

Alarm systems — Intrusion systems —

Part 2-2: Requirements for passive infrared detectors

ICS 13.310

National foreword

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Cross-references

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Part 2-2: Requirements for passive infrared detectors

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infrarouges passifs

Alarmanlagen -
Einbruchmeldeanlagen
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This Technical Specification was approved by CENELEC on 2004-05-04.

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Foreword

This Technical Specification was prepared by the Technical Committee CENELEC TC 79, Alarm systems.

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- latest date by which the existence of the TS (doa) 2004-11-04
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NOTE Latest date by which the TS has to be voted as EN: 2 years maximum after day of TS.

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Introduction

This Technical Specification is a specification for passive infrared detectors (to be referred to as the detector) used as part of intrusion detection systems installed in buildings. It includes four security grades and the first three environmental classes.

The purpose of a detector is to detect the broad spectrum infrared radiation emitted by an intruder and to provide the necessary range of signals or messages to be used by the rest of the intruder alarm system.

The number and scope of these signals or messages will be more comprehensive for systems that are specified at the higher grades.

This specification is only concerned with the requirements and tests for the detector. Other types of detector are covered by other documents identified as CLC/TS 50131-2-x.

The requirement in EN 50131-1 that detectors in grade 3 and 4 systems shall include a means to detect a significant reduction in range may be met either by detectors having the appropriate function (4.2.3) or by suitable system design.

1 Scope

This Technical Specification provides for security grades 1 to 4 (see EN 50131-1), specific or non-specific wired or wire-free detectors, and uses environmental classes I to III (see EN 50130-5).

A function designated in the specification as not required for a particular grade may be provided by the manufacturer. If provided, it will be tested, and shall meet all relevant requirements of any higher grade. If it passes, the manufacturer may claim it as an extra feature, which does not alter the overall grading of the detector.

The specification does not apply to system interconnections.

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 50130-4:1995	Alarm systems - Part 4: Electromagnetic compatibility - Product family standard: Immunity requirements for components of fire, intruder and social alarm systems
EN 50130-5:1998	Alarm systems - Part 5: Environmental test methods
EN 50131-1:1997	Alarm Systems - Intrusion systems - Part 1: General requirements
EN 50131-6:1997	Alarm systems - Intrusion systems - Part 6: Power supplies
EN 60529:1991	Degree of protection provided by enclosures (IP code)

3 Definitions and abbreviations

For the purpose of this specification, the following definitions and abbreviations apply in addition to those given in EN 50131-1.

3.1

alert/set mode

state of operation in which a detector shall generate an intrusion signal or message in response to stimulation by a human being or the standard walk test target

3.2

basic detection target

heat source designed to verify the operation of a detector

3.3

ceiling mount detector

detector capable of sensing human movement from a mounting position on the ceiling

3.4

curtain detector

detector capable of sensing human movement through a continuous layer of detection zones

3.5

incorrect operation

physical condition that causes an inappropriate signal or message from a detector

3.6

local memory

storage medium situated on board the detector, having the capability to record signals or messages generated by the detector

3.7

long range detector

detector capable of sensing human movement in an extended field of view with horizontal angular coverage less than 10°

3.8

masking

interference with the detector input capability by the introduction of a physical barrier such as metal, plastics, paper or sprayed paints or lacquers in close proximity to the detector

3.9

passive infrared detector

detector of the broad-spectrum infrared radiation emitted by a human being

3.10

simulated walk test target

non-human or synthetic heat source designed to simulate the standard walk test target

3.11

standard walk test target

human being of standard weight and height clothed in close fitting clothing appropriate to the simulation of an intruder

3.12

standby/unset mode

state of operation in which a detector is not required to generate an alarm signal or message in response to stimulation by a human being or a standard walk test target

3.13

test mode

state of operation in which a detector will activate an intrusion indicator in response to stimulation by a human being or the standard walk test target

3.14

volumetric detector

detector capable of sensing human movement in a volume such as a room with a field of view with horizontal angular coverage greater than 45°

3.15**walk test**

operational test during which a detector is stimulated by the standard walk test target in a controlled environment

3.16**walk test attitude, crawling**

crawling attitude shall consist of the standard walk test target moving with hands and knees in contact with the floor

3.17**walk test attitude, upright**

upright attitude shall consist of the standard walk test target standing and walking with arms by the sides of the body. The standard walk test target begins and ends a traverse with feet together

3.18**wire free detector**

detector connected to the control and indicating equipment by interconnection such as radio frequency signals

3.19 Abbreviations

HDPE	high density polyethylene
PIR	passive infrared
EMC	electromagnetic compatibility
SWT	standard walk test target
BDT	basic detection target
FOV	field of view

4 Functional requirements**4.1 Indication signals or messages**

All detectors shall have an alert/set mode. Grades 3 and 4 shall have an unset mode. If a detector has only one mode of operation, then it shall always be in the alert/set mode. Tamper detection shall be active in all modes.

Each possible mode of operation is determined by the status of the intrusion detection system with which the detector communicates. The detector signals or messages in these modes of operation shall function in accordance with Table 1. All signals or messages apply to all modes of operation unless stated otherwise. Where a memory display or intrusion indicator is provided on board the detector, it shall not function in the alert/set mode.

Table 1 - Indication signals or messages

Event	Grades	Intrusion signal or message	Tamper signal or message	Fault signal or message
Intrusion	1 – 4	Required *	Not permitted	Not permitted
No stimulus	1 – 4	Not permitted	Not permitted	Not permitted
Masking	1 – 2	Not required	Not required	Not required
	3 – 4	Required **	Not required	Required **
Tamper	1 – 4	Not required	Required	Not required
Low supply voltage (external)	1 – 2	Not required	Not required	Not required
	3 – 4	Not required	Not required	Required
Total loss of external power supply	1	Not required	Not required	Not required
	2 – 4 ***	Required	Not required	Not required
Local self-test pass	1 – 4	Not permitted	Not permitted	Not permitted
Local self-test fail	1 – 2	Not permitted	Not permitted	Not required
	3 – 4	Not permitted	Not permitted	Required
Remote self-test pass	1 – 2	Not required	Not permitted	Not permitted
	3 – 4	Required	Not permitted	Not permitted
Remote self-test fail	1 – 2	Not permitted	Not permitted	Not required
	3 – 4	Not permitted	Not permitted	Required
* Not required in unset/standby mode: required in test mode. ** An independent masking signal or message may be provided instead. *** Not required for bus systems. NOTE For internal power supplies, see EN 50131-6.				

4.2 Detection

4.2.1 Detection performance

The detector shall generate an intrusion signal or message when the standard or simulated walk test target moves within the boundary for a distance of 3 m. The detector shall also generate an intrusion signal or message when the standard or simulated walk test target moves across the manufacturer's claimed boundary of detection.

The velocities and attitudes are as specified in Table 2.

Table 2 - General walk test velocity and attitude requirements

Test	Grade 1	Grade 2	Grade 3	Grade 4
Detection across the boundary	Required	Required	Required	Required
Velocity (m/s)	1,0	1,0	1,0	1,0
Attitude	Upright	Upright	Upright	Upright
Detection within the boundary	Required	Required	Required	Required
Velocity (m/s)	0,3	0,3	0,2	0,1
Attitude	Upright	Upright	Upright	Upright
Detection at high velocity	Not required	Required	Required	Required
Velocity (m/s)	#	2,0	2,5	3,0
Attitude	#	Upright	Upright	Upright
Close-in detection performance (dist, m)	2,0	2,0	0,5	0,5
Velocity (m/s)	0,5	0,4	0,3	0,2
Attitude	Upright	Upright	Crawling	Crawling
Intermittent movement detection performance *	Not required	Not required	Required	Required
Velocity (m/s)	#	#	0,2 (1,0)	0,1 (1,0)
Attitude	#	#	Upright	Upright
Effect of control adjustments **	Not required	Required	Required	Required
Velocity (m/s)	#	0,3	0,2	0,1
Attitude	#	Upright	Upright	Crawling
Significant reduction of specified range	Not required	Not required	Not required ***	Not required ***
Velocity (m/s)	#	#	# (1,0)	1,0
Attitude	#	#	# Upright	Upright
* The intermittent movement shall consist of the SWT moving a distance of 1 m by taking two 0,2 (5) m steps (at 1,0 m/s), pausing for 5 s then continuing until the SWT has left the area for a further 1 s. ** If means for continuous adjustment of detection sensitivity is provided, the effect of any setting shall be indicated with a tolerance of less than 25 % of the maximum reading. *** The means to detect a significant reduction in range may be met either by detectors having the appropriate function (4.2.3) or by suitable system design. # To test features that are not required in a particular grade, parameters from a higher grade shall be specified.				

4.2.2 Indication of detection

An indicator, if provided at the detector, shall indicate when detection causes an intrusion signal or message. This indicator shall be capable of being enabled/disabled. This operation shall only be performed locally after removal of the cover or remotely at the control and indicating equipment.

4.2.3 Significant reduction of specified range

If the facility to detect reduction in specified range is provided, then range reduction along the principal axis of detection of more than 50 % shall generate an alarm or fault signal or message within a maximum period of 180 s, according to the requirements given in Table 2. The requirements of 4.3.5 (self test) and 4.5.5 (resistance to masking) can provide range reduction detection.

If additional equipment is required to detect significant reduction in range, reference shall be made to the manufacturer's documentation.

4.3 Operational requirements

4.3.1 Time interval between intrusion signals or messages

Wired detectors shall be able to provide an intrusion signal or message not more than 15 s after the end of the preceding intrusion signal or message. Wire free detectors shall perform the same function in a time as follows:

- Grade 1: 300 s,
- Grade 2: 300 s,
- Grade 3: 30 s,
- Grade 4: 15 s (see EN 50131-1 for amendment).

4.3.2 Switch on delay

The detector shall meet all functional requirements within 180 s of the power supply reaching its nominal voltage.

4.3.3 Fault condition signalling

When a detector suffers a fault, a fault signal or message shall be generated in accordance with the manufacturer's specification, and the provisions of Table 1.

4.3.4 Power supply faults

Detectors of all grades shall signal complete power failure according to the provisions of Table 1. Additionally, detectors of grades 3 and 4 shall signal when the supply voltage moves below the manufacturer's specified range according to the provisions of Table 1.

4.3.5 Self tests

Grade 3 and grade 4 detectors shall monitor the function of the sensor and associated on-board signal processing circuitry. A self-test shall be performed under the control of the detector.

When a remote self-test is initiated, a signal or message shall be generated between 1 s and 5 s later, and shall be signalled within 5 s of that initiation. The test duration shall not exceed 10 s. After the test is completed, the detector shall resume its previous state within 5 s. Fault indication requirements appear in Table 1.

Where normal operation of the detector is inhibited during a local test of function monitoring the detector inhibition time shall be limited to a maximum of 15 s in a period of 1 h.

4.4 Immunity to incorrect operation

The detector shall be considered to have sufficient immunity to incorrect operation if the following requirements have been met. No intrusion signal or message shall be generated during the tests.

4.4.1 Immunity to air flow

The detector shall not generate any signal or message when air is blown over the face of the detector.

4.4.2 Immunity to visible and near infrared radiation

The detector shall not generate any signal or message when visible and near Infrared radiation from a light source such as a car headlamp is directed on to the front window or lens through a pane of glass.

4.5 Tamper security

Tamper security requirements for each grade of detector are shown in Table 3.

4.5.1 Prevention of unauthorized access to the inside of the detector through covers and existing holes

Access holes shall not allow interference with the operation of the detector by probing with commonly available tools. Damage shall not be caused that would be visible to a person with normal eyesight viewing from a distance of 1 m with the detector illuminated at a level of 2 000 lux.

A tool shall be required to open the unit. All covers giving access to components which could affect adversely the operation of the detector shall be fitted with a tamper detection device in accordance with Table 3. A tamper signal or message shall be generated before access is gained with any tool.

4.5.2 Detection of removal from the mounting surface

A tamper detection device shall be fitted which signals a tamper if the detector is removed from the mounting surface, in accordance with Table 3. Mounting screws shall only be accessible from within the unit. Operation of the device shall not be preventable by external means. This device shall activate before access can be gained to it.

4.5.3 Resistance to re-orientation

Where the orientation of a detector can be adjusted, resistance to re-orientation shall be provided in accordance with Table 3.

The alignment of the boundary of detection shall not have changed by more than 5° due to a grade dependent applied torque. Alternatively a tamper detection device shall signal before the alignment of the boundary of detection has moved by 5°. One test arrangement is described in Annex L.

If a detector provides a means to adjust the orientation of its coverage pattern, the access to this means shall be protected by a tamper device.

4.5.4 Immunity to magnetic field interference

It shall not be possible to inhibit any output or signalling devices with a magnet of grade dependent remanence, according to Table 3. The form of standard magnets shall be as described in Annex A.

4.5.5 Resistance to masking

Means shall be provided to detect inhibition of the operation of the detector by covering its sensing area and sensor, in the unset mode. The maximum response time for the masking detection device shall be 180 s. Intrusion and fault signals or messages or a dedicated anti-masking signal or message shall be generated. The signals or messages shall remain latched until restored. Grade dependency appears in Table 3.

No anti-masking signal or message shall be generated by normal human movement at 1 m/s at a distance greater than 1 m in the unset condition.

Table 3 - Tamper security requirements

Requirement	Grade 1	Grade 2	Grade 3	Grade 4
Resistance to access to the inside of the detector	Required	Required	Required	Required
Removal from the mounting surface*	Not required	Required *	Required	Required
Resistance to re-orientation:	Not required	Required	Required	Required
Applied torque (Nm)		2	5	10
Magnetic field immunity:	Not required	Required	Required	Required
Remanence (T)		0,15	0,3	1,2
Anti-masking: capability	Not required	Not required	Required	Required
* Required for wire free detectors only.				

4.6 Electrical requirements

These requirements do not apply to detectors having internal power supplies. For these detectors refer to EN 50131-6. For detectors having an external power supply, the requirements appear in Table 4.

Table 4 - Electrical requirements

Test	Grade 1	Grade 2	Grade 3	Grade 4
Detector current consumption	Required	Required	Required	Required
Input voltage range & slow input voltage rise	Not required	Required	Required	Required
Input voltage ripple	Not required	Required	Required	Required
Input voltage step change	Not required	Required	Required	Required
Total loss of supply	Not required	Required	Required	Required

4.6.1 Detector current consumption

The detector's quiescent and maximum current consumption shall not exceed the figures claimed by the manufacturer at the nominal input voltage.

4.6.2 Slow input voltage change (rise) and voltage range limits

The detector shall meet all functional requirements when the input voltage lies between $\pm 25\%$ of the nominal value, or between the manufacturer's stated values (range limits if greater). When the supply voltage is raised slowly, the detector shall function normally at the specified range limits.

4.6.3 Input voltage ripple

The detector shall meet all functional requirements during the sinusoidal variation of the input voltage by $\pm 10\%$ of nominal, at a frequency of 100 Hz.

4.6.4 Input voltage step change

No signals or messages shall be caused by a step in the input voltage between maximum or minimum and nominal values of the input voltage.

4.6.5 Total loss of supply

An intrusion signal or message shall be caused by the total loss of the supply voltage.