

Environmental testing —

Part 2-30: Tests — Test Db: Damp heat, cyclic (12 h + 12 h cycle)

The European Standard EN 60068-2-30:2005 has the status of a
British Standard

ICS 19.040

National foreword

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The UK participation in its preparation was entrusted to Technical Committee GEL/104, Environmental testing, which has the responsibility to:

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Summary of pages

This document comprises a front cover, an inside front cover, the EN title page, pages 2 to 14, an inside back cover and a back cover.

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Environmental testing
Part 2-30: Tests –
Test Db: Damp heat, cyclic (12 h + 12 h cycle)
(IEC 60068-2-30:2005)

Essais d'environnement
Partie 2-30: Essais –
Essai Db: Essai cyclique de chaleur
humide (cycle de 12 h + 12 h)
(CEI 60068-2-30:2005)

Umgebungseinflüsse
Teil 2-30: Prüfverfahren –
Prüfung Db: Feuchte Wärme, zyklisch
(12 + 12 Stunden)
(IEC 60068-2-30:2005)

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Up-to-date lists and bibliographical references concerning such national standards may be obtained on application to the Central Secretariat or to any CENELEC member.

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CENELEC

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

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Foreword

The text of document 104/369/FDIS, future edition 3 of IEC 60068-2-30, prepared by IEC TC 104, Environmental conditions, classification and methods of test, was submitted to the IEC-CENELEC parallel vote and was approved by CENELEC as EN 60068-2-30 on 2005-11-01.

This European Standard supersedes EN 60068-2-30:1999.

The main changes with respect to EN 60068-2-30:1999 are:

- editorial changes,
- addition of normative references,
- addition of guidance for temperature tolerances,
- period for recovery has been extended.

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) | 2006-08-01 |
| – latest date by which the national standards conflicting with the EN have to be withdrawn | (dow) | 2008-11-01 |

Annex ZA has been added by CENELEC.

Endorsement notice

The text of the International Standard IEC 60068-2-30:2005 was approved by CENELEC as a European Standard without any modification.

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ENVIRONMENTAL TESTING –

Part 2-30: Tests – 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 $25\text{ °C} \pm 3\text{ K}$ 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 $\pm 3\text{ K}$ 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 $\pm 0,5\text{ K}$ 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 $500\ \Omega\text{m}$.

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 $\pm 0,5$ K to maintain the required humidity.

7.2 Stabilizing period

The temperature of the specimens shall be stabilized at $25\text{ °C} \pm 3\text{ K}$ (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 $25\text{ °C} \pm 3\text{ K}$ 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 $25\text{ °C} \pm 3\text{ K}$.

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 $3\text{ h} \pm 30\text{ min}$ 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 (± 2 K) until $12\text{ h} \pm 30\text{ min}$ from the start of the cycle.

During this period, the relative humidity shall be $93\% \text{ RH} \pm 3\% \text{ RH}$. During the first and last 15 min it shall be between $90\% \text{ RH}$ and $100\% \text{ RH}$.

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 $25\text{ °C} \pm 3\text{ K}$ 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 $25\text{ °C} \pm 3\text{ K}$ being attained in $3\text{ h} \pm 15\text{ min}$. The relative humidity shall be not less than $95\% \text{ RH}$. During the first 15 min it shall be not less than $90\% \text{ RH}$.

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 $25\text{ °C} \pm 3\text{ K}$ 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 $80\% \text{ RH}$.

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 $25\text{ °C} \pm 3\text{ K}$ with a relative humidity of not less than $95\% \text{ RH}$ 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

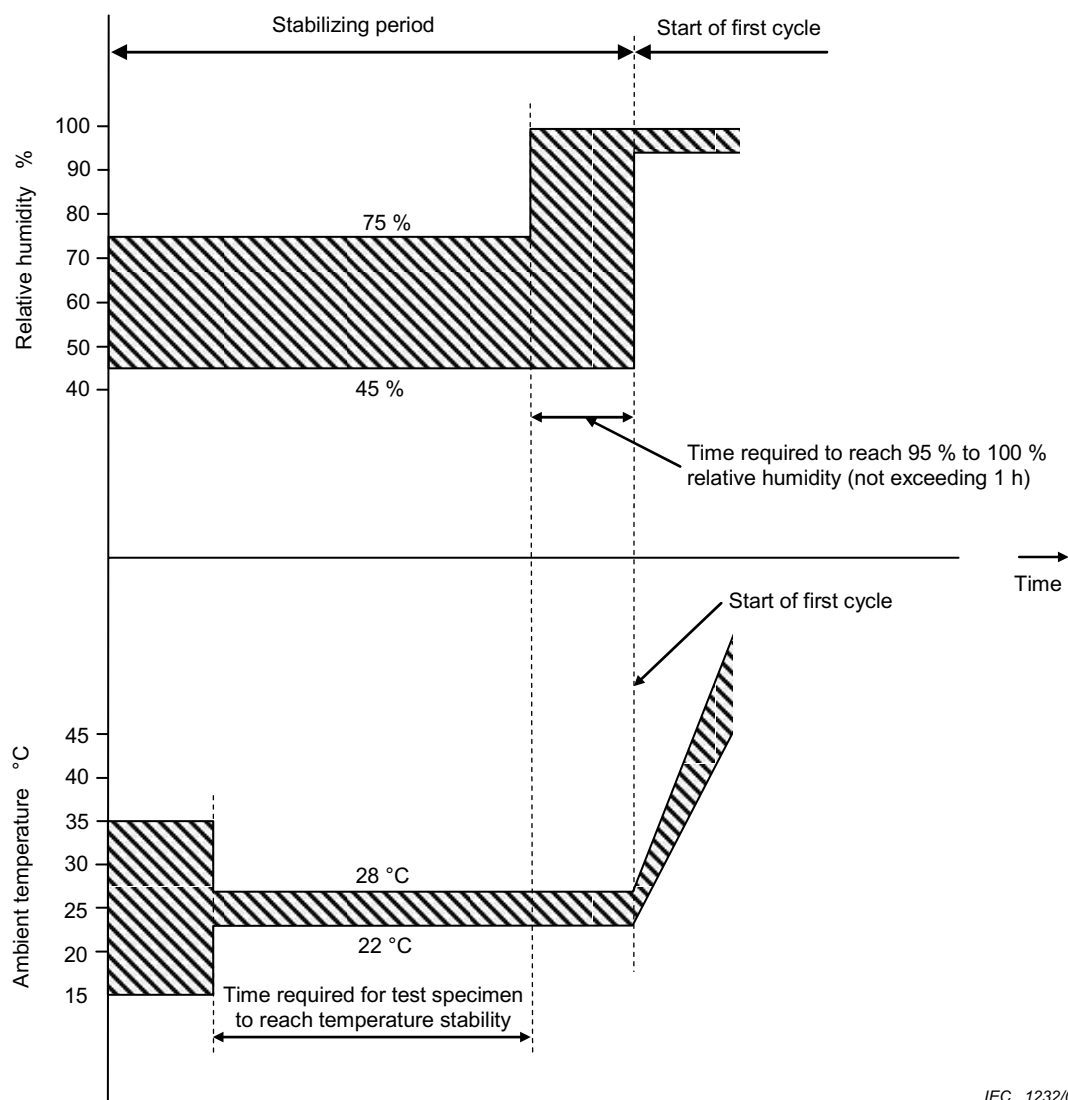
The specimens shall be visually inspected, and functionally tested as required by the relevant specification.

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



IEC 1232/05

Figure 1 – Test Db – Stabilizing period

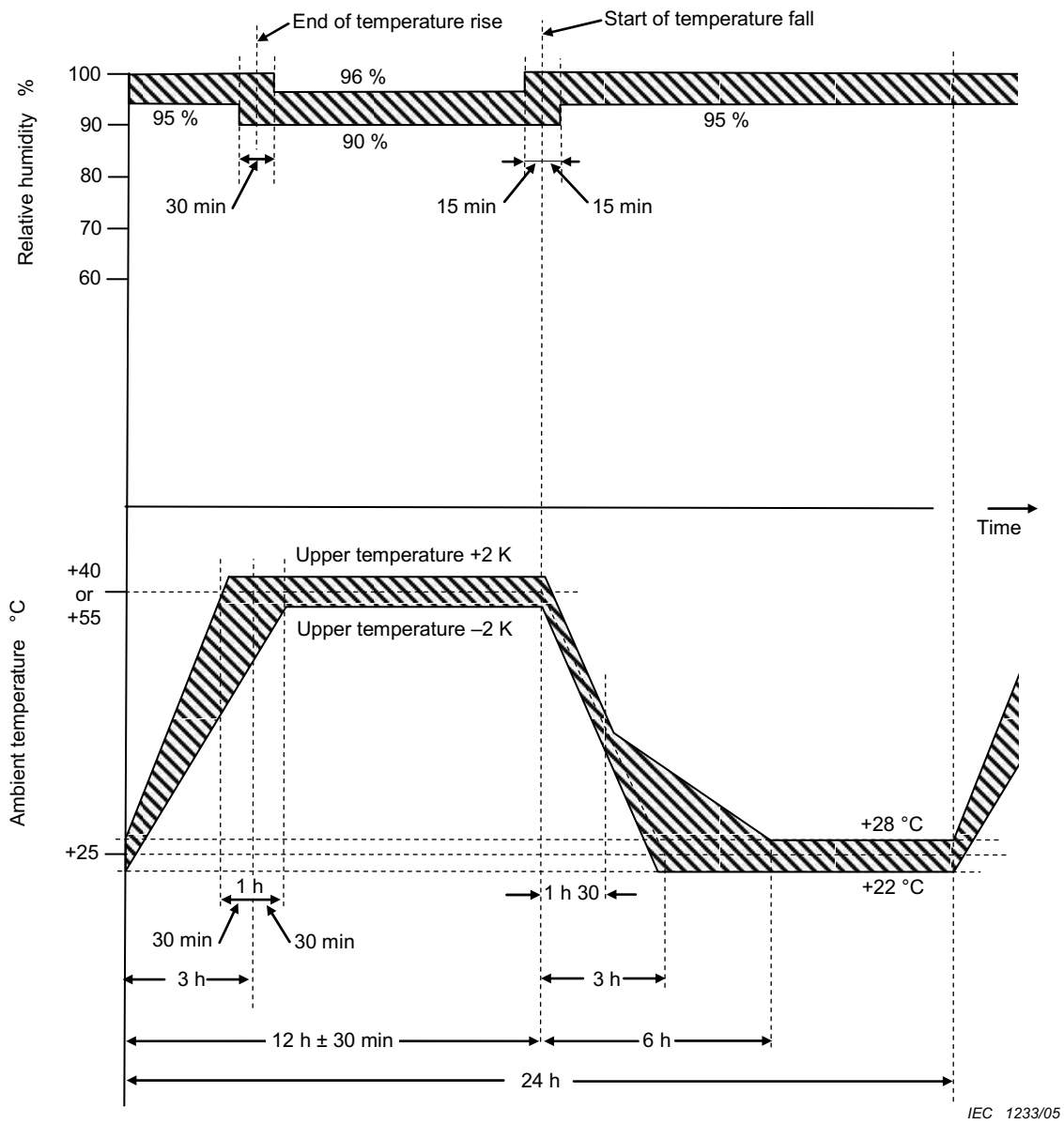


Figure 2a – Test Db – Test cycle – Variant 1

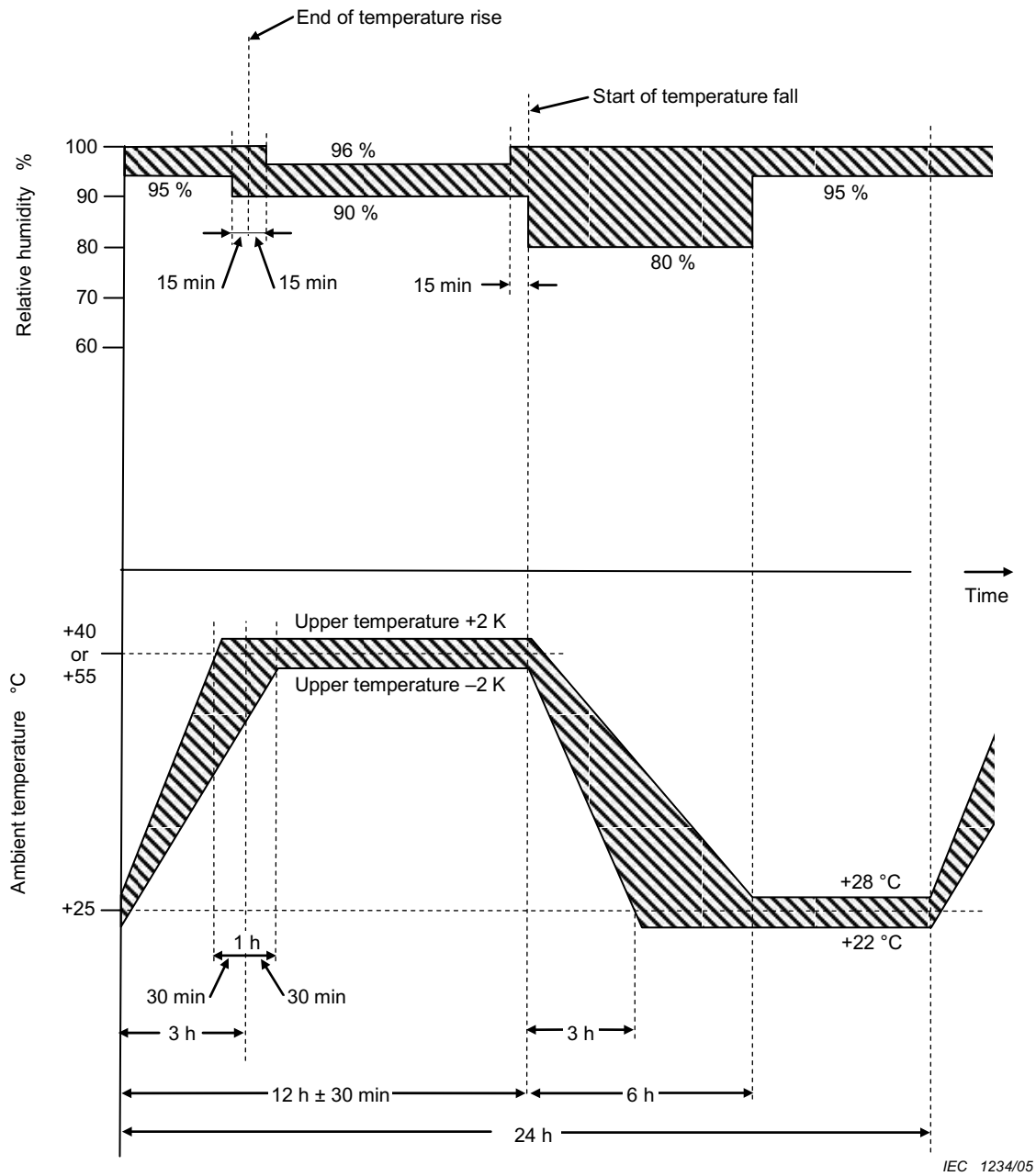


Figure 2b – Test Db – Test cycle – Variant 2

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

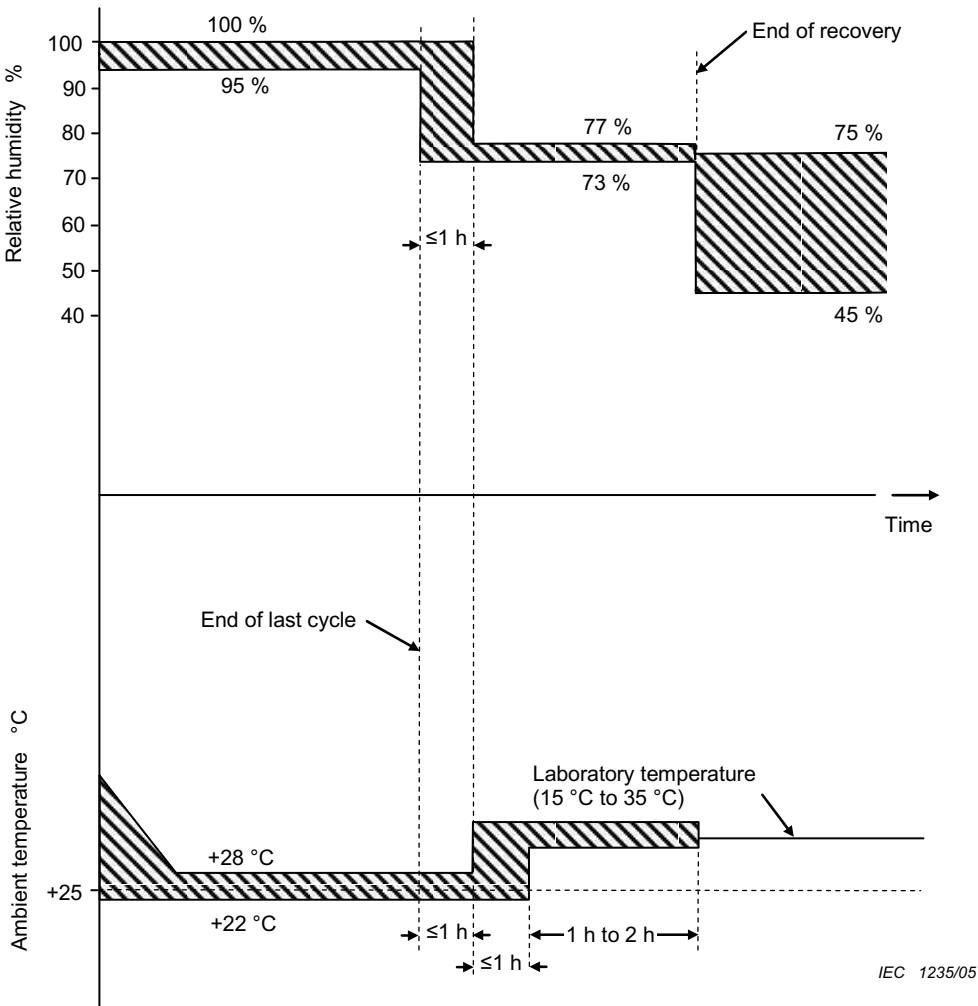


Figure 3 – Test Db – Recovery at controlled conditions

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 steady-state 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*

Annex ZA (normative)

Normative references to international publications with their corresponding European publications

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.

NOTE Where 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 60068-2-38	- ¹⁾	Environmental testing Part 2: Tests - Test Z/AD: Composite temperature/humidity cyclic test	EN 60068-2-38	1999 ²⁾
IEC 60068-3-6	- ¹⁾	Part 3-6: Supporting documentation and guidance - Confirmation of the performance of temperature/humidity chambers	EN 60068-3-6	2002 ²⁾
IEC 60068-1	1988	Part 1: General and guidance	EN 60068-1 ³⁾	1994
IEC 60068-5-2	- ¹⁾	Part 5: Guide to drafting of test methods - Terms and definitions	EN 60068-5-2	1999 ²⁾

1) Undated reference.

2) Valid edition at date of issue.

3) EN 60068-1 includes corrigendum October 1988 + A1:1992 to IEC 60068-1.

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