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Environmental testing –

**Part 2-78:
Tests – Test Cab: Damp heat,
steady state**

*This **English-language** version is derived from the original **bilingual** publication by leaving out all French-language pages. Missing page numbers correspond to the French-language pages.*



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INTERNATIONAL ELECTROTECHNICAL COMMISSION

ENVIRONMENTAL TESTING –

Part 2-78: Tests – Test Cab: Damp heat, steady state

FOREWORD

- 1) The IEC (International Electrotechnical Commission) is a worldwide organization for standardization comprising all national electrotechnical committees (IEC National Committees). The object of the IEC is to promote international co-operation on all questions concerning standardization in the electrical and electronic fields. To this end and in addition to other activities, the IEC publishes International Standards. Their preparation is entrusted to technical committees; any IEC National Committee interested in the subject dealt with may participate in this preparatory work. International, governmental and non-governmental organizations liaising with the IEC also participate in this preparation. The IEC collaborates closely with the International Organization for Standardization (ISO) in accordance with conditions determined by agreement between the two organizations.
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- 3) The documents produced have the form of recommendations for international use and are published in the form of standards, technical specifications, technical reports or guides and they are accepted by the National Committees in that sense.
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- 6) Attention is drawn to the possibility that some of the elements of this International Standard may be the subject of patent rights. The IEC shall not be held responsible for identifying any or all such patent rights.

International Standard IEC 60068-2-78 has been prepared by IEC technical committee 104: Environmental conditions, classification and methods of test.

The text of this standard is based on the following documents:

FDIS	Report on voting
104/207/FDIS	104/214/RVD

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

This publication has been drafted in accordance with the ISO/IEC Directives, Part 3.

The committee has decided that the contents of this publication will remain unchanged until 2006. At this date, the publication will be

- reconfirmed;
- withdrawn;
- replaced by a revised edition, or
- amended.

ENVIRONMENTAL TESTING –

Part 2-78: Tests – Test Cab: Damp heat, steady state

1 Scope

This part of IEC 60068 provides a test method for determining the suitability of electrotechnical products, components or equipment for transportation, storage and use under conditions of high humidity. The test is primarily intended to permit the observation of the effect of high humidity at constant temperature without condensation on the specimen over a prescribed period.

This test provides a number of preferred severities of high temperature, high humidity and test duration. The test can be applied to both heat-dissipating and non-heat dissipating specimens.

The test is applicable to small equipment or components as well as large equipment having complex interconnections with test equipment external to the chamber, requiring a set-up time which prevents the use of preheating and the maintenance of specified conditions during the installation period.

2 Normative references

The following normative documents contain provisions which, through reference in this text, constitute provisions of this part of IEC 60068. For dated references, subsequent amendments to, or revisions of, any of these publications do not apply. However parties to agreements based on this part of IEC 60068 are encouraged to investigate the possibility of applying the most recent editions of the normative documents indicated below. For undated references, the latest edition of the normative document referred to applies. Members of ISO and IEC maintain registers of currently valid International Standards.

IEC 60068-1, *Environmental testing – Part 1: General and guidance*

IEC 60068-2-2, *Basic environmental testing procedures – Part 2: Tests – Tests B: Dry heat*

3 General description

In this test, the specimen is introduced into the chamber, both of which are at laboratory temperature.

The conditions in the chamber are adjusted to the severity required according to clause 5 and maintained for the prescribed time.

Because the conditions of temperature and humidity adjacent to a heat-dissipating specimen can be different from the specified test values, the measurement of these parameters is prescribed in the manner used for free air conditions (see 4.4 and 4.6.2 of IEC 60068-1).

4 Test chamber

The chamber and measuring system shall be such that:

- a) sensing devices can be located in the working space to monitor the temperature and humidity. For the testing of heat dissipating specimens, the devices are located at positions as defined in IEC 60068-1;
- b) the temperature and relative humidity in the working space can be maintained at the values and within the tolerances prescribed, taking into account the effect of the specimen under test on chamber conditions. The temperature tolerances given in clause 5 are intended to take account of absolute errors in measurements and slow changes of temperature.

For heat-dissipating specimens, the temperature and relative humidity near the specimen are influenced by the effect of heat-dissipation of the specimen itself and can be different from the values measured in the positions defined in IEC 60068-1;

- c) condensed water is continuously drained from the chamber and not re-used until re-purified;
- d) no condensed water from the walls and roof of the test chamber can fall on the specimens;
- e) water utilized for the maintenance of chamber humidity shall have a resistivity of not less than 0,05 MΩcm;
- f) the specimen under test shall not be subjected to radiant heat from the chamber conditioning devices;
- g) in injection-type chambers, moisture shall be injected remotely from the specimen and without impinging directly on it.

4.1 Testing of heat-dissipating specimens

The volume of the test chamber shall be at least five times the total volume of the specimen under test.

The distance between the specimen and the chamber walls shall be in accordance with appendix A of IEC 60068-2-2. The air speed within the chamber shall be commensurate with achieving the desired conditions.

4.2 Mounting of the specimens

The relevant specification shall prescribe specific mounting structures, which shall replicate or simulate the thermal characteristics applicable in real life conditions. If these conditions are not defined, the mounting device shall have the minimum influence on the heat and humidity exchanges between specimen and surrounding conditions.

5 Severity

The test severity is defined by a combination of temperature, relative humidity and total test duration.

Unless otherwise specified in the relevant specification, temperature and relative humidity severities may be selected from the following:

(30 ± 2) °C	(93 ± 3) % RH
(30 ± 2) °C	(85 ± 3) % RH
(40 ± 2) °C	(93 ± 3) % RH
(40 ± 2) °C	(85 ± 3) % RH

Preferred test durations are: 12 h; 16 h; 24 h; and 2, 4, 10, 21 or 56 days.

The total temperature tolerance of ±2 K is intended to take account of absolute errors in the measurement, slow changes of temperature, and temperature variations of the working space. However, in order to maintain the relative humidity within the required tolerances, it is necessary to keep the temperature difference between any two points in the working space at any moment within narrower limits. The required humidity conditions will not be achieved if such temperature differences exceed 1 K. It may also be necessary to keep short term fluctuations within ±0,5 K to maintain the required humidity.

6 Initial measurements

The specimen shall be visually inspected and electrically and mechanically checked, as required by the relevant specification.

7 Conditioning

The conditioning shall be such that:

- a) Unless otherwise specified, the specimen shall be introduced into the chamber, both of which shall be at standard ambient conditions of the laboratory. The specimen shall be introduced in the unpacked, switched-off, ready-for-use state.

In certain cases the relevant specification may allow the introduction of the specimen in the chamber when this is already at the conditions prescribed for the test; however, condensation on the specimen shall always be avoided. This can be obtained for small specimens by pre-heating them to the chamber temperature.

- b) Adjust the temperature in the chamber to the prescribed severity, and allow the specimen to reach temperature stability.

Temperature stability is defined in 4.8 of IEC 60068-1. The rate of change of temperature shall not exceed 1 K/min, averaged over a period of not more than 5 min. During this period condensation on the specimen shall not occur.

- c) Condensation can be avoided during this period by not increasing the absolute humidity.
- d) Adjust the humidity to the prescribed severity within a time of not more than 2 h.
- e) Expose the specimen to the test conditions and duration as specified in the relevant specification. The duration is measured from the time the specified conditions are achieved.
- f) The relevant specification shall define the operating conditions and the period (or periods) in which they shall be carried out.
- g) At the end the recovery procedure shall be followed.

8 Intermediate measurements

The relevant specification may call for measurements during, or at the end of, conditioning while the specimen is still in the chamber. If such measurements are required, the relevant specification shall define the measurements and the period (or periods) at which they shall be carried out. For these measurements the specimen shall not be removed from the chamber.

9 Recovery

The relevant specification shall prescribe whether recovery shall be made at standard atmospheric conditions for testing (see 5.3 of IEC 60068-1), or at controlled recovery conditions (see 5.4.1 of IEC 60068-1). If controlled recovery conditions are required, the specimen may be transferred to a second chamber for this recovery period or may remain in the test chamber.

If the second chamber method is used, the changeover time shall be as short as possible.

Relative humidity shall be adjusted to a value of 73 % to 77 % RH in not more than 0,5 h, after which the temperature shall be adjusted to laboratory temperature within ± 1 K in not more than 0,5 h.

The recovery time if specified in the relevant specification is counted from the moment when the prescribed recovery conditions have been obtained.

10 Final measurements

The specimen shall be visually inspected and electrically and mechanically checked, as required by the relevant specification.

11 Information to be given in the relevant specification

When this test is included in the relevant specification, the following details shall be given as far as they are applicable.

Information to be given:	Clause or subclause
a) Specific mounting structures, if required	4.2
b) Test severities and tolerances:	5
– temperature	
– relative humidity	
– duration	
c) Initial measurements	6
d) Conditioning	7
e) Intermediate measurements	8
f) Recovery conditions	9
g) Final measurements	10

Annex ZA (normative)

Normative references to international publications with their corresponding European publications

This European Standard incorporates, by dated or undated reference, provisions from other publications. These normative references are cited at the appropriate places in the text and the publications are listed hereafter. For dated references, subsequent amendments to or revisions of any of these publications apply to this European Standard only when incorporated in it by amendment or revision. For undated references, the latest edition of the publication referred to applies (including amendments).

NOTE When an international publication has been modified by common modifications, indicated by (mod), the relevant EN/HD applies.

<u>Publication</u>	<u>Year</u>	<u>Title</u>	<u>EN/HD</u>	<u>Year</u>
IEC 60068-1	- ¹⁾	Environmental testing Part 1: General and guidance	EN 60068-1	1994 ²⁾
IEC 60068-2-2	- ¹⁾	Part 2: Tests - Test B: Dry heat	EN 60068-2-2 ³⁾	1993

¹⁾ Undated reference.

²⁾ Valid edition at time of issue.

³⁾ EN 60068-2-2 includes supplement A:1976 to IEC 60068-2-2:1974.

