control unit: No false operation during vibration for a sweep between 10 Hz and 150 Hz at 1 m s (Group I) / at 5 m s (Group II and III); alarms given after simulation
- Vibration, sinusoidal (operational) for sensing element: No false operation during vibration for a sweep between 10 Hz and 150 Hz at 5 m s (Group II and III); meets manufacturer's declared values
- Vibration, sinusoidal (endurance) for sensor control unit: No false operation after vibration for 20 sweeps between 10 Hz and 150 Hz at 5 m s (Group I) / at 10 m s (Group II and III); alarms given after simulation
- Vibration, sinusoidal (endurance) for sensing element: No false operation after vibration for 20 sweeps between 10 Hz and 150 Hz at 10 m s (Group II and III); meets manufacturer's declared values

- **Corrosion** Sulphur **resistance** dioxide(SO) corrosion (endurance) for sensing element: No false operation after 21 d at 25 °C, 93 % RH and 25 µl/l SO content (Group II and III); meets manufacturer's declared values

- Sulphur dioxide (SO) corrosion (endurance) for sensor control unit: No false operation after 21 d at 25 °C, 93 % RH and 25 µl/l SO content (Group II and III); alarms given after simulation

- **Electrical** Electromagnetic **stability** compatibility (EMC), immunity tests (operational): No false operation when applying electrostatic discharge, radiated electromagnetic fields, conducted disturbances induced by electromagnetic fields, fast transient burst

Figure ZA.2 — Example of CE marking information in the documentation accompanying the non-resettable line-type heat detector

Bibliography

[1] EN ISO 9001, *Quality management systems - Requirements (ISO 9001)*

Adjustment : Ali Mohammad Akhavan

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FIRE-GAS

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