SLOVENSKI STANDARD
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Sistemi za odkrivanje in javljanje požara ter alarmiranje - 22. del: Linijski toplotni javljalniki

Fire detection and fire alarm system - Part 22: Line type heat detectors

Brandmeldeanlagen - Teil 22: Linienförmige Wärmemelder

Systemes de détection et d'alarme incendie - Partie 22: Détecteurs linéaires de chaleur

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Fire detection and fire alarm system - Part 22: Line type heat detectors

Systèmes de détection et d'alarme incendie - Partie 22: Détecteurs linéaires de chaleur

Brandmeldeanlagen - Teil 22: Linienförmige Wärmemelder

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Foreword

This document (prEN 54-22:2007) has been prepared by Technical Committee CEN/TC 72 “Fire detection and fire alarm systems”, the secretariat of which is held by BSI.

This document is currently submitted to the CEN Enquiry.

This document has been prepared under a mandate given to CEN by the European Commission and the European Free Trade Association, and supports essential requirements of EU Directive(s).

For relationship with EU Directive(s), 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 detector using an optical light 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 routine equipment

Part 22: Line-type heat detectors

Part 23: Fire alarm devices – Visual alarms

Part 24: Components of voice alarm systems – Loudspeakers

Part 25: Components using radio links and system requirements

Introduction

Line type heat detectors (LTHD) have been incorporated into fire alarm systems for a considerable number of years. 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 LTHD products. LTHD are based upon many unique operating principles. It is the intention of this standard to define common operating characteristics for each type of LTHD in conjunction with existing EN 54 detector standards, so that line type heat detectors have a response behaviour comparable to that of point type heat detectors.

Due to the various applications for LTHD, 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 LTHD should be used in applications. However, the standard indicates two general fields of application, room protection and secondly local protection. The standard defines separate response test classifications for these two fields.

Generally there are two functional principles employed by LTHD: non-integrating and integrating systems. Therefore the subclasses A1N, A2N, BN, … GN have been created for non integrating systems and the subclasses A1I, A2I, BI, … GI have been created for integrating systems.

1 Scope

This European Standard applies to LTHD consisting of a sensing element using an optical fibre, a pneumatic tube or an electrical sensor cable 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 buildings and tunnels.

This standard also covers LTHD intended for use in the local protection of plants and machinery.

LTHD with special characteristics and developed for specific risks are not covered by this standard.

This standard specifies the requirements and performance criteria. This standard specifies the corresponding test methods and the evaluation of conformity of the product to the standard.

2 Normative references

The following referenced documents are indispensable for the application of this document. For dated references, only the edition cited applies. For undated references, the latest edition of the referenced document (including any amendments) applies.

EN 54-1:1996, *Fire detection and fire alarm systems — Part 1: Introduction*

EN 54-2:1997+A1:2006, *Fire detection and fire alarm systems — Part 2: Control and indicating equipment*

EN 54-4:1997+A1:2002+A2:2006, *Fire detection and fire alarm systems — Part 4: Power supply equipment*

EN 54-5:2000+A1:2002; *Fire detection and fire alarm systems —Part 5: Point-type heat detectors*

EN 54-7:2000+A1:2002+A2:2006; *Fire detection and fire alarm systems —Part 7: Point-type smoke detectors*

EN 50130-4:1995+A1:1998+A2:2003, *Alarm systems — Part 4: Electromagnetic compatibility — Product family standard: immunity requirements for components of fire, intruder and social alarm systems*

EN 60068-1:1994, *Environmental testing - Part 1: General and guidance*

EN 60068-2-2:1993 +A1:1993, *Environmental testing – Part 2: Tests; tests B: dry heat*

EN 60068-2-1:1993+A1:1993+A2:1994, *Environmental testing – Part 2: Tests; tests Ab: cold*

EN 60068-2-78:2001, *Environmental testing – Part 2-78: Tests, Test Cab: Damp heat, steady state*

EN 60068-2-30:2005, *Environmental testing – Part 2-30: Variant 1 test cycle and controlled recovery conditions: Damp heat, cyclic*

EN 60068-2-78:2001, *Environmental testing – Part 2-78: Tests, Test Cab: Damp heat, steady state*

EN 60068-2-42:2003, *Environmental testing – Part 2-42: Tests, Test Kc: Sulphur dioxide, steady state*

EN 60068-2-27:1993, *Environmental testing – Part 2-27: Tests, Test Ea: shock*

EN 60068-2-75:1997, *Environmental testing – Part 2-75: Tests, Test Eh for test Ehb: impact*

EN 60068-2-6:1995, *Environmental testing – Part 2: Tests - Test Fc: Vibration, sinusoidal*

EN 9001:2000, *Quality management systems – Requirements (ISO 9001: 2000)*

3 Terms, definitions and abbreviations

For the purposes of this document the terms and definitions given in EN 54-1:1996 and the following apply.

3.1 Terms and definitions

3.1.1
analogue detector
detectors, the sensing element of which, produces an output signal functionally related to the heat sensed.

3.1.2
digital detector
detectors, the sensing element of which can be either of two states: standby or alarm. The alarm threshold is inherent to the cable construction.

3.1.3
functional unit
part of a line type heat detector beside the sensor control unit and the sensing element which is essential for the function of the line type heat detector.

EXAMPLE Terminating device, filter, switch

3.1.3
integrating detector
detectors where the response to temperature is summed in some way, (not necessarily linearly), along a length of the sensing element. For such detectors, the output to the sensor control unit is therefore a function of the temperature distribution along the length of the sensing element

EXAMPLE Pneumatic systems, analogue detectors

3.1.4
linear heat detector
detectors which respond to heat applied to any point along the length of the sensing element.

3.1.5
line type heat detector (LTHD)
detector which responds to heat sensed in the vicinity of a continuous line. A line type heat detector may consist of a sensor control unit, a sensing element and functional units. There are two subtypes: Linear heat detectors and multipoint heat detectors

3.1.6
local protection application
application where the sensing element is installed in relatively close proximity to the potential fire risk.

NOTE Examples of local protection applications could be pipelines, conveyor belts, combustion engines/turbines, rolling stocks, transformer, process dryers, cable trays, escalators, chemical process equipment, electrical equipment cabinets, ventilation system (dust collector, hood extractor, etc.), switch gear (e.g. printing press).

3.1.7
multipoint heat detector
detectors that contain multiple discrete temperature sensors, separated by a distance of no more than 10 m, embedded within a sensing element

3.1.8
non-integrating detector
detectors for which the output signal is depending on local temperature effects but not on the integration of the whole temperature distribution along the sensing element

EXAMPLE Fibre optics systems, digital detectors

3.1.9
room protection application
application where the sensing element is installed at a distance from the potential fire hazard close to the ceiling or roof of the area to be protected

NOTE Examples of room protection applications could be car parks (open or closed), road/rail/metro tunnels, floor/ceiling voids, elevator shafts, cold stores, warehouses, heritage buildings, aircrafts hangars, spray shops, chemical storehouses, ammunition depots, refineries, silos.

3.1.10
sensing element
heat sensing part of the line type heat detector which can be a fibre optic cable, a pneumatic tube or an electrical cable

3.1.11
sensor control unit
unit that supervises the sensing element and communicates to the control and indicating equipment. 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 standard, the following abbreviations apply:

LTHD line type heat detector

4 Requirements

4.1 Compliance

In order to comply with this standard the LTHD shall meet the requirements of this clause, which shall be verified by visual inspection or engineering assessment, shall be tested as described in clause 5 and shall meet the requirements of the tests.

4.2 Classification

4.2.1 Heat response for room protection application

LTHD for room protection shall comply at least to one heat response class of Table 1 or Table 2.

Table 1 — Heat response, room protection for non-integrating LTHD

Heat response class	Typical application temp-erature (°C)	Maximum application temp-erature (°C)	Minimum static response temperature (°C)	Maximum static response temperature (°C)	TF 6S response time		TF 6 response time		TF 6F response time	
					Lower value (s)	Upper value (s)	Lower value (s)	Upper value (s)	Lower value (s)	Upper value (s)
A1N	25	50	54	65	50	400	30	210	20	130
A2N	25	50	54	70	120	600	60	300	40	180
NOTE For non-integrating LTHD the static response temperature test is performed with a part of 10 m of sensing element and the max ambient temperature test (to test the maximum application temperature) is performed with the maximum length of sensing element as specified by the manufacturer.										

Table 2 — Heat response, room protection for integrating LTHD

Heat response class	Typical application temp-erature (°C)	Maximum application temp-erature (°C)	Minimum static response temperature (°C)	Maximum static response temperature (°C)	TF 6S response time		TF 6 response time		TF 6F response time	
					Lower value (s)	Upper value (s)	Lower value (s)	Upper value (s)	Lower value (s)	Upper value (s)
A1I	25	50	54	65	50	400	30	210	20	130
A2I	25	50	54	70	120	600	60	300	40	180
NOTE For integrating LTHD the static response temperature test and the max ambient temperature test (to test the maximum application temperature) are performed with the maximum length of sensing element as specified by the manufacturer.										

4.2.2 Heat response for local protection application

LTHD for local protection shall comply at least to one heat response class of Table 3 or Table 4.

Table 3 — Heat response local protection for non-integrating LTHD

Heat response class	Typical application temperature (°C)	Maximum application temperature (°C)	Minimum static response temperature (°C)	Maximum static response temperature (°C)
BN	40	65	69	85
CN	55	80	84	100
DN	70	95	99	115
EN	85	110	114	130
FN	100	125	129	145
GN	115	140	144	160
NOTE For non-integrating LTHD the static response temperature test is performed with a part of 10 m of sensing element and the max ambient temperature test (to test the maximum application temperature) is performed with the maximum length of sensing element as specified by the manufacturer.				

Table 4 — Heat response local protection for integrating LTHD

Heat response class	Typical application temperature (°C)	Maximum application temperature (°C)	Minimum static response temperature (°C)	Maximum static response temperature (°C)
BI	40	65	69	85
CI	55	80	84	100
DI	70	95	99	115
EI	85	110	114	130
FI	100	125	129	145
GI	115	140	144	160
NOTE For integrating LTHD the static response temperature test and the max ambient temperature test (to test the maximum application temperature) are performed with the maximum length of sensing element as specified by the manufacturer.				

4.3 Environmental groups

The sensing element may be classified as one of two environmental groups (II or III).

The sensor control unit may be classified as one of three environmental groups (I, II or III).

4.4 General detector requirements

4.4.1 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 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.

4.4.2 Interface

4.4.2.1 Alarm and fault interface

The sensor control unit shall signal the alarm and fault status to the control and indicating equipment.

If more than one sensing element is connected to the sensor control unit, there shall be separate alarm and fault signals for each sensing element.

4.4.2.2 Fault

A fault shall be signalled in the following conditions:

1. Sensing element faults (see 5.26)
2. Low voltage (see 5.27)
3. Processor failure, where applicable

4.4.3 Connection of ancillary devices

Where the LTHD 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 LTHD.

4.4.4 Marking

4.4.4.1 General

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

The marking shall be visible during installation and shall be accessible during maintenance.

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

4.4.4.2 Marking of sensor control unit

The sensor control unit shall be clearly marked with the following information:

a) the number of this standard (i.e. EN 54-22:200x);

b) the class(es) of the LTHD (e.g. A1I, A1N, BI, BN, etc.). If the detector has provision for on-site adjustment of the classes (see 4.2), then the marking of the class may be replaced by the symbol P (programmable);

c) Environment classification (Group I, II or III);

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

e) the model designation (type or number);

f) the wiring terminal designations;

g) 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.

4.4.4.3 Marking of sensing element

Each sensing element shall be marked with the following information:

a) name or trademark of the manufacturer or supplier;

b) model designation (type or number);

c) environment classification (Group II or III);

d) 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.

e) marking of sensor location and orientation (if applicable, e.g. for multipoint systems);

NOTE If it is not possible to mark directly on the sensing element then the use of at least one label securely fixed to the sensing element is permitted.

4.4.4.4 Marking of functional units

Each functional unit shall be marked with the following information:

a) the number of this standard (i.e. EN 54-22:200x);

b) name or trademark of the manufacturer or supplier;

c) model designation (type or number);

d) environment classification (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.

4.4.5 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).

4.4.6 On-site adjustment of response behaviour

The effective response behaviour of a LTHD is dependent upon both the sensitivity settings of the sensor control unit and the heat sensing element. Many types of LTHD therefore have facilities to adjust the sensitivity of the LTHD 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.

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

4.4.7 Power supplies

The power for the LTHD shall be supplied by a power supply complying with EN 54-4.

NOTE This power supply may be the power supply for the control and indicating equipment.

4.4.8 Data

LTHD shall either be supplied with sufficient technical, installation and maintenance data to enable their correct installation and operation or, if all of these data are not supplied with each detector, reference to the appropriate data sheet shall be given with each LTHD.

To understand correct operation of the detectors, additional data shall be available that describe the processing of the signals from the detector. This may be in the form of a full technical specification of these signals, a reference to the appropriate signalling protocol or a reference to suitable types of sensor control unit and/or control and indicating equipment, etc.

Installation and maintenance data shall include reference to an in situ test method to ensure that detectors operate correctly when installed.

For integrating LTHD the manufacturer shall declare the relation between the maximum application temperature and the corresponding sensing element length for each class to which the manufacturer claims compliance.

NOTE Additional information could be required by organisations certifying that detectors produced by a manufacturer conform to the requirements of this standard.

4.4.9 Additional requirements for software controlled detectors

4.4.9.1 General

For LTHD, which rely on software control in order to fulfil the requirements of this standard, the requirements of 4.4.9.2, 4.4.9.3 and 4.4.9.4 shall be met.

4.4.9.2 Software documentation

4.4.9.2.1 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:

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.

4.4.9.2.2 The manufacturer shall have available detailed design documentation, which only needs to be provided if required by the testing authority. 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).

4.4.9.3 Software design

In order to ensure the reliability of the LTHD, 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.