BS EN 50130-5:2011

BSI Standards Publication

# Alarm systems -

## Part 5: Environmental test methods

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## National foreword

This British Standard is the UK implementation of EN 50130-5:2011. It supersedes BS EN 50130-5:1999 which is withdrawn.

The UK participation in its preparation was entrusted to Technical Committee GW/1/1, Alarm components.

A list of organizations represented on this committee can be obtained on request to its secretary.

This publication does not purport to include all the necessary provisions of a contract. Users are responsible for its correct application.



ISBN 978 0 580 71074 2

ICS 13.310; 13.320

**Compliance with a British Standard cannot confer immunity from legal obligations.**

This British Standard was published under the authority of the Standards Policy and Strategy Committee on 31 August 2011.

**Amendments issued since publication**

| Date | Text affected |
|---|---|

EUROPEAN STANDARD

NORME EUROPÉENNE

EUROPÄISCHE NORM

# EN 50130-5

June 2011

ICS 13.320; 29.020

Supersedes EN 50130-5:1998

English version

# Alarm systems - Part 5: Environmental test methods

Systèmes d'alarme - Partie 5: Méthodes d'essai d'environnement

Alarmanlagen - Teil 5: Methoden für Umweltprüfungen



CENELEC

European Committee for Electrotechnical Standardization
Comité Européen de Normalisation Electrotechnique
Europäisches Komitee für Elektrotechnische Normung

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Ref. No. EN 50130-5:2011 E

## Foreword

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

The text of the draft was submitted to the formal vote and was approved by CENELEC as EN 50130-5 on 2011-06-13.

This document supersedes EN 50130-5:1998.

The main changes with respect to EN 50130-5:1998 are listed below:

1) updating of the referenced base standards to the latest editions, this updating has caused changes therefore in the test methods used in several clauses.

2) Clauses 8 and 9 have had changes made to the requirements in class IV limits.

3) Clause 27 was removed.

The following dates were fixed:

– latest date by which the EN has to be implemented at national level by publication of an identical national standard or by endorsement (dop) 2012-06-13

– latest date by which the national standards conflicting with the EN have to be withdrawn (dow) 2014-06-13

This European Standard is part of the EN 50130 series of standards. This series is intended to give the requirements applicable to alarm systems in general (e.g. the environmental test methods, in this case, and EMC immunity requirements in the case of EN 50130-4). The following associated series of European standards are intended to give the other requirements (e.g. performance requirements), which are applicable to the specific types of alarm systems:

- EN 50131 Alarm systems – Intrusion and hold-up systems;

- EN 50132 Alarm systems – CCTV surveillance systems for use in security applications;

- EN 50133 Alarm systems – Access control systems for use in security applications;

- EN 50134 Alarm systems – Social alarm systems;

- EN 50136 Alarm systems – Alarm transmission systems and equipment;

- CLC/TS 50398 Alarm systems – Combined and integrated alarm systems – General requirements.

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## 1 Scope

This European Standard specifies environmental test methods to be used for testing the system components of the following alarm systems, intended for use in and around buildings:

- intruder alarm systems;
- hold-up alarm systems;
- social alarm systems;
- CCTV systems, for security applications;
- access control systems, for security applications;
- alarm transmission systems [1)].

This European Standard specifies three equipment classes (fixed, movable & portable equipment) and four environmental classes.

The environmental classes only include the general service environments envisaged for equipment installed in typical residential, commercial and industrial environments. It may be necessary for the product standard to require additional or different environmental tests or severities where

a) there could be specific environmental problems (e.g. some different severities may be required for break glass detectors stuck to glass windows, due to the local extremes of temperature and humidity),

b) the test exposure falls within the intended detection phenomenon of the detector (e.g. during a vibration test on a seismic detector).

In order to provide reproducible test methods and to avoid the proliferation of technically similar test methods, the test procedures have been chosen, where possible, from internationally accepted standards (e.g. IEC publications). For specific guidance on these tests, reference should be made to the appropriate document, which is indicated in the relevant sub-section. For more general guidance and background information on environmental testing, reference should be made to EN 60068-1 and to the EN 60068-3 series.

This European Standard does not specify

a) the requirements or performance criteria to be applied, which should be specified in the relevant product standard,

b) special tests only applicable to a particular device (e.g. the effects of turbulent air draughts on ultrasonic movement detectors),

c) basic safety requirements, such as protection against electrical shocks, unsafe operation, insulation coordination and related dielectric tests,

d) tests relating to deliberate acts of damage or tampering.

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1) Apart from equipment which is part of a public communication network.

## 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 60068-1:1994 | Environmental testing – Part 1: General and guidance (IEC 60068-1:1988 + corr. Oct. 1988 + A1:1992) |
| 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 60068-2-5:1999 | Environmental testing – Part 2-5: Tests – Test Sa: Simulated solar radiation at ground level (IEC 60068-2-5:1975) |
| EN 60068-2-6:2008 | Environmental testing – Part 2-6: Tests – Test Fc: Vibration (sinusoidal) (IEC 60068-2-6:2007) |
| EN 60068-2-14:2009 | Environmental testing – Part 2-14: Tests – Test N: Change of temperature (IEC 60068-2-14:2009) |
| EN 60068-2-18:2001 | Environmental testing – Part 2-18: Tests – Tests R and guidance: Water (IEC 60068-2-18:2000) |
| EN 60068-2-27:2009 | Environmental testing – Part 2-27: Tests – Test Ea and guidance: Shock (IEC 60068-2-27:2008) |
| EN 60068-2-30:2005 | Environmental testing – Part 2-30: Tests – Test Db: Damp heat, cyclic (12 h + 12 h cycle) (IEC 60068-2-30:2005) |
| EN 60068-2-31:2008 | Environmental testing – Part 2-31: Tests – Test Ec: Rough handling shocks, primarily for equipment-type specimens (IEC 60068-2-31:2008) |
| EN 60068-2-42:2003 | Environmental testing – Part 2-42: Tests – Test Kc: Sulphur dioxide test for contacts and connections (IEC 60068-2-42:2003) |
| EN 60068-2-52:1996 | Environmental testing – Part 2-52: Tests – Test Kb: Salt mist, cyclic (sodium chloride solution) (IEC 60068-2-52:1996) |
| EN 60068-2-75:1997 | Environmental testing – Part 2-75: Tests – Test Eh: Hammer tests (IEC 60068-2-75:1997) |
| EN 60068-2-78:2001 | Environmental testing – Part 2-78: Tests – Test Cab: Damp heat, steady state (IEC 60068-2-78:2001) |
| EN 60529:1991 + corr. May. 1993 + A1:2000 | Degrees of protection provided by enclosures (IP Code) (IEC 60529:1989 + A1:1999) |
| EN 62262:2002 | Degrees of protection provided by enclosures for electrical equipment against external mechanical impacts (IK code) (IEC 62262:2002) |

## 3 Terms and definitions

For the purposes of this document, the following terms and definitions apply.

**3.1**
**intruder alarm system**
alarm system to detect and indicate the presence, entry or attempted entry of an intruder into supervised premises

**3.2**
**hold-up alarm system**
alarm system designed to permit the deliberate creation of an alarm condition in the case of a hold-up

**3.3**
**social alarm system**
alarm system providing facilities to summon assistance for use by persons, who can be considered to be living at risk

**3.4**
**fixed equipment**
equipment fastened to a support or otherwise secured in a specific location, or equipment not provided with a carrying handle and having such a mass that it cannot easily be moved

EXAMPLE An intruder alarm system control panel screwed to the wall.

**3.5**
**movable equipment**
equipment which is not fixed equipment and which is not normally in operation while the location is changed

EXAMPLE A local unit or controller for a social alarm system, which is placed on a table top.

**3.6**
**portable equipment**
equipment designed to be in operation while being carried

EXAMPLE Access control "smart card" badge, electronic key, social alarm trigger device carried by the user.

**3.7**
**preconditioning**
treatment of a specimen, before conditioning, with the object of removing or partly counteracting the effects of its previous history

**3.8**
**conditioning**
exposure of a specimen to environmental conditions in order to determine the effect of such conditions on the specimen

**3.9**
**recovery**
treatment of a specimen, after conditioning, in order that the properties of the specimen may be stabilised before measurement

## 4 Environmental classes

This European Standard specifies the tests and severities to be used for each of the following environmental classes:

**I** **Indoor but restricted to residential/office environment**
(e.g. living rooms and offices)

**II** **Indoor in general**
(e.g. sales floors, shops, restaurants, stairways, manufacturing and assembly areas, entrances and storage rooms)

**III** **Outdoor but sheltered from direct rain and sunshine, or indoor with extreme environmental conditions**
(e.g. garages, lofts, barns and loading bays)

**IV** **Outdoor in general**

Classes I, II, III and IV are progressively more severe, and therefore class IV equipment may be used in class III applications, etc.

A special suffix "A" can be added to classes III & IV, to cater for the especially cold conditions found in the very north of Europe. The environmental classes IIIA & IVA are identical to classes III & IV, respectively, apart from the conditioning temperature in the Cold (operational) and Temperature change (operational) tests. The testing for classes IIIA & IVA shall therefore be conducted as for classes III & IV, respectively, except for these tests, in which the lower conditioning temperature, indicated in the appropriate tables (see 10.3.4 & 11.3.4), shall be used.

## 5 Standard laboratory conditions

Unless otherwise specified, the atmospheric conditions in the laboratory shall be the standard atmospheric conditions for measurements and tests, specified in EN 60068-1:1994, 5.3.1, as follows:

- temperature: 15 °C to 35 °C;
- relative humidity: 25 % to 75 %;
- air pressure: 86 kPa to 106 kPa.

NOTE 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.

## 6 Tolerances

Unless otherwise stated, the tolerances for the environmental test parameters shall be as given in the basic reference standards for the test (e.g. the relevant part of the EN 60068-2 series).

## 7 Information to be included in the relevant product standard

The following information, which is required to conduct the environmental tests, shall be included in the relevant product standard making reference to this standard:

a) the equipment class (fixed, movable or portable - see Clause 3);

b) the mounting arrangements for the specimen;

c) any deviations from the specified test procedure(s) or test severity(ies);

d) any initial measurements or inspections, to be made before the conditioning (e.g. a functional test);

e) the state of the specimen required during the conditioning (e.g. the configuration and operating conditions);

f) any monitoring of the specimen and any measurements or inspections to be made during the conditioning (e.g. a functional test, where possible);

g) any final measurements or inspections to be made after the conditioning (e.g. a functional test and a visual inspection) and any special recovery conditions required before these measurements;

h) the pass/fail criteria;

i) the test schedule, which gives the allocation of specimens to each test.

The following points should be taken into account during the drafting of the product standard making reference to this standard:

- the information, a) to h) above, may differ from test to test or between types of tests (e.g. between Operational & Endurance tests);

- for some types of equipment, it may not be possible to make the usual functional test during the conditioning of some of the tests, due to limitations imposed on the equipment (e.g. being placed inside an environmental chamber). It may therefore be necessary to conduct a reduced functional test or to omit the functional test during conditioning. In other tests, it is not possible to do a functional test during conditioning, due to the transitory or changing nature of the conditioning;

- the product standards should indicate whether any memory back up batteries should remain connected during endurance tests, and if so whether the memory contents should be retained.

## 8 Dry heat (operational)

### 8.1 Object of the test

The object of the test is to demonstrate the ability of the equipment to function correctly at high ambient temperatures, which may occur for short periods in the anticipated service environment.

### 8.2 Principle

The test consists of exposing the specimen to the high temperature for sufficient time to allow temperature stability to be reached, and for functional tests and/or monitoring to be conducted. 'Free air' conditions are simulated for heat dissipating specimens to allow for self heating effects.

### 8.3 Test procedure

#### 8.3.1 General

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

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

The dry heat operational test may be combined with the dry heat endurance test by omitting the recovery and the functional test in between.

### 8.3.2 Initial measurements

Before the conditioning, subject the specimen to the initial measurements required by the product standard.

### 8.3.3 State of specimen during conditioning

Mount the specimen and place it in the configuration and operating condition, as specified in the product standard.

### 8.3.4 Conditioning

Apply the appropriate severity of conditioning shown in Table 1.

**Table 1 – Dry heat (operational) – Conditioning**

| **Equipment class** | | **Fixed, movable and portable** | | |
|---|---|---|---|---|
| Environmental class | | I | II & III | IV |
| Temperature | (°C) | 40 | 55 | 70 or 55 [a] |
| Duration | (h) | 16 | 16 | 16 |

[a] The test at 70 °C includes, by simple means, the effect of heat radiation from the sun. If this simple means is not considered suitable, then the test shall be conducted at 55 °C and the simulated solar radiation test, temperature rise (operational) (Clause 24) shall also be applied.

### 8.3.5 Measurements during conditioning

Monitor the specimen during the conditioning period to detect any change in status. Any further measurements, which the product standard requires to be made during the conditioning, shall be made during the last half hour of the conditioning period.

### 8.3.6 Final measurements

After a recovery period of at least 1 h at standard laboratory conditions, subject the specimen to the final measurements required by the product standard.

## 9 Dry heat (endurance)

### 9.1 Object of the test

The object of the test is to demonstrate the ability of the equipment to withstand long term ageing effects.

### 9.2 Principle

The test consists of exposing the specimen to the high temperature for a long period to accelerate ageing effects.

### 9.3 Test procedure

#### 9.3.1 General

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

Use test Bb for non heat dissipating specimen.

The dry heat endurance test may be combined with the dry heat operational test by omitting the recovery and the functional test in between.

#### 9.3.2 Initial measurements

Before the conditioning, subject the specimen to the initial measurements required by the product standard.

#### 9.3.3 State of specimen during conditioning

Mount the specimen as specified in the product standard. The specimen shall not be supplied with power during the conditioning.

#### 9.3.4 Conditioning

Apply the appropriate severity of conditioning shown in Table 2.

**Table 2 – Dry heat (endurance) – Conditioning**

| **Equipment class** | **Fixed, movable and portable** | |
|---|---|---|
| Environmental class | I, II & III | IV |
| Temperature (°C) | No test | 55 |
| Duration (days) | | 21 |

#### 9.3.5 Measurements during conditioning

None.

#### 9.3.6 Final measurements

After a recovery period of at least 1 h at standard laboratory conditions, subject the specimen to the final measurements required by the product standard.

# 10 Cold (operational)

## 10.1 Object of the test

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

## 10.2 Principle

The test consists of exposing the specimen to the low temperature for sufficient time to allow temperature stability to be reached, and for functional tests and/or monitoring to be conducted. 'Free air' conditions are simulated for heat dissipating specimens to allow for self heating effects.

## 10.3 Test procedure

### 10.3.1 General

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.

### 10.3.2 Initial measurements

Before the conditioning, subject the specimen to the initial measurements required by the product standard.

### 10.3.3 State of specimen during conditioning

Mount the specimen and place it in the configuration and operating condition, as specified in the product standard.

### 10.3.4 Conditioning

Apply the appropriate severity of conditioning shown in Table 3.

**Table 3 – Cold (operational) – Conditioning**

| **Equipment class** | | **Fixed, movable and portable** | | |
|---|---|---|---|---|
| Environmental class | | I | II | III & IV |
| Temperature | (°C) | +5 | -10 | -25 [a] |
| Duration | (h) | 16 | 16 | 16 |
| [a] This temperature is -40 °C for classes IIIA & IVA (see Clause 4). | | | | |

### 10.3.5 Measurements during conditioning

Monitor the specimen during the conditioning period to detect any change in status. Any further measurements, which the product standard requires to be made during the conditioning, shall be made during the last half hour of the conditioning period.

### 10.3.6 Final measurements

After a recovery period of at least 1 h at standard laboratory conditions, subject the specimen to the final measurements required by the product standard.

## 11 Temperature change (operational)

### 11.1 Object of the test

To demonstrate the ability of portable equipment to function correctly when exposed to temperature shocks when carried back and forth between normal and cold ambient temperature.

### 11.2 Principle

The test consists of exposing the specimen to a succession of changes of temperature. The specimen is moved from one test chamber to another.

### 11.3 Test procedure

#### 11.3.1 General

The test apparatus and procedure shall generally be as described in EN 60068-2-14:2009. Test Na with rapid change of temperature, with prescribed time of transition, shall be used.

#### 11.3.2 Initial measurements

Before the conditioning, subject the specimen to the initial measurements required by the product standard.

#### 11.3.3 State of specimen during conditioning

Mount the specimen and place it in the configuration and operating condition, as specified in the product standard.

#### 11.3.4 Conditioning

Apply the appropriate severity of conditioning shown in Table 4.

**Table 4 – Temperature change (operational) – Conditioning**

| **Equipment class** | | **Portable** | | |
|---|---|---|---|---|
| Environmental class | | I | II | III & IV |
| Low temperature $T_A$ | (°C) | +5 | -10 | -25 [a] |
| High temperature $T_B$ | (°C) | +30 | +30 | +30 |
| Exposure time $t_1$ | (h) | 1 | 1 | 1 |
| Change-over time $t_2$ | (min) | 2 to 3 | 2 to 3 | 2 to 3 |
| Number of cycles | | 4 | 4 | 4 |

[a] For classes IIIA & IVA (see Clause 4), make this temperature -40 °C.

### 11.3.5 Measurements during conditioning

Monitor the specimen during the conditioning period to detect any change in status. Any further measurements, which the product standard requires to be made during the conditioning, shall be made during the first 10 min of the high temperature and low temperature conditioning periods of the last cycle.

### 11.3.6 Final measurements

After a recovery period of at least 1 h at standard laboratory conditions, subject the specimen to the final measurements required by the product standard.

## 12 Damp heat, steady state (operational)

### 12.1 Object of the test

The object of the test is to demonstrate the ability of the equipment to function correctly at high relative humidity (without condensation) which may occur for short periods in the service environment.

### 12.2 Principle

The test consists of exposing the specimen to a constant temperature and 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.

### 12.3 Test procedure

#### 12.3.1 General

The test apparatus and procedure shall be as described in EN 60068-2-78:2001. The damp heat steady state operational test may be combined with the damp heat steady state endurance test by omitting the recovery and the functional test in between.

#### 12.3.2 Initial measurements

Before the conditioning, subject the specimen to the initial measurements required by the product standard.

#### 12.3.3 State of specimen during conditioning

Mount the specimen and place it in the configuration and operating condition, as specified in the product standard.

#### 12.3.4 Conditioning

Apply the appropriate severity of conditioning shown in Table 5.

**Table 5 – Damp heat, steady state (operational) – Conditioning**

| **Equipment class** | | **Fixed, movable and portable** | |
|---|---|---|---|
| Environmental class | | I | II, III & IV |
| Temperature | (°C) | 40 | No test [a] |
| Relative humidity | (%) | 93 | |
| Duration | (days) | 4 | |

[a] This condition is covered by the damp heat cyclic (operational test). If no such damp heat cyclic test is to be made then the test indicated for environmental class I should be conducted for classes II, III & IV.

### 12.3.5 Measurements during conditioning

Monitor the specimen during the conditioning period to detect any change in status. Any further measurements, which the product standard requires to be made during the conditioning, shall be made during the last half hour of the conditioning period.

### 12.3.6 Final measurements

After a recovery period of at least 1 h at standard laboratory conditions, subject the specimen to the final measurements required by the product standard.

## 13 Damp heat, steady state (endurance)

### 13.1 Object of the test

The object of the test is to demonstrate the ability of the equipment to withstand the long-term effects of humidity in the service environment (e.g. changes in electrical properties due to absorption, chemical reactions involving moisture, galvanic corrosion, etc.).

### 13.2 Principle

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

A long period of exposure is chosen to allow effects due to absorption and chemical changes to take place.

### 13.3 Test procedure

#### 13.3.1 General

The test apparatus and procedure shall be as described in EN 60068-2-78:2001.

The damp heat steady state endurance test may be combined with the damp heat steady state operational test by omitting the recovery and the functional test in between.

#### 13.3.2 Initial measurements

Before the conditioning, subject the specimen to the initial measurements required by the product standard.

### 13.3.3 State of specimen during conditioning

Mount the specimen as specified in the product standard. The specimen shall not be supplied with power during the conditioning.

### 13.3.4 Conditioning

Apply the appropriate severity of conditioning shown in Table 6.

**Table 6 – Damp heat, steady state (endurance) – Conditioning**

| **Equipment class** | | **Fixed, movable and portable** |
|---|---|---|
| Environmental class | | I, II, III & IV |
| Temperature | (°C) | 40 |
| Relative humidity | (%) | 93 |
| Duration | (days) | 21 |

### 13.3.5 Measurements during conditioning

None.

### 13.3.6 Final measurements

After a recovery period of at least 1 h at standard laboratory conditions, subject the specimen to the final measurements required by the product standard.

## 14 Damp heat, cyclic (operational)

### 14.1 Object of the test

The object of the test is to demonstrate the immunity of the equipment to an environment with high relative humidity, where condensation occurs on the equipment.

### 14.2 Principle

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 80 % 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.

### 14.3 Test procedure

#### 14.3.1 General

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.

The damp heat cyclic operational test may be combined with the damp heat cyclic endurance test by omitting the recovery and the functional test in between.

### 14.3.2 Initial measurements

Before the conditioning, subject the specimen to the initial measurements required by the product standard.

### 14.3.3 State of specimen during conditioning

Mount the specimen and place it in the configuration and operating condition, as specified in the product standard.

### 14.3.4 Conditioning

Apply the appropriate severity of conditioning shown in Table 7.

**Table 7 – Damp heat, cyclic (operational) – Conditioning**

| **Equipment class** | **Fixed, movable and portable** | | |
|---|---|---|---|
| Environmental class | I | II | III & IV |
| Upper temperature (°C) | No test | 40 | 55 |
| Cycles | | 2 | 2 |

### 14.3.5 Measurements during conditioning

Monitor the specimen during the conditioning period to detect any change in status. Any further measurements, which the product standard requires to be made during the conditioning, shall be made during the last half hour of the high temperature phase of the last cycle.

### 14.3.6 Final measurements

After the recovery period, subject the specimen to the final measurements required by the product standard.

## 15 Damp heat, cyclic (endurance)

### 15.1 Object of the test

The object of the test is to demonstrate the ability of the equipment to withstand the long-term effects of high humidity and condensation.

### 15.2 Principle

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 80 % 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.

### 15.3 Test procedure

#### 15.3.1 General

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.

The damp heat cyclic endurance test may be combined with the damp heat cyclic operational test by omitting the recovery and the functional test in between.

#### 15.3.2 Initial measurements

Before the conditioning, subject the specimen to the initial measurements required by the product standard.

#### 15.3.3 State of specimen during conditioning

Mount the specimen as specified in the product standard. The specimen shall not be supplied with power during the conditioning.

#### 15.3.4 Conditioning

Apply the appropriate severity of conditioning shown in Table 8.

**Table 8 – Damp heat, cyclic (endurance) – Conditioning**

| **Equipment class** | | **Fixed, movable and portable** | |
|---|---|---|---|
| Environmental class | | I & II | III & IV |
| Upper temperature | (°C) | No test | 55 |
| Cycles | | | 6 |

#### 15.3.5 Measurements during conditioning

None.

#### 15.3.6 Final measurements

After the recovery period, subject the specimen to the final measurements required by the product standard.

## 16 Water ingress (operational)

### 16.1 Object of the test

The object of the test is to demonstrate that the equipment is appropriately protected against the ingress of water.

### 16.2 Principle

The test consists of exposing the specimen to water applied in different ways depending on the type of protection required (i.e. falling drops at up to 15° to the vertical, water sprayed from all possible directions or for portable devices, which the manufacturer specifies as being resistant to immersion, total immersion).

### 16.3 Test procedure

#### 16.3.1 General

The test apparatus and procedure shall be as described in EN 60068-2-18:2001. The procedure for test Ra2 shall be used for dripping water, the procedure for test Rb2.1 or Rb2.2 shall be used for spraying water, and the procedure for test Rc1 shall be used for total immersion.

#### 16.3.2 Initial measurements

Before the conditioning, subject the specimen to the initial measurements required by the product standard.

#### 16.3.3 State of specimen during conditioning

Mount the specimen and place it in the configuration and operating condition, as specified in the product standard. The specimen shall be mounted in its intended orientation in accordance with the manufacturer's installation instructions, using any weather protection accessories provided, and the appropriate cable and cable glands, etc.

#### 16.3.4 Conditioning

Apply the appropriate severity of conditioning shown in Table 9 or Table 10.

**Table 9 – Water ingress (operational) – Conditioning for fixed and movable equipment class**

| **Equipment class** | | **Fixed and movable** | | |
|---|---|---|---|---|
| Environmental class | I & II | III | IV | |
| Test procedure | No test | Ra2 | Rb1.1 or Rb1.2 | |
| Tilt angle of specimen, α (°) | | 15 | | |
| Intensity (mm × $h^{-1}$) | | 180 (+30 -0) | | |
| Drop falling height (m) | | 0,2 | | |
| Tube type | | | 2 | |
| Spray angle, α (°) | | | ± 90 | ± 180 [a] |
| Tube oscillating angle, β (°) | | | ± 180 | |
| Water flow / nozzle ($dm^3$ × $min^{-1}$) | | | (0,07 ± 5) % | |
| Nozzle orifice diameter (mm) | | | 0,40 | |
| Water flow rate ($dm^3$ × $min^{-1}$) | | | | (10 ± 5) % |
| Duration (min) | | 10 | 10 | 15 [b] |
| Similar EN 60529 classification | | IPX2 | IPX4 | |

[a] From all directions with the shield removed.

[b] 3 min per $m^2$ surface area with a minimum of 15 min.

**Table 10 – Water ingress (operational) – Conditioning for portable equipment class**

| **Equipment class** | **Portable** | | | |
|---|---|---|---|---|
| Environmental class | I & II | III & IV | | Optional [a] |
| Test procedure | Ra2 | Rb1.1 or Rb1.2 | | Rc1 |
| Tilt angle of specimen, α (°) | 15 | | | |
| Intensity (mm × $h^{-1}$) | 180 (+30 -0) | | | |
| Drop falling height (m) | 0,2 | | | |
| Spray angle, α (°) | | ± 90 | ± 180 [b] | |
| Tube oscillating angle, β (°) | | ± 180 | | |
| Water flow / nozzle ($dm^3$ × $min^{-1}$) | | (0,07 ± 5) % | | |
| Nozzle orifice diameter (mm) | | 0,40 | | |
| Water flow rate ($dm^3$ × $min^{-1}$) | | | (10 ± 5) % | |
| Head of water (m) | | | | 0,40 |
| Duration (min) | 10 | 10 | 15 [c] | 30 |
| Similar EN 60529 classification | IPX2 | IPX4 | | IPX7 |

[a] This severity shall be applied if the manufacturer specifies that the device is resistant to immersion in water.

[b] From all directions with the shield removed.

[c] 3 min per $m^2$ surface area with a minimum of 15 min.

### 16.3.5 Measurements during conditioning

Monitor the specimen during the conditioning period to detect any change in status.

### 16.3.6 Final measurements

After the conditioning, subject it to the final measurements required by the product standard and inspect it for any damage or water ingress.

NOTE Any special recovery conditions required before the final measurements (e.g. drying of the specimen) should be specified in the product standard. The product standard should also state whether it is acceptable for water to have entered the specimen enclosure. In the case where this is not stated, then the manufacturer should state if water penetration is acceptable.

## 17 Sulphur dioxide ($SO_2$) (endurance)

### 17.1 Object of the test

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

### 17.2 Principle

The test consists of exposing the specimen to a test atmosphere containing sulphur dioxide at a constant temperature and high relative humidity. The test conditions should maintain the surface temperature of the specimen above the dew point. The presence of hygroscopic materials on the specimen or formed as corrosive products may, however, lead to condensation appearing.

### 17.3 Test procedure

#### 17.3.1 General

The test apparatus and procedure shall be generally as described in EN 60068-2-42:2003, except for the relative humidity of the test atmosphere, which shall be maintained at (93 ± 3) % instead of (75 ± 5) %.

#### 17.3.2 Initial measurements

Before the conditioning, subject the specimen to the initial measurements required by the product standard.

#### 17.3.3 State of specimen during conditioning

Mount the specimen as specified in the product standard. The specimen shall not be supplied with power during the conditioning. However, it shall have untinned copper wires, of the appropriate diameter, connected to sufficient terminals to allow the functional test to be made after conditioning, without making further connections to the specimen.

#### 17.3.4 Conditioning

Apply the appropriate severity of conditioning shown in Table 11.

**Table 11 – Sulphur dioxide ($SO_2$) (endurance) – Conditioning**

| **Equipment class** | **Fixed, movable and portable** | | | |
|---|---|---|---|---|
| Environmental class | I | II | III | IV |
| Sulphur dioxide concentration (Vol/Vol) | No test | $25 \times 10^{-6}$ | $25 \times 10^{-6}$ | $25 \times 10^{-6}$ |
| Temperature (°C) | | 25 | 25 | 25 |
| Relative humidity (%) | | 93 | 93 | 93 |
| Duration (days) | | 4 | 10 | 21 |

#### 17.3.5 Measurements during conditioning

None.

#### 17.3.6 Final measurements

Immediately after the conditioning, subject the specimen to a drying period of 16 h at 40 °C, ≤ 50 % RH, followed by a recovery period of at least 1 h at standard laboratory conditions, and then subject the specimen to final measurements required by the product standard and then inspect it visually for mechanical damage both externally and internally.

## 18 Salt mist, cyclic (endurance)

### 18.1 Object of the test

To demonstrate an adequate level of protection against corrosion for equipment exposed to the elements.

### 18.2 Principle

The test consists of exposing the specimen, when mounted in its normal position, to a specified number of periods of spraying by a salt mist, each followed by a period of storage under humid conditions.

### 18.3 Test procedure

#### 18.3.1 General

The test apparatus and procedure shall comply with the requirements of EN 60068-2-52:1996.

#### 18.3.2 Initial measurements

Before the conditioning, subject the specimen to the initial measurements required by the product standard.

#### 18.3.3 State of specimen during conditioning

The specimen shall be mounted in its intended orientation in accordance with the manufacturer's installation instructions, using any weather protection accessories provided, and the appropriate cable and cable glands etc.

The specimen shall not be supplied with power during the conditioning. It shall, however, have untinned copper wires, of the appropriate diameter, connected to sufficient terminals to allow for the functional test to be made after conditioning, without making further connections to the specimen.

### 18.3.4 Conditioning

Apply the appropriate severity of conditioning shown in Table 12.

**Table 12 – Salt mist, cyclic (endurance) – Conditioning**

| **Equipment class** | | **Fixed, movable and portable** | |
|---|---|---|---|
| Environmental class | | I, II & III | IV |
| Total duration | (days) | No test | 28 |
| Number of cycles | | | 4 |
| Salt mist exposure: salt (NaCl) concentration | (% [a]) | | 5 |
| pH of salt solution | | | 6,5 to 7,2 |
| Temperature | (°C) | | 15 to 35 |
| Duration per cycle | (h) | | 2 |
| Damp heat exposure: temperature | (°C) | | 40 |
| Relative humidity | (%) | | 93 |
| Duration per cycle | (h) | | 166 |

[a] By weight.

### 18.3.5 Measurements during conditioning

None.

### 18.3.6 Final measurements

After the conditioning, allow the specimen to cool under standard laboratory conditions for 1 h to 2 h, and then subject it to the final measurements required by the product standard, and inspect it for mechanical damage both externally and internally.

NOTE Any special cleaning procedure(s) required before the final measurements (e.g. drying of the specimen) should be specified in the product standard.

## 19 Shock (operational)

### 19.1 Object of the test

To demonstrate the immunity of the equipment to mechanical shocks, which are likely to occur, in the service environment.

### 19.2 Principle

The test consists of subjecting the specimen to a number of shock pulses, applied via the normal mounting points. The shock pulse is defined by the maximum acceleration amplitude, the duration, and the shape of the acceleration/time relationship. The pulse shape chosen (i.e. a half sine wave) is unlikely to occur, in practice in such a pure form, but provides a reproducible method of simulating the effects of more realistic shocks.

The shock amplitude (peak acceleration) is related to the mass of the specimen, as shown in Figure 1, in order to limit the energy imparted to heavier specimens.

### 19.3 Test procedure

#### 19.3.1 General

The test apparatus and procedure shall generally be as described in EN 60068-2-27:2009, for a half sine wave pulse, but with the peak acceleration related to specimen mass as indicated below.

#### 19.3.2 Initial measurements

Before the conditioning, subject the specimen to the initial measurements required by the product standard.

#### 19.3.3 State of specimen during conditioning

Mount the specimen and place it in the configuration and operating condition, as specified in the product standard.

#### 19.3.4 Conditioning

Apply the appropriate severity of conditioning shown in Table 13.

**Table 13 – Shock (operational) – Conditioning**

| **Equipment class** | | **Fixed, movable [a] and portable [a]** |
|---|---|---|
| Environmental class | | I, II, III & IV |
| Pulse duration | (ms) | 6 |
| Peak acceleration $\hat{A}$ related to the specimen mass $M$ [b] | ($m \times s^{-2}$), (kg): | |
| | $M < 4{,}75$ | $\hat{A} = 1\,000 - (200 \times M)$ |
| | $M \geq 4{,}75$ | No test |
| Number of shock directions | | 6 [c] |
| Number of pulses per direction | | 3 |

[a] For movable and portable devices, the shock test is omitted if false alarm is not accepted in the free fall test.

[b] See Figure 1.

[c] Both directions (+ & -) in each of three mutually perpendicular axes.

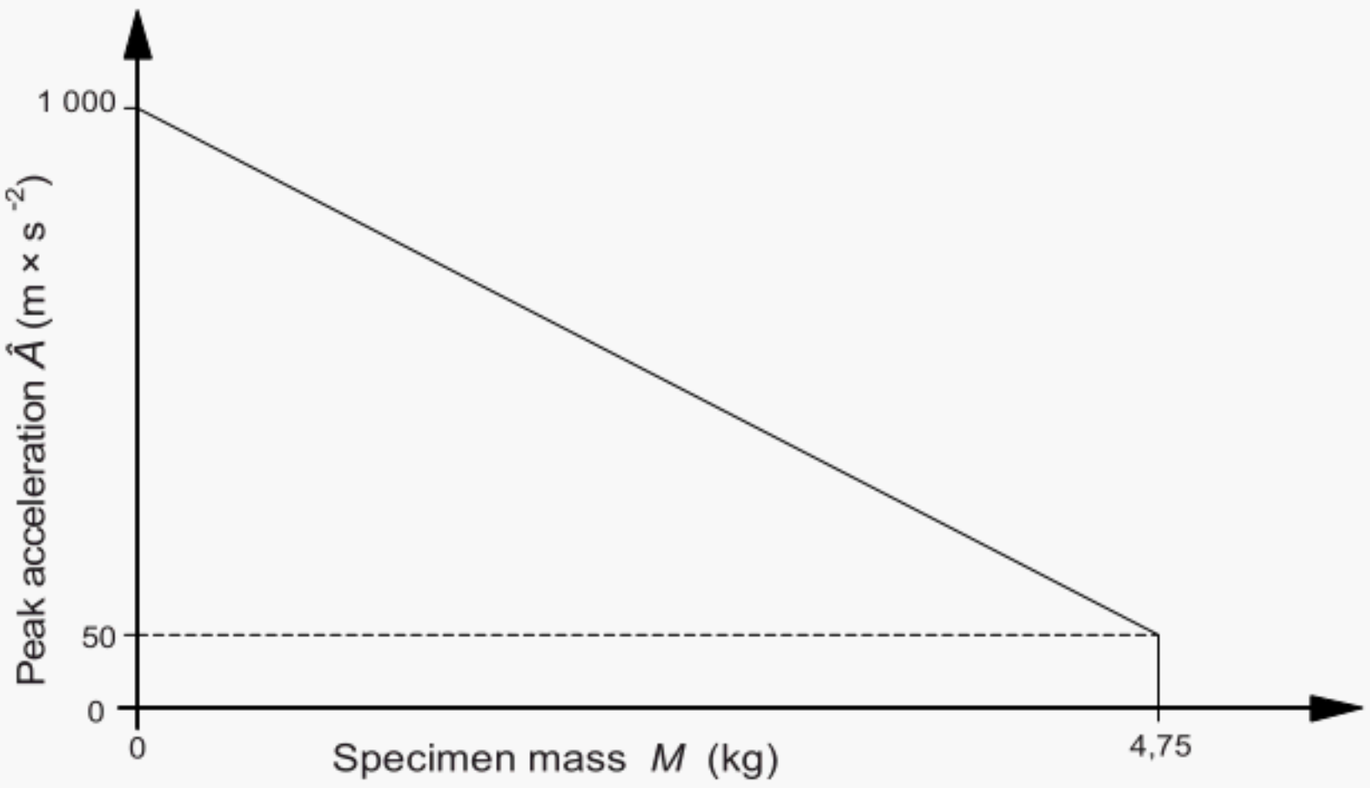


**Figure 1 – Graph showing peak acceleration vs. specimen mass**

### 19.3.5 Measurements during conditioning

Monitor the specimen during the conditioning period to detect any change in status.

### 19.3.6 Final measurements

After the conditioning, subject the specimen to the final measurements required by the product standard and inspect it visually for mechanical damage both externally and internally.

## 20 Impact (operational)

### 20.1 Object of the test

To demonstrate the immunity of fixed or movable equipment to mechanical impacts upon the surface, which it may sustain in the normal service environment and which it can reasonably be expected to withstand.

### 20.2 Principle

The test consists of subjecting the specimens to impacts from a small hemispherical hammer-head on any exposed surface of the specimen.

### 20.3 Test procedure

#### 20.3.1 General

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

Impacts shall be applied to all accessible surfaces of the specimen, unless otherwise specified in the product standard.

NOTE For certain devices, it may be necessary for the product standard to restrict the surfaces to be impacted.

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 one series of three blows do not influence subsequent series. In case of doubt with regard to the influence of preceding blows, the defect shall be disregarded and a further three blows shall be applied to the same position on a new specimen.

### 20.3.2 Initial measurements

Before the conditioning, subject the specimen to the initial measurements required by the product standard.

### 20.3.3 State of specimen during conditioning

Mount the specimen and place it in the configuration and operating condition, as specified in the product standard.

### 20.3.4 Conditioning

Apply the appropriate severity of conditioning shown in Table 14.

**Table 14 – Impact (operational) – Conditioning**

| **Equipment class** | **Fixed and movable** | |
|---|---|---|
| Environmental class | I, II & III | IV |
| Impact energy (J) | 0,5 | 1,0 |
| Number of impacts per point | 3 | 3 |
| Similar EN 62262 classification | IK04 | IK06 |

### 20.3.5 Measurements during conditioning

Monitor the specimen during the conditioning period to detect any change in status.

### 20.3.6 Final measurements

After the conditioning, subject the specimen to the final measurements required by the product standard and inspect it visually for mechanical damage both externally and internally.

## 21 Free fall (operational)

### 21.1 Object of the test

To demonstrate the immunity of moveable or portable equipment to mechanical impacts upon the surface, which it may sustain in the normal service environment and which it can reasonably be expected to withstand.

### 21.2 Principle

The test consist of subjecting the specimens to falls from a specified height onto a surface of concrete or steel.

### 21.3 Test procedure

#### 21.3.1 General

The test apparatus and procedure shall be as described in EN 60068-2-31:2008 for Procedure 1.

The specimen in its operating condition for use shall be allowed to fall freely.

#### 21.3.2 Initial measurements

Before the conditioning, subject the specimen to the initial measurements required by the product standard.

#### 21.3.3 State of specimen during conditioning

Mount the specimen and place it in the configuration and operating condition, as specified in the product standard.

#### 21.3.4 Conditioning

Apply the appropriate severity of conditioning shown in Table 15.

**Table 15 – Free fall (operational) – Conditioning**

| Equipment class | Movable | Portable |
|---|---|---|
| Environmental class | I, II, III & IV | I, II, III & IV |
| Height (m) | 0,5 [a] | 1,5 |
| Number of attitudes | 6 | 6 |
| Number of falls per attitude | 1 | 2 |

[a] The product committee need to consider the severity of this test, depending upon the application and the likelihood of the equipment being dropped. (e.g. the 0,5 m is foreseen for a local transmission unit for a social alarm system, which would normally be placed on a table top under a telephone in a normal house). A lower severity or no test may be considered suitable in a more controlled environment.

#### 21.3.5 Measurements during conditioning

Monitor the specimen during the conditioning period to detect any change in status.

#### 21.3.6 Final measurements

After the conditioning, subject the specimen to the final measurements required by the product standard and inspect it visually for mechanical damage both externally and internally.

## 22 Vibration, sinusoidal (operational)

### 22.1 Object of the test

To demonstrate the immunity of the equipment to vibration at levels appropriate to the service environment.

### 22.2 Principle

The test consists of subjecting the specimen to sinusoidal vibration at a level and over a frequency range appropriate to the service environment. The specimen is subjected to a sweep cycle of the frequency range for each of its main functional modes (e.g. quiescent, alarm and fault warning conditions) applied in each of three mutually perpendicular axes.

NOTE A sweep cycle is a sweep of the frequency range in both directions (i.e. min. to max. to min.).

### 22.3 Test procedure

#### 22.3.1 General

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

The vibration shall be applied in each of three mutually perpendicular axes, in turn. One of the three axes shall be perpendicular to the normal mounting plane of the equipment.

The vibration operational test may be combined with the vibration endurance test, so that the specimen is subjected to the operational test conditioning followed by the endurance test conditioning in each axis.

#### 22.3.2 Initial measurements

Before the conditioning, subject the specimen to the initial measurements required by the product standard.

#### 22.3.3 State of specimen during conditioning

Mount the specimen and place it in the configuration and operating condition(s), as specified in the product standard.

#### 22.3.4 Conditioning

Apply the appropriate severity of conditioning shown in Table 16.

**Table 16 – Vibration, sinusoidal (operational) – Conditioning**

| **Equipment class** | | **Fixed, movable and portable** | |
|---|---|---|---|
| Environmental class | | I | II, III & IV |
| Frequency range | (Hz) | 10 to 150 | 10 to 150 |
| Acceleration | ($m \times s^{-2}$) | 2 | 5 |
| Number of axes | | 3 | 3 |
| Sweep rate | (octaves × $min^{-1}$) | 1 | 1 |
| Number of sweep cycles / axis / functional mode | | 1 | 1 |

### 22.3.5 Measurements during conditioning

Monitor the specimen during the conditioning period to detect any change in status.

### 22.3.6 Final measurements

After the conditioning in all three axes, subject the specimen to the final measurements required by the product standard and inspect it visually for mechanical damage both externally and internally.

## 23 Vibration, sinusoidal (endurance)

### 23.1 Object of the test

To demonstrate the ability of the equipment to withstand the long term effects of vibration at levels appropriate to the environment.

### 23.2 Principle

The test consists of subjecting the specimen to sinusoidal vibration swept over the frequency range appropriate to the service environment but at an increased level, to accelerate the effects of the vibrations.

### 23.3 Test procedure

#### 23.3.1 General

The test apparatus and procedure shall be generally as described in EN 60068-2-6:2008, for vibration endurance by sweeping.

The vibration shall be applied in each of three mutually perpendicular axes in turn. One of these axes shall be perpendicular to the normal mounting plane of the equipment.

The vibration endurance test may be combined with the vibration operational test, so that the specimen is subjected to the operational test conditioning followed by the endurance test conditioning in each axis in turn.

#### 23.3.2 Initial measurements

Before the conditioning, subject the specimen to the initial measurements required by the product standard.

#### 23.3.3 State of specimen during conditioning

Mount the specimen as specified in the product standard. The specimen shall not be supplied with power during the conditioning.

#### 23.3.4 Conditioning

Apply the appropriate severity of conditioning shown in Table 17.

**Table 17 – Vibration, sinusoidal (endurance) – Conditioning**

| **Equipment class** | | **Fixed, movable and portable** | |
|---|---|---|---|
| Environmental class | | I | II, III & IV |
| Frequency range | (Hz) | 10 to 150 | 10 to 150 |
| Acceleration | (m × $s^{-2}$) | 5 | 10 |
| Number of axes | | 3 | 3 |
| Sweep rate | (octaves × $min^{-1}$) | 1 | 1 |
| Number of sweep cycles / axis | | 20 | 20 |

#### 23.3.5 Measurements during conditioning

None.

#### 23.3.6 Final measurements

After the conditioning in all three axes, subject the specimen to the final measurements required by the product standard and inspect it visually for mechanical damage both externally and internally.

## 24 Simulated solar radiation, temperature rise (operational)

NOTE This test is an alternative to the dry heat (operational) test for Group IV. The dry heat test should normally be adequate but if this is not considered to be a suitable simulation of the effect of heat radiation from the sun (e.g. where the test specimen has a solar shield), the simulated solar radiation test may be used.

### 24.1 Object of the test

To demonstrate the ability of the equipment to function correctly when exposed to the thermal effects of solar radiation under the conditions experienced at the surface of the earth.

### 24.2 Principle

The test consists of exposing the test specimen to an irradiance of 1 120 W × $m^{-2}$ and a gradual change of ambient temperature, both in a diurnal cycle. As the object of the test only concerns the thermal effects caused by solar radiation, any spectral distribution of the source of radiation can be used, if correction is made for the absorptance factor of the test specimen.

### 24.3 Test procedure

#### 24.3.1 General

The test apparatus and procedure shall be as described in EN 60068-2-5:1999, for procedure A and where only the thermal effects of solar radiation are of interest.

#### 24.3.2 Initial measurements

Before the conditioning, subject the specimen to the initial measurements required by the product standard.

### 24.3.3 State of specimen during conditioning

Mount the specimen and place it in the configuration and operating condition, as specified in the product standard.

### 24.3.4 Conditioning

Temperature-radiation-time relationship during conditioning shall be in accordance with EN 60068-2-5:1999, Figure 1. Two 24 h cycles shall be performed, with an upper temperature of 40 °C at free field conditions.

Apply the appropriate severity of conditioning shown in Table 18.

**Table 18 – Simulated solar radiation, Temperature rise (operational) – Conditioning**

| **Equipment class** | | **Fixed, movable and portable** | |
|---|---|---|---|
| Environmental class | | I, II & III | IV |
| Temperature | (°C) | No test | 40 |
| Duration | (h) | | 2 × 24 |

### 24.3.5 Measurements during conditioning

Monitor the specimen during the conditioning period to detect any change in status. Any further measurements, which the product standard requires to be made during the conditioning shall be made during the last half hour of the last irradiation period.

### 24.3.6 Final measurements

After a recovery period of at least 1 h at standard laboratory conditions, subject the specimen to the final measurements required by the product standard.

## 25 Simulated solar radiation, surface degradation (endurance)

NOTE This test should only be selected where it is necessary to assess specific materials or components for which degradation due to solar radiation is considered to be critical.

### 25.1 Object of the test

To demonstrate the ability of the equipment surface to withstand the surface degradation effects of solar radiation under the conditions experienced at the surface of the earth.

### 25.2 Principle

The test consists of exposing the test specimen to an irradiance of 1 120 W × $m^2$. During this test a Xenon radiation source is used. Either the test specimen itself or samples of the test specimen surface may be used be for test.

### 25.3 Test procedure

#### 25.3.1 General

The test apparatus and procedure shall be as described in EN 60068-2-5:1999, for procedure C.

#### 25.3.2 Initial measurements

Before the conditioning, subject the specimen to the initial measurements required by the product standard.

#### 25.3.3 State of specimen during conditioning

Mount the specimen as specified in the product standard. The specimen shall not be supplied with power during the conditioning.

#### 25.3.4 Conditioning

The radiation source is aligned to produce a direction of incident radiation of 90°, and adjusted to produce an irradiation of 1 120 W × $m^{-2}$ perpendicular to the test specimen.

Temperature-radiation-time relationship during conditioning shall be in accordance with EN 60068-2-5:1999, Figure 1.

Apply the appropriate severity of conditioning shown in Table 19.

**Table 19 – Simulated solar radiation, surface degradation (endurance) – Conditioning**

| **Equipment class** | | **Fixed, movable and portable** | |
|---|---|---|---|
| Environmental class | | I, II & III | IV |
| Temperature | (°C) | No test | 40 |
| Duration | (days) | | 10 |

#### 25.3.5 Measurements during conditioning

None.

#### 25.3.6 Final measurements

After a recovery period of at least 1 h at standard laboratory conditions, subject the specimen to the final measurements required by the product standard.

## 26 Dust tightness (endurance)

NOTE This test should only be selected where it is necessary to assess specific enclosures, for which the ingress of dust is considered to be critical.

### 26.1 Object of the test

To demonstrate that specific enclosures are adequately protected against the ingress of fine dust. The test is not suitable for simulation of natural or induced environments.

### 26.2 Principle

The test consists of exposing the test specimen to a heavily dust laden air flow containing non-abrasive powder of specified particle size. Specimens of specified category are tested with internal air pressure lower than the surrounding atmospheric pressure in order to support the ingress of powder. The specified quantity of powder provides the dust density to be extremely high and uniform. The powder is talcum with a maximum grain size of 75 μm.

### 26.3 Test procedure

#### 26.3.1 General

The test apparatus and procedure shall be as described in EN 60529:1991 and its A1:2000, for the dust test for the first characteristic numerals 5 and 6.

#### 26.3.2 Initial measurements

Before the conditioning, subject the specimen to the initial measurements required by the product standard.

#### 26.3.3 State of specimen during conditioning

Mount the specimen as specified in the product standard. The specimen shall normally be in non-operating condition. The relevant specification may call for the specimen to be switched on and/or operated during the test.

Make sure that seals and other means for dust protection are situated as specified by the manufacturer. It shall be determined whether the specimen belongs to category 1 or category 2.

Category 1: Air pressure drop in the specimen below the surrounding air caused by intermittent operation or change of temperature of the surrounding air will occur.

Category 2: Air pressure drop in the specimen below the surrounding air will not occur.

#### 26.3.4 Conditioning

Apply the appropriate severity of conditioning shown in Table 20 or Table 21.

**Table 20 – Dust tightness (endurance) – Conditioning for Category 1**

| **Equipment class** | | **Fixed, movable and portable** |
|---|---|---|
| Environmental class | | (I, II, III & IV) [a] |
| Depression | (volumes per hour) | 40 to 60 |
| Duration | (h) | 2 |
| Depression, maximum | (kPa) | 2 |
| Duration | (h) | 8 |
| Similar to EN 60529 classification | | (IP5X or IP6X) [b] |
| The pressure inside the specimen is maintained below the surrounding air by a vacuum pump. | | |
| [a] The test may be applied to any environmental class but is only selected where it is necessary to assess specific enclosures, for which the ingress of dust is considered to be critical.<br>[b] Depending upon the acceptance criteria chosen by the product committee. | | |

**Table 21 – Dust tightness (endurance) – Conditioning for Category 2**

| **Equipment class** | | **Fixed, movable and portable** |
|---|---|---|
| Environmental class | | (I, II, III & IV) [a] |
| Duration | (h) | 8 |
| Similar to EN 60529 classification | | (IP5X or IP6X) [b] |
| The test specimen is not connected to a vacuum pump. | | |
| [a] The test may be applied to any environmental class but is only selected where it is necessary to assess specific enclosures, for which the ingress of dust is considered to be critical.<br>[b] Depending upon the acceptance criteria chosen by the product committee. | | |

### 26.3.5 Measurements during conditioning

None.

### 26.3.6 Final measurements

After a recovery period of at least 1 h at standard laboratory conditions, subject the specimen to the final measurements required by the product standard.

# Bibliography

EN 60068-3 series Environmental testing – Part 3: Background information (IEC 60068-3 series)

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