IEC 63180

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INTERNATIONAL STANDARD

NORME INTERNATIONALE

colour inside

Methods of measurement and declaration of the detection range of detectors – Passive infrared detectors for major and minor motion detection

Méthodes de mesure et qualification de la plage de détection des détecteurs – Détecteurs infrarouges passifs pour la détection de mouvements de forte et de faible amplitude

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INTERNATIONAL ELECTROTECHNICAL COMMISSION

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METHODS OF MEASUREMENT AND DECLARATION OF THE DETECTION RANGE OF DETECTORS –

Passive infrared detectors for major and minor motion detection

FOREWORD

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The text of this International Standard is based on the following documents:

FDIS	Report on voting
23B/1319/FDIS	23B/1320/RVD

Full information on the voting for the approval of this International Standard can be found in the report on voting indicated in the above table.

This document has been drafted in accordance with the ISO/IEC Directives, Part 2.

The committee has decided that the contents of this document will remain unchanged until the stability date indicated on the IEC website under "http://webstore.iec.ch" in the data related to the specific document. At this date, the document will be

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- withdrawn,
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- amended.

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INTRODUCTION

Passive infrared detectors are an important element in an energy efficient building. They allow for switching on and off and for controlling loads in order to achieve an optimum degree of comfort and energy efficiency.

The detectors covered in this document are motion detectors using passive infrared (PIR) technology in electronic control devices and appliance switches whether stand-alone (direct control of one or more applications) or as part of home and building electronic systems or building automation control systems (HBES/BACS) or similar. In the case of HBES/BACS, the resulting action depends on the programming of the relevant HBES/BACS.

The purpose of these detectors is to detect the movement of persons.

Detectors linked to a system may also be assigned other tasks: state reporting, power consumption, event reporting, scenarios, etc. These additional functions are not part of this document.

In order to achieve the energy efficiency targets and comfort, the detectors should operate accurately. In addition, the detection area will need to be provided with sufficient accuracy in order to allow integrators to choose the correct detectors for the needed action.

This document provides a methodology and test procedures for a manufacturer to declare and verify the detection performance of these devices with respect to the detection area.

METHODS OF MEASUREMENT AND DECLARATION OF THE DETECTION RANGE OF DETECTORS –

Passive infrared detectors for major and minor motion detection

1 Scope

This document provides a methodology and test procedures to be able to declare and verify the detection area for motion detectors using passive infrared technology in electronic control devices and appliance switches, whether stand-alone (direct control of one or more applications) or as part of home and building electronic systems or building automation control systems (HBES/BACS) or similar.

It also provides a uniform way to present the test results.

The purpose of these detectors is to detect the major and minor movements of persons.

2 Normative references

There are no normative references in this document.

3 Terms and definitions

For the purposes of this document, the following terms and definitions 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 http://www.iso.org/obp

3.1
infrared
IR
optical radiation for which the wavelengths in vacuum are longer than those for visible radiation, that is approximately between 780 nm and 1 mm

[SOURCE: IEC 60050-731:1991, 731-01-05]

3.2
passive infrared detector
electronic detector that measures infrared (IR) light radiating from humans in its field of view

3.3
motion detector
unit detecting motion that can be part of an electronic control device or an appliance switch

Note 1 to entry: "Electronic control device" is used as a general term to cover electronic switches, HBES/BACS switches and electronic extension units.

3.4
major motion
movement of a person walking into an area or walking within an area

3.5
radial motion
motion directly toward the motion detector

EXAMPLE See the example given in Figure 1.

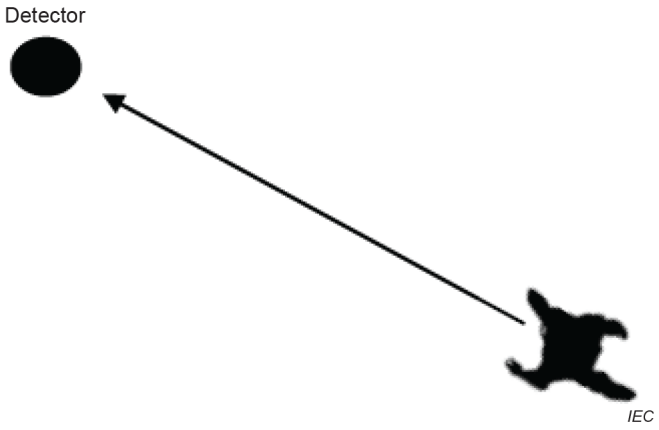

Figure 1 – Radial motion

3.6
tangential motion
motion laterally or obliquely to the motion detector

EXAMPLE See the example given in Figure 2.

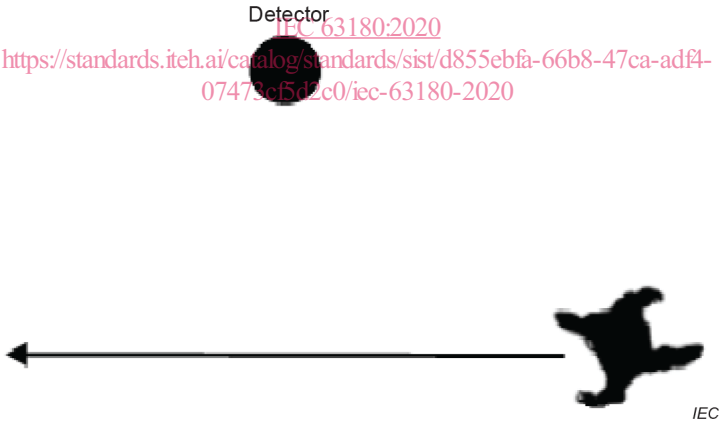

Figure 2 – Tangential motion

3.7
minor motion
small movements of a person or a part of a person within an area

Note 1 to entry: Typical examples of minor motion are in working areas, for example, offices, classrooms, meeting rooms, where the attendance time is long, and the motions of the persons are small (e.g. sitting activities with arm movements).

Note 2 to entry: Non-standardized terms for a minor motion detector are "presence detector" or "occupancy detector".

3.8
detection area
surface area in which the detector is specified to detect the motion of a person

EXAMPLE See the example given in Figure 3.

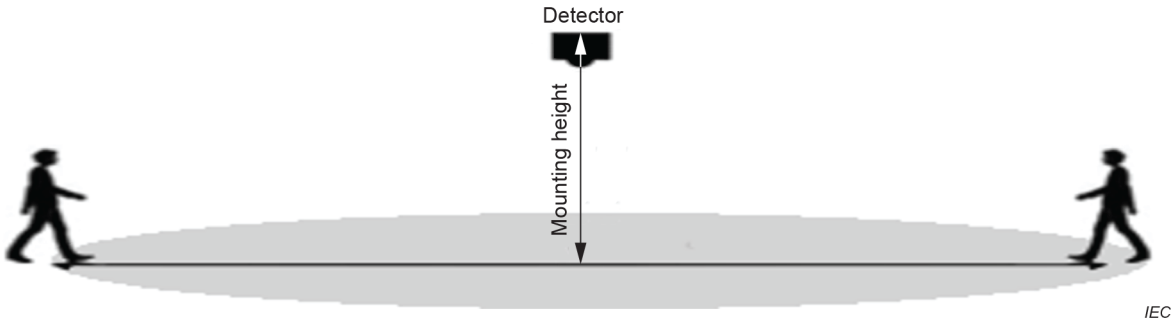

Figure 3 – Example of a major motion detector

3.9
non-detection area
surface area where detection is not expected

Note 1 to entry: Although it becomes unlikely that detection of persons will occur, triggering of the detector is not excluded in this area.

3.10
sensitivity
degree of response of a detector to an incoming signal

Note 1 to entry: Depending on the technology, sensitivity can be adjusted for certain parameters (e.g. range, amplification of infrared signal).

3.11
delay-time
duration of time from the moment the motion was last detected until the status of the controlled load is changed

3.12
dead time
time during which the detector is unable to detect after the delay-time and at start up

4 General requirements on tests

Detectors shall be mounted and installed according to the manufacturer's instructions.

Manufacturer's instructions regarding operation shall be applied to all tests, where applicable.

It is allowed to set the delay-time of detectors at minimum setting or in test mode. The sensitivity is set at maximum.

NOTE A modification of the detector software with a minimum value of 5 s for the delay-time can be necessary to shorten the test time in total.

During the test, the detectors shall be able to activate the load independently of the light level in the test room.

The dead time of the detector shall be considered according to the manufacturer's instructions. The timing of any persons' (dummy) movement and any test arm movement shall be adjusted accordingly.

Tests according to this document are type tests.

NOTE Type tests are defined in IEC 60050-581:2008, 581-21-08.

For detectors installed in an HBES/BACS, a minimum configuration is built to test the performance of the detectors. The digital output signal is monitored to verify the activation of the detectors or a load can be switched in the HBES/BACS. In the latter case the dead time of the HBES/BACS shall be taken into consideration.

The major motion test can be executed via a human walking test or via an automated test system as described in this document.

5 Test environment

The general ambient conditions in the test room shall be as follows:

– temperature 18 °C to 23 °C;
– relative humidity maximum 70 % RH.

The size of the room shall be large enough in order not to influence the test result.

The walls of the test room, if located within the coverage area of the detector, shall not influence the result.

NOTE This can be achieved by covering the detection area of the detector towards the wall or by covering the wall with a coating or a curtain.

During the tests, air movement (for example, air-conditioning) shall not affect the results; and the walls, floor and ceilings shall have a negligible effect on the reflection in the infrared range.

The room shall be a closed room and daylight entrance shall be limited. Direct sunlight on the test area is not allowed.

The use of artificial light shall not contain an IR component.

NOTE Artificial light without an IR component can be achieved using LED technology.

The supply voltage to the detector shall meet the following requirements:

– voltage stability ±3 %;
– frequency stability ±2 %;
– total harmonic distortion 5 %.

The temperature measurements shall be taken at 1,7 m ± 5 cm height from the floor. The temperature measurement shall be performed as close as possible to the centre of the expected detection area.

The temperature of walls, ceiling and floor of the test room shall be allowed to stabilize prior to testing.

NOTE It can be required to set the test room temperature several hours prior to testing.

The test room temperature and the temperature of the walls, ceiling and floor shall be stable within a tolerance of ±2 K during the tests.

When using test dummies and test arms to perform the tests, the difference between the temperature of these tools and that of the test room shall be stable during the tests within a tolerance of ±2 K.

There shall be no other people or moving objects in the coverage area.

6 Test equipment

6.1 Test person for major motion detection

The test person shall meet the following criteria:

– height: 1,7 m ± 10 cm;

– weight: 70 kg ± 10 kg.

The test person shall be dressed in tight fitting clothes with the hands and head exposed (e.g. bicycling clothes, running clothes) in such a way that, when measured with infrared camera on one point of the body, in the vicinity of the belly button, the test person achieves a temperature average of 7 K ± 2 K above the ambient temperature of the room.

NOTE The 7 K delta value was found to be the average surface temperature of people with only the head and hands exposed.

6.2 Test dummies for major motion detection when using automated test systems

For testing the detection area, a test dummy as given in Figure 4 shall be used.

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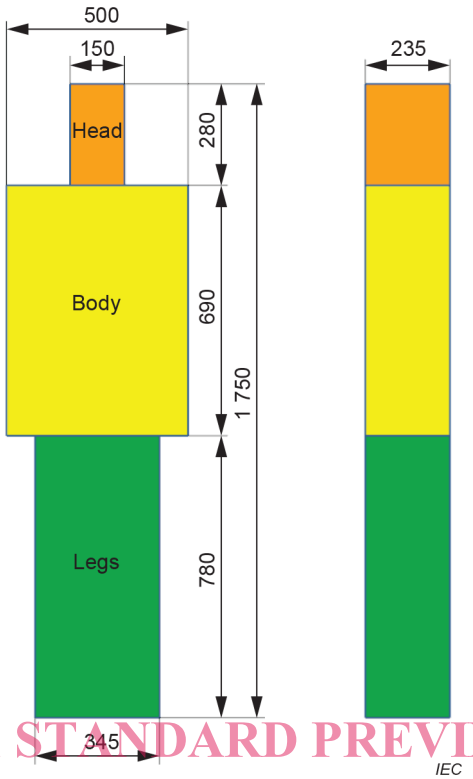
Figure 4 – Test dummy perspective view

For detectors with an installation height up to and including 3 m, a full-size test dummy as given in Figure 5 shall be used. Providing that a sufficiently large testing room is available, a full-size dummy can also be used for testing higher installation heights. If the test room is not large enough, smaller test dummies can be used as given in Figure 6 and Figure 7, and shall be chosen according to Table 1.

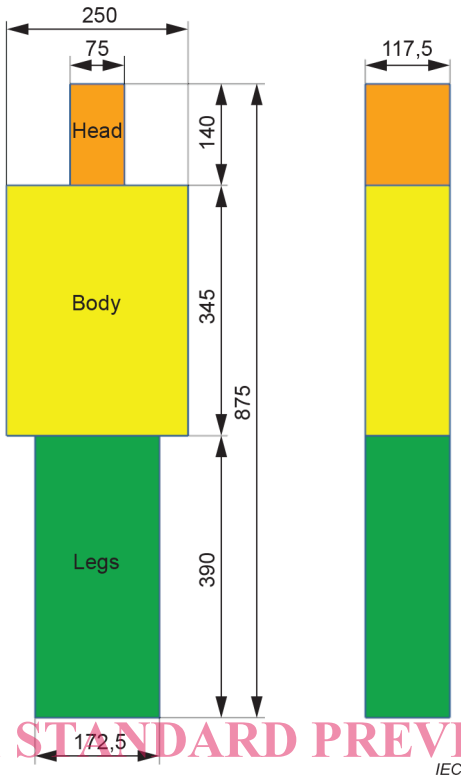
Dimensions in millimetres (tolerance ± 3 mm)



The temperature of the zone between the head and the shoulders, within 50 mm, is undefined.

Figure 5 – Full size test dummy for testing motion detection

Dimensions in millimetres (tolerance ± 3 mm)



The temperature of the zone between the head and the shoulders, within 30 mm, is undefined.

Figure 6 – Scaled 1:2 test dummy for testing motion detection