SLOVENSKI STANDARD
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Nadomešča:
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Alarmni sistemi - Sistemi za javljanje vloma in ropa - 2-4. del: Zahteve za kombinirane pasivne infrardeče in mikrovalovne javljalnike

Alarm systems - Intrusion and hold-up systems - Part 2-4: Requirements for combined passive infrared and microwave detectors

Alarmanlagen - Einbruch- und Überfallmeldeanlagen - Teil 2-4: Anforderungen an Passiv-Infrarotdualmelder und Mikrowellenmelder

Systèmes d'alarme - Systèmes d'alarme contre l'intrusion et les hold-up - Partie 2-4: Exigences pour détecteurs combinés à infrarouges passifs et à hyperfréquences

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13.310	Varstvo pred kriminalom	Protection against crime
13.320	Alarmni in opozorilni sistemi	Alarm and warning systems

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English Version

Alarm systems - Intrusion and hold-up systems - Part 2-4: Requirements for combined passive infrared and microwave detectors

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European Committee for Electrotechnical Standardization
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Europäisches Komitee für Elektrotechnische Normung

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European foreword

This document (EN 50131-2-4:2020) has been prepared by CLC/TC 79, “Alarm systems”.

The following dates are fixed:

• latest date by which this document has to be implemented at national level by publication of an identical national standard or by endorsement	(dop)	2021-06-30
• latest date by which the national standards conflicting with this document have to be withdrawn	(dow)	2023-06-30

This document supersedes EN 50131-2-4:2008 and all of its amendments and corrigenda (if any).

EN 50131-2-4:2020 includes the following significant technical changes with respect to EN 50131-2-4:2008:

— editorial changes and refinement of wording;

— clarification to significant reduction of range requirements;

— clarification to the Electrical requirements section and certain environmental conditions;

— addition of requirements, tests and corresponding Annexes throughout the overall standard, to support ceiling mounted detectors;

— improvement of the requirements of the supplied documentation;

— improvement of the standard conditions for testing;

— addition of chapter which defines the condition for the mounting height while the tests are performed;

— refinement of the standard requirements for the Testing procedures;

— refinement of the Immunity to air flow test to allow for better repeatability of the test results;

— verifying and clarifying of the wording of the test for resistance to or detection of re-orientation of adjustable mountings;

— updating of the test magnet specification for resistance to magnetic field interference;

— verifying and clarifying of the wording for the detection of detector masking in regards to the conditions and the test material;

— review and optimization of the methods for temperature adjustments for the test environment;

— review of Sample Testmatrix;

— review and verifying of references to other standards.

EN 50131 consists of the following parts, under the general title *Alarm systems - Intrusion and hold-up systems*:

— *Part 1: System requirements*

— *Part 2–2: Intrusion detectors – Passive infrared detectors*

— *Part 2–3: Intrusion detectors – Microwave detectors*

— *Part 2–4: Intrusion detectors – Combined passive infrared / Microwave detectors*

— *Part 2–5: Intrusion detectors – Combined passive infrared / Ultrasonic detectors*

— *Part 2–6: Intrusion detectors – Opening contacts*

— *Part 2–7–1: Intrusion detectors – Glass break detectors – Acoustic*

— *Part 2–7–2: Intrusion detectors – Glass break detectors – Passive*

— *Part 2–7–3: Intrusion detectors – Glass break detectors – Active*

— *Part 3: Control and indicating equipment*

— *Part 4: Warning devices*

— *Part 5–3: Requirements for interconnections equipment using radio frequency techniques*

— *Part 6: Power supplies*

— *Part 7: Application guidelines*

— *Part 8: Security fog devices*

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

Introduction

This document deals with combined passive infrared and microwave detectors (to be referred to as the detector) used as part of intrusion alarm systems installed in buildings. It includes four security grades and four environmental classes.

The purpose of the detector is to detect the broad spectrum infrared radiation emitted by an intruder, to emit microwave signals and analyse the signals that are returned and to provide the necessary range of signals or messages to be used by the rest of the intrusion 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 version of the standard contains limited requirements for Grade 4 detectors. Future revisions of the standard are expected to include enhanced requirements for Grade 4 detectors.

This document is only concerned with the requirements and tests for the detector. Other types of detector are covered by other documents identified as in the EN 50131-2 series.

NOTE Each country has certain regulations in regards to which part of the microwave spectrum is allowed to be used in this application. This information can be found in ERC recommendation 70-03.

1 Scope

This document is for combined passive infrared and microwave detectors installed in buildings and 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 IV (see EN 50130-5). This document does not include requirements for detectors intended for use outdoors.

The purpose of the detector is to detect the broad spectrum infrared radiation emitted by an intruder, to emit microwave signals and analyse the signals that are returned and to provide the necessary range of signals or messages to be used by the rest of the intrusion alarm system.

For a combined detector where both detection technologies need to be in their activated state in order to generate an alarm condition, the grade-dependent requirements of this document apply. For combined detectors which can be configured or operated such that each detection technology can generate an alarm condition independently, the grade-dependant requirements as defined in EN 50131-2-2 and EN 50131-2-3 apply, when configured accordingly. Otherwise, it is the responsibility of the manufacturer to clearly state that the detector does not comply to this document and not to EN 50131-2-2 and EN 50131-2-3 when put into such a configuration.

It is essential that a detector fulfils all the requirements of the specified grade.

Functions additional to the mandatory functions specified in this document can be included in the detector, providing they do not influence the correct operation of the mandatory functions.

Requirements for system interconnections are not included in this document.

2 Normative references

The following documents are referred to in the text in such a way that some or all of their content constitutes requirements 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, *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 50130-5, *Alarm systems — Part 5: Environmental test methods*

EN 50131-1, *Alarm systems — Intrusion and hold-up systems — Part 1: System requirements*

EN 50131-6, *Alarm systems — Intrusion and hold-up systems — Part 6: Power supplies*

EN 60404-5, *Magnetic materials — Part 5: Permanent magnet (magnetically hard) materials — Methods of measurement of magnetic properties (IEC 60404-5)*

EN 60404-8-1, *Magnetic materials — Part 8-1: Specifications for individual materials — Magnetically hard materials (IEC 60404-8-1)*

EN 60404-14, *Magnetic materials — Part 14: Methods of measurement of the magnetic dipole moment of a ferromagnetic material specimen by the withdrawal or rotation method (IEC 60404-14)*

3 Terms, definitions and abbreviations

For the purposes of this document, the terms, definitions and abbreviations given in EN 50131-1 and the following apply.

ISO and IEC maintain terminological databases for use in standardization at the following addresses:

- IEC Electropedia: available at http://www.electropedia.org/
- ISO Online browsing platform: available at https://www.iso.org/obp

3.1 Terms and definitions

3.1.1
activated state
condition where a detection technology participates in the generation of an alarm signal or message

3.1.2
basic detection target
heat source and/or microwave reflector designed to verify the operation of a detector

3.1.3
coverage angle
width of field of view in degrees provided by the detector when measured in the horizontal plane

3.1.4
combined passive infrared and microwave detector
device used to determine the presence of human intruders by sensing the broad-spectrum infrared emitted by a human being and differences between emitted and reflected microwave signals due to the associated movement

Note 1 to entry: The infrared and microwave detection technology are housed within the same enclosure.

3.1.5
detection settings
adjustments which influence the performance of the detector (e.g. pulse count settings, gain settings)

3.1.6
detector reference axis
virtual line determined by the detector manufacturer projecting from the point of origin of the detection coverage pattern

3.1.7
incorrect operation
physical condition that causes an inappropriate signal from a detector in the context of this document

3.1.8
masking
interference with the ability to detect human intruders by the introduction of a physical obstruction such as metal, plastic, paper or sprayed paints or lacquers on or in close proximity to the detector

3.1.9
microwave detector
device used to determine the presence of human intruders by sensing the differences between emitted and reflected microwave signals due to movement

3.1.10
passive infrared detector
device used to determine the presence of human intruders by sensing the broad-spectrum infrared emitted by a human being

3.1.11
simulated walk test target
non-human or synthetic heat source or microwave reflector designed to simulate the standard walk test target

3.1.12
standard walk test target
human being of defined weight and height clothed in close fitting garments

3.1.13
walk test
operational test to demonstrate detection performance during which a detector is stimulated by the standard walk test target in a controlled environment

3.1.14
walk test attitude, crawling
orientation of the standard walk test target moving with hands and knees in contact with the floor

3.1.15
walk test attitude, upright
orientation of the standard walk test target standing and walking with arms held at the sides of the body

3.2 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 Event Processing

Detectors shall process the events shown in Table 1.

Table 1 — Events to be processed by grade

Event	Grade			
	1	2	3	4
Intrusion Detection	M	M	M	M
Tamper Detection	Op	M	M	M
Masking Detection	Op	Op	M	M
Low Supply Voltage	Op	Op	M	M
Total Loss of Power Supply	Op	M	M	M
Local Self-Test	Op	Op	M	M
Remote Self-Test	Op	Op	Op	M
M = Mandatory Op = Optional				

Detectors shall generate signals or messages as shown in Table 2.

Table 2 — Generation of Signals or Messages

Event	Signals or Messages		
	Intrusion	Tamper	Fault
No Event	NP	NP	NP
Intrusion	M	NP	NP
Tamper	NP	M	NP
Masking [a]	M	Op	M
Low Supply Voltage	Op	Op	M
Total Loss of Power Supply [b]	M	Op	Op
Local Self-Test Pass [a]	NP	NP	NP
Local Self-Test Fail	NP	NP	M
Remote Self-Test Pass [a]	M	NP	NP
Remote Self-Test Fail	NP	NP	M
M = Mandatory NP = Not Permitted Op = Optional			
This permits two methods of signalling a masking: either by the intrusion signal and fault signal, or by a dedicated masking or message. Use of the intrusion signal and fault signal is preferable, as this requires fewer connections between CIE and detector. If multiple events overlap there will be some signal combinations that may be ambiguous. To overcome this ambiguity it is suggested that detectors should not signal 'intrusion' and 'fault' at the same time except to indicate masking. This implies that the detector should prioritize signals, e.g. 1 Intrusion, 2 Fault, 3 Masking. When, in Table 1, an event may optionally generate signals or messages, they shall be as shown in this table.			
[a] An independent signal or message may be provided instead. [b] Total loss of Power Supply does not apply for message based detectors.			

4.2 Detection

4.2.1 Detection performance

Both detection technologies shall be in an activated state, before the alarm condition shall be generated.

The detector shall generate an intrusion signal or message when the standard or simulated walk-test target moves at velocities and attitudes specified in Table 3. For detection across the boundary the walk-test distance shall be 1,5 m either side of the boundary. For test “Detection within the boundary” the walk-test distance shall be 3,0 m.

Table 3 — 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	1,0 ms^{-1}	1,0 ms^{-1}	1,0 ms^{-1}	1,0 ms^{-1}
Attitude	Upright	Upright	Upright	Upright
Detection within the boundary	Required	Required	Required	Required
Velocity	0,3 ms^{-1}	0,3 ms^{-1}	0,2 ms^{-1}	0,1 ms^{-1}
Attitude	Upright	Upright	Upright	Upright
Detection at high velocity	Not required	Required	Required	Required
Velocity	N/A	2,0 ms^{-1}	2,5 ms^{-1}	3,0 ms^{-1}
Attitude	N/A	Upright	Upright	Upright
Close-in detection performance (For coverage angles less than or equal to 180°)	Required	Required	Required	Required
Distance	2,0 m	2,0 m	0,5 m	0,5 m
Velocity	0,5 ms^{-1}	0,4 ms^{-1}	0,3 ms^{-1}	0,2 ms^{-1}
Attitude	Upright	Upright	Crawling	Crawling
Detection of radial movement (For coverage angles of 360°)	Required	Required	Required	Required
Velocity	0,5 ms^{-1}	0,4 ms^{-1}	0,3 ms^{-1}	0,2 ms^{-1}
Attitude	Upright	Upright	Upright	Upright
Intermittent movement detection performance [a]	Not required	Not required	Required	Required
Velocity	N/A	N/A	1,0 ms^{-1}	1,0 ms^{-1}
Attitude	N/A	N/A	Upright	Upright

[a] For grade 3 and 4 detectors, the intermittent movement shall consist of the SWT walking 1 m at a velocity of 1,0 ms^{-1} then pausing for 5 s before continuing. The sequence shall be maintained until the SWT has traversed through the entire detection area. This constitutes one walk test. The test shall be repeated in each of the directions shown in Figure C.3.

The detection performance tests required for a detector will depend on the coverage angle claimed. Therefore this document differentiates between detectors with coverage angles less than or equal to 180°, such as those typically used for wall mounted applications, and detectors with coverage angles of 360° detectors intended for ceiling mounting.

4.2.2 Indication of detection

An indicator shall be provided at the detector to indicate when an intrusion signal or message has been generated. At grades 1 and 2 this indicator shall be capable of being enabled and disabled either remotely at Access Level 2 and/or locally enabled/disabled after removal of a cover which provides tamper detection as described in Tables 1 and 4. At grades 3 and 4 this indicator shall be capable of being enabled and disabled remotely at Access Level 2.

4.3 Operational requirements

4.3.1 Time interval between intrusion signals or messages

Detectors using wired interconnections 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.

Detectors using wire free interconnections shall be able to provide an intrusion signal or message after the end of the preceding intrusion signal or message within the following times:

Grade 1	300 s
Grade 2	180 s
Grade 3	30 s
Grade 4	15 s

4.3.2 Switch on delay

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

4.3.3 Self-tests

4.3.3.1 General

Self-tests shall detect failures of a critical function (e.g. unable to detect temperature differences) and signal these situations according to Table 2. As a minimum, the self-tests shall detect failures of the output of each sensing technology.

4.3.3.2 Local Self-Test

The detector shall automatically test itself at least once every 24 h according to the requirements of Tables 1 and 2. If normal operation of the detector is inhibited during a local self-test, the detector inhibition time shall be limited to a maximum of 30 s in any period of 2 h.

4.3.3.3 Remote Self-Test

A detector shall process remote self-tests and generate signals or messages in accordance with Tables 1 and 2 within 10 s of the remote self-test signal being received, and shall return to normal operation within 30 s of the remote test signal being received.

4.4 Immunity of the individual technologies to incorrect operation

4.4.1 General

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.

4.4.2 Immunity to turbulent warm air flow

The PIR component of the detector shall not initiate the generation of any signals or messages when turbulent warm air is blown over the face of the detector.

4.4.3 Immunity to visible & near infrared radiation

The PIR component of the detector shall not initiate the generation of any signals or messages when a beam of visible light is swept across the front window or lens through two panes of glass.

4.4.4 Immunity to microwave signal interference by fluorescent lights

The microwave component of the detector shall not initiate the generation of any signals or messages due to the operation of a fluorescent light source mounted nearby.

4.5 Tamper security

4.5.1 General

Tamper security requirements for each grade of detector are shown in Table 4.

Table 4 — 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
Detection of access to the inside of the detector	Not Required	Required	Required	Required
Removal from the mounting surface wired detectors	Not required	Not Required	Required	Required
Removal from the mounting surface wirefree detectors	Not required	Required	Required	Required
Resistance to, or detection of, re-orientation Applied torque	Not required	Required 2 Nm	Required 5 Nm	Required 10 Nm
Magnetic field immunity Magnet Type defined in Annex A	Not required	Required Type 1	Required Type 2	Required Type 2
Masking Detection	Not required	Not required	Required	Required

4.5.2 Resistance to and detection of unauthorised access to components and means of adjustment

All components, means of adjustment and access to mounting screws, which, when interfered with, could adversely affect the operation of the detector, shall be located within the detector housing. Such access shall require the use of an appropriate tool and depending on the grade as specified in Table 4 shall generate a tamper signal or message before access can be gained.

It shall not be possible to gain such access without generating a tamper signal or message or causing visible damage.

4.5.3 Detection of removal from the mounting surface

A tamper signal or message shall be generated if the detector is removed from its mounting surface for each claimed mounting type (e.g. wall, ceiling, corner, brackets) in accordance with Table 4.

The tamper detection mechanism shall not be defeated by the use of small tools as per the examples in Annex I.

4.5.4 Resistance to, or detection of, re-orientation

Detectors mounted on adjustable mountings, shall resist or detect reorientation.

After the torque given in Table 4 has been applied and then removed from the detector it shall not have rotated more than 5° from its original position. Alternatively, when the torque given in Table 4 has been applied, a tamper signal or message shall be generated if the detector rotates by more than 5°.

4.5.5 Immunity to magnetic field interference

It shall not be possible to inhibit any signal or message with a magnet of grade dependence according to Table 4. The magnet types shall be as described in Annex A.

4.5.6 Detection of masking

Means shall be provided to detect inhibition of the operation of the detector by masking according to the requirements of Table 4.