भारतीय मानक

Indian Standard

[Superseding IS 9000 (Part 5/Sec 1 and 2) : 1981 and IS 9001 (Part 4) : 1979])

पर्यावरण परीक्षण

भाग 2 परीक्षण

अनुभाग 30 परीक्षण डीबी: नम गर्मी चक्रीय

(12 घंटे + 12 घंटे चक्र)

Environmental Testing

Part 2 Tests

Section 30 Test Db: Damp

Heat Cyclic (12 h + 12 h Cycle)

ICS 19.040

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Environmental Testing Procedure Sectional Committee, LITD 01

NATIONAL FOREWORD

This Indian Standard (Part 2/Sec 30) which is identical to IEC 60068-2-30 : 2005 'Environmental testing — Part 2-30 : Tests — Test Db: Damp heat, cyclic (12 h + 12 h cycle)' issued by the International Electrotechnical Commission (IEC) was adopted by the Bureau of Indian Standards on the recommendation of the Environmental Testing Procedure Sectional Committee and approval of the Electronics and Information Technology Division Council.

IS 9000 (Part 5/Sec 1 and 2) : 1981 'Basic environmental testing procedures for electronic and electrical items: Part 5 Damp heat cyclic test' and IS 9001 (Part 4) : 1985 'Guidance for environmental testing: Part 4 Damp heat tests' were based on IEC Pub 68-2-30 : 1980. The superseding of these standards has been undertaken to align these with the latest version of IEC 60068-2-30 : 2005. On publication of this Indian standard IS 9000 (Part 5/Sec 1 and 2):1981 and IS 9001 (Part 4):1985 stands withdrawn.

The text of IEC standard has been approved as suitable for publication as an Indian Standard without deviations. Certain conventions are however not identical to those used in Indian Standards. Attention is particularly drawn to the following:

- a) Wherever the words 'International Standard' appears referring to this standard, they should be read as 'Indian Standard'; and
- b) Comma (,) has been used as a decimal marker while in Indian Standards, the current practice is to use a point (.) as the decimal marker.

In this adopted standard, reference appears to certain International Standards, for which Indian Standards also exist. The corresponding Indian Standards, which are to be substituted in their places, are listed below along with their degree of equivalence for editions indicated. For dated references, only the edition cited applies. For undated references, the latest edition of the referenced document (including any amendments) applies:

International Standard	Corresponding Indian Standard	Degree of Equivalence
IEC 60068-1 : 1988 Environmental testing — Part 1: General and guidance	IS/IEC 60068-1 : 2013 Environmental testing: Part 1 General and Guidance	Identical
IEC 60068-2-38 Environmental testing — Part 2-38 : Tests — Test Z/AD: Composite temperature/humidity cyclic test	IS/IEC 60068-2-38 : 2021 Environmental testing: Part 2 Tests, Section 5 Test ZAD: Composite temperature/humidity cyclic test	Identical

The Committee has reviewed the provisions of following International Standards referred in this adopted standard and has decided that they are acceptable for use in conjunction with this standard. For undated references, the latest edition of the referenced document applies, including any corrigenda and amendment:

International Standards	Title	
IEC 60068-3-6	Environmental testing — Part 3-6: Supporting documentation and guidance — Confirmation of the performance of temperature/humidity chambers	
IEC 60068-5-2	Environmental testing — Part 5: Guide to drafting of test methods — Terms and definitions	

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Indian Standard ENVIRONMENTAL TESTING PART 2 TESTS SECTION 30 TEST Db: DAMP HEAT CYCLIC (12 h + 12 h CYCLE)

1 Scope

This part of IEC 60068 determines the suitability of components, equipment or other articles for use, transportation and storage under conditions of high humidity – combined with cyclic temperature changes and, in general, producing condensation on the surface of the specimen. If the test is being used to verify the performance of a specimen whilst it is being transported or stored in packaging then the packaging will normally be fitted when the test conditions are being applied.

For small, low mass specimens, it may be difficult to produce condensation on the surface of the specimen using this procedure; users should consider the use of an alternative procedure such as that given to IEC 60068-2-38.

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.

IEC 60068-2-38, Environmental testing – Part 2-38: Tests – Test Z/AD: Composite temperature/humidity cyclic test

IEC 60068-3-6, *Environmental testing – Part 3-6:* Supporting documentation and guidance – Confirmation of the performance of temperature/humidity chambers

IEC 60068-1:1988, Environmental testing – Part 1: General and guidance

IEC 60068-5-2, Environmental testing – Part 5: Guide to drafting of test methods – Terms and definitions

3 General description

This test comprises one or more temperature cycles in which the relative humidity is maintained at a high level.

Two variants of the cycle are given which are identical except for the temperature fall period; during this part of the cycle, variant 2 allows wider tolerances of relative humidity and the rate of temperature fall.

The upper temperature of the cycle and the number of cycles (see Clause 5) determine the test severity.

Test profiles illustrating the procedure are shown in Figures 1, 2a, 2b and 3.

The tolerances stated in this standard do not take measurement uncertainty into consideration.

4 Testing chamber – Construction requirements

4.1 The temperature can be varied cyclically between 25 $^{\circ}$ C ± 3 K and the appropriate upper temperature specified with the tolerance and rate of change specified in 7.3 and Figures 2a or 2b, as applicable.

The total temperature tolerance of ± 3 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.

4.2 The relative humidity in the working space can be maintained within the limits given in 7.3 and in Figures 2a or 2b, as applicable.

4.3 Care shall be taken to ensure that the conditions prevailing at any point in the working space are uniform and are as similar as possible to those prevailing in the immediate vicinity of suitably located temperature and humidity sensing devices. The chamber shall meet the performance criteria as detailed in IEC 60068-3-6.

4.4 The specimens under test shall not be subjected to radiant heat from the chamber conditioning processes.

4.5 Water used for the maintenance of chamber humidity shall have a resistivity of not less than 500 Ω m.

Condensed water shall be continuously drained from the chamber and not used again until it has been re-purified.

Precautions shall be taken to ensure that no condensed water is allowed to fall on the specimens.

4.6 The dimensions, properties and/or electrical loading of the specimens under test shall not appreciably influence conditions within the chamber.

5 Severities

5.1 The combination of the upper temperature and the number of cycles define the severity of the test.

5.2 The severity shall be chosen from the following:

a) upper temperature: 40 °C,

number of cycles: 2, 6, 12, 21, 56;

b) upper temperature: 55 °C, number of cycles: 1, 2, 6.

6 Initial measurements

The specimens shall be visually inspected, and functionally tested, as required by the relevant specification.

7 Conditioning

The specimens shall be introduced into the chamber either in the unpacked, switched-off, ready-for-use state, or as otherwise specified in the relevant specification.

Where no specific mounting is prescribed, the thermal conduction of the mounting shall be low, so that for all practical purposes the specimen is thermally isolated.

7.1 Temperature tolerances

The total temperature tolerance of ± 2 K and ± 3 K given in this standard 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.

7.2 Stabilizing period

The temperature of the specimens shall be stabilized at 25 °C \pm 3 K (the definition of temperature stability is given in IEC 60068-1 and IEC 60068-5-2). This shall be achieved by either

- a) placing the specimens in a separate chamber before introducing it into the test chamber, or,
- b) adjusting the temperature of the test chamber to 25 $^{\circ}$ C ± 3 K after the introduction of the specimens and maintaining them at this level until the specimens attain temperature stability.

During the stabilization of temperature by either method, the relative humidity shall be within the limits prescribed for standard atmospheric conditions for testing.

Following stabilization, with the specimens in the test chamber, the relative humidity shall be increased to not less than 95 % RH at an ambient temperature of 25 $^{\circ}$ C ± 3 K.

7.3 Description of the 24 h cycle

7.3.1 The temperature of the chamber shall be raised to the appropriate upper temperature prescribed by the relevant specification. The upper temperature shall be achieved in a period of $3 h \pm 30$ min and at a rate within the limits defined by the shaded areas in Figures 2a and 2b.

During this period, the relative humidity shall not be less than 95 % RH. During the last 15 min it shall not be less than 90 % RH.

Condensation may occur on the specimen during this temperature-rise period.

NOTE The condensation condition implies that the surface temperature of the specimen is below the dew point of the air in the chamber.

7.3.2 The temperature shall then be maintained within the prescribed limits for the upper temperature $(\pm 2 \text{ K})$ until 12 h \pm 30 min from the start of the cycle.

During this period, the relative humidity shall be 93 % RH ± 3 %RH. During the first and last 15 min it shall be between 90 % RH and 100 % RH.

7.3.3 The temperature shall then be lowered in accordance with one of the two variants given below.

Variant 1 (see Figure 2a)

The temperature shall be lowered to 25 °C \pm 3 K within 3 h to 6 h. The rate of fall for the first one and one half hours shall be such that, if maintained as indicated in Figure 2a, it would result in a temperature of 25 °C \pm 3 K being attained in 3 h \pm 15 min. The relative humidity shall be not less than 95 % RH. During the first 15 min it shall be not less than 90 % RH.

NOTE 1 See Annex A for descriptions of the type of specimen suitable for Variant 1.

Variant 2 (see Figure 2b)

The temperature shall be lowered to 25 $^{\circ}$ C ± 3 K within 3 h to 6 h, but without the additional requirement for the first hour and one half as in variant 1. The relative humidity shall be not less than 80 % RH.

NOTE 2 See Annex A for descriptions of the type of specimen suitable for Variant 2.

7.3.4 The temperature shall then be maintained at 25 $^{\circ}$ C ± 3 K with a relative humidity of not less than 95 % RH until the 24 h cycle is completed.

8 Intermediate measurements

The relevant specification may require functional tests during the conditioning programme.

NOTE Measurements preceded by a recovery, which would require removal of the specimens from the chamber, are not permissible during the conditioning. If it is desired to make intermediate measurements, the relevant specification should define the measurements and the period(s) during the conditioning after which they will be carried out.

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 (see Figure 3), the specimen may be transferred to another chamber for this recovery period or may remain in the damp heat chamber.

In the former case, the change over time shall be as short as possible and not more than 10 min.

In the latter case, the relative humidity shall be reduced to 75 % RH \pm 2 % RH in not more than 1 h. The temperature shall then be adjusted to laboratory temperature within \pm 1 K in not more than one further hour. For large specimens, the relevant specification may allow longer change over times.

The recovery time of 1 h to 2 h is counted from the moment when the prescribed recovery conditions have been obtained.

Specimens having a large thermal time constant may be submitted to recovery for a period sufficient to attain temperature stability (see Clause 4 of 60068-1).

The relevant specification shall state whether any special precautions shall be taken regarding the removal of surface moisture.

10 Final measurements

The specimens shall be visually inspected, and functionally tested as required by the relevant specification.

The measurements shall be commenced immediately after the recovery period and the parameters most sensitive to changes of relative humidity shall be measured first. Unless otherwise specified, the measurement of these parameters shall be completed within 30 min.

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.

		Clause or subclause
a)	Severity: temperature and number of cycles	5.2
b)	Initial measurements	6
c)	State of the specimen during conditioning	7
d)	Details of mounting or supports	7
e)	Variant 1 or variant 2	7.3.3
f)	Intermediate measurements	8
g)	Recovery conditions	9
h)	Special precautions to be taken regarding removal of surface moisture	9
i)	Visual inspection and/or functional tests to be made at the end of the test, the parameters to be measured first, and the maximum period allowed for the measurement of these parameters (final measurements)	10



Figure 1 – Test Db – Stabilizing period



Figure 2a – Test Db – Test cycle – Variant 1



Figure 2b – Test Db – Test cycle – Variant 2

Figure 2 – Test Db – Test cycle – Variants 1 and 2



Figure 3 – Test Db – Recovery at controlled conditions

Annex A

(informative)

Selection of variant for the temperature-fall period – Guidance

In this test two variants are included for the temperature-fall period.

Variant 1, where the rate of temperature fall shall be closely controlled during the first 90 minutes and the relative humidity shall be not less than 95 % except for the first 15 min when it shall be not less than 90 %. This variant requires specially designed chambers.

Variant 1 is particularly suitable for specimens where moisture may penetrate due to the breathing effect for example, specimens which include hollow spaces where condensation may occur on internal surfaces.

Variant 2 gives satisfactory reproducibility for all other types of specimens.

Further information on the application of damp heat tests including a comparison of steadystate and cyclic tests can be found in IEC 60068-3-4¹.

¹ IEC 60068-3-4, Environmental testing – Part 3-4: Supporting documentation and guidance – Damp heat tests

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For the purpose of deciding whether a particular requirement of this standard is complied with, the final value, observed or calculated, expressing the result of a test or analysis, shall be rounded off in accordance with IS 2 : 2022 'Rules for rounding off numerical values (*second revision*)'. The number of significant places retained in the rounded off value should be the same as that of the specified value in this standard.

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Review of Indian Standards

Amendments are issued to standards as the need arises on the basis of comments. Standards are also reviewed periodically; a standard along with amendments is reaffirmed when such review indicates that no changes are needed; if the review indicates that changes are needed, it is taken up for revision. Users of Indian Standards should ascertain that they are in possession of the latest amendments or edition by referring to the website-www.bis.gov.in or www.standardsbis.in.

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