

INTERNATIONAL STANDARD

NORME INTERNATIONALE

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

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



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INTERNATIONAL ELECTROTECHNICAL COMMISSION

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

FOREWORD

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IEC 60068-2-30 has been prepared by IEC technical committee 104: Environmental conditions, classification and methods of test. It is an International Standard.

This fourth edition cancels and replaces the third edition published in 2005. This edition constitutes a technical revision.

This edition includes the following significant technical changes with respect to the previous edition:

- a) revision of the requirements for the test chamber;
- b) change of the temperature tolerances of the test to limits;
- c) updating of the figures for clarification purposes;
- d) revision of the limits of the temperature and relative humidity during conditioning;
- e) revision of the intermediate measurements;
- f) revision of standardized requirements for the test report.

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

| Draft | Report on voting |
|---------------|------------------|
| 104/1111/FDIS | 104/1125/RVD |

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

The language used for the development of this International Standard is English.

This document was drafted in accordance with ISO/IEC Directives, Part 2, and developed in accordance with ISO/IEC Directives, Part 1 and ISO/IEC Directives, IEC Supplement, available at www.iec.ch/members_experts/refdocs. The main document types developed by IEC are described in greater detail at www.iec.ch/publications.

A list of all the parts of the IEC 60068 series, under the general title *Environmental testing*, can be found on the IEC website.

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

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1 Scope

This part of IEC 60068 specifies a test procedure to determine 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. This test method can also be used to validate the packaging of specimen for transportation and storage.

This document does only in exceptional cases apply to specimens that are energized throughout the test.

2 Normative references

The following documents are referred to in the text in such a way that some or all of their content constitutes requirements 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 60068-1, *Environmental testing - Part 1: General and guidance*

IEC 60068-2-67, *Environmental testing - Part 2-67: Tests - Test Cy: Damp heat, steady state, accelerated test primarily intended for components*

3 Terms and definitions

For the purposes of this document, the terms and definitions given in IEC 60068-1 apply.

ISO and IEC maintain terminology databases for use in standardization at the following addresses:

- IEC Electropedia: available at <https://www.electropedia.org/>
- ISO Online browsing platform: available at <https://www.iso.org/obp>

4 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 cooling period; during this part of the cycle, Variant 2 allows wider limits of relative humidity and the temperature change rate.

The conditioning temperature and the number of cycles (see Clause 6) determine the test severity.

The preconditioning phase is illustrated in Figure 1, the test procedure in Figure 2 to Figure 5 and the recovery procedure in Figure 6.

NOTE For small, low mass specimens, it can be difficult to produce condensation on the surface of the specimen using this procedure; considering an alternative test such as Test Z/AD (IEC 60068-2-38) can be helpful.

5 Description of test chamber

The test chamber shall be so constructed that:

- a) the temperature in the working space can be varied cyclically between 22 °C to 28 °C as well as the appropriate high conditioning temperature in a period specified in 7.4 as well as Figure 2 to Figure 5, as applicable;
- b) the relative humidity in the working space can be maintained within the limits of Variant 1 or Variant 2, or both, as given in 7.4 as well as in Figure 2 to Figure 5, as applicable;
- c) 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 air in the chamber will therefore be continuously stirred at a rate necessary to maintain the specified conditions of temperature and humidity;
- d) the specimen under test is not subjected to radiant heat from the chamber conditioning processes;
- e) the water used for the chamber humidity system complies with the limits given in IEC 60068-2-67;
- f) any water is continuously drained from the chamber and not used again unless it has been re-purified;
- g) the materials used in the construction do not cause any significant corrosion of the specimen, or degradation of the quality of the humidifying water;
- h) injected moisture, when applicable, is not directly applied to the specimen but injected remotely from the specimen. Precautions shall be taken to ensure that no droplet of injected water deposits on the specimens.

Precautions should be taken to ensure that no condensed water from the walls and roof of the test chamber can fall on the specimen. The specimen should not significantly impede the air flow.

6 Severities

The combination of the test variant, the conditioning temperature and the number of cycles define the severity of this test.

The severity shall be chosen from the methods given in Table 1:

Table 1 – Severities of Test Db

| Method | Variant | High conditioning temperature | Number of cycles |
|--------|---------|-------------------------------|------------------|
| I | 1 | 38 °C to 42 °C | 2, 6, 12, 21, 56 |
| II | | 53 °C to 57 °C | 1, 2, 6 |
| III | 2 | 38 °C to 42 °C | 2, 6, 12, 21, 56 |
| IV | | 53 °C to 57 °C | 1, 2, 6 |

7 Testing procedure

7.1 General

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.

This document does not apply to specimens that are energized during the complete test, except in exceptional cases. Specimens can be energized during the constant phases of the tests.

Measurements on energized specimens are typically carried out during constant phases of the test unless specified otherwise (see 7.5).

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

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

The temperature and relative humidity limits given in this document are intended to take into account errors in the measurement, slow changes of temperature, and temperature variations of the working space.

NOTE 1 For further information on the working space, see IEC 60068-3-6.

The temperature and relative humidity refer to the control sensor of the test chamber, if not specified otherwise.

The limits stated in this document do not take measurement uncertainty into consideration.

NOTE 2 The limits are valid for an empty test space during stabilized temperature/humidity conditions of the test. In some conditions, where the specimen has a negligible impact on the chamber control, the limits can still be valid for the chamber with specimen(s). For further information on the operation of a test chamber with specimens, see IEC 60068-3-7.

NOTE 3 To maintain the relative humidity within the required limits, it can be necessary to keep the temperature difference between any two points in the working space at any moment within narrower limits.

The dimensions of the specimen shall be such that it is entirely within the working space of the test chamber. The specimen shall not be placed directly on the floor of the test chamber. The position of the specimen shall be specified in the relevant specification.

7.2 Initial measurements

Initial measurements should be performed under standard atmospheric conditions for measurements and tests (see IEC 60068-1).

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

7.3 Preconditioning

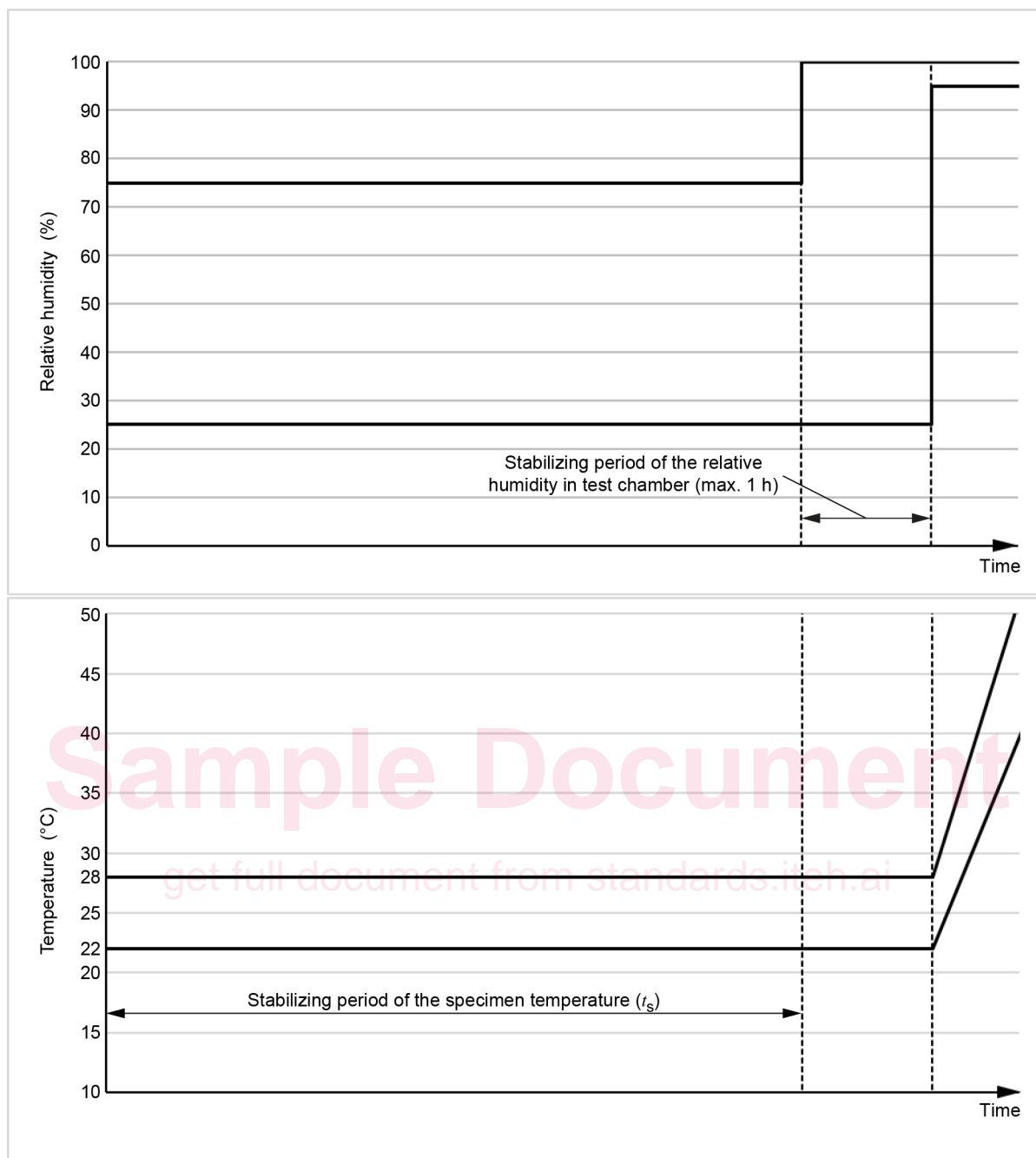
The temperature of the specimens shall be stabilized between 22 °C and 28 °C.

This shall be achieved by either placing the specimens in a separate test chamber before introducing them into the test chamber or adjusting the temperature of the test chamber accordingly to stay within the specified limits (22 °C to 28 °C) after the introduction of the specimens and maintaining them at this level until the specimens attain temperature stability. A representative point (or points) on the specimen can be used for this measurement.

During the stabilization of temperature by either method, the relative humidity shall be within the limits specified for standard atmospheric conditions for measurement and test (see IEC 60068-1), i.e. 25 % RH to 75 % RH (see Figure 1).

Following stabilization, with the specimens in the test chamber, the relative humidity shall be increased to not less than 95 % RH at a test chamber temperature of 22 °C to 28 °C in a time not exceeding 1 h.

After the stabilization of the relative humidity in the test chamber the first test cycle begins.



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Figure 1 – Test Db – Preconditioning period

7.4 Test cycle

- a) The temperature of the test chamber shall be continuously raised to the chosen conditioning temperature with the specified limits given for area A in Figure 2 to Figure 5 and Annex B within a period of 2,5 h to 3,5 h. During this period of temperature increase (area A), the relative humidity shall not be less than 95 % RH.

After 3 h 15 min the relative humidity shall not be less than 90 % RH. Condensation can occur on the specimen during this temperature-rise period.

NOTE 1 The condensation condition implies that the surface temperature of the specimen is below the dew point of the air in the test chamber.

- b) The temperature shall then be maintained within the specified limits given for area B in Figure 2 to Figure 5 and Annex B for the high conditioning temperature until 12 h after the start of the cycle.

During this period (area B), the relative humidity shall be between 90 % and 96 % RH. During the first and last 15 min it shall be between 90 % RH and 100 % RH.

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

1) Variant 1, C₁

The temperature shall be lowered to 22 °C to 28 °C within 3 h to 6 h (see area C₁ in Figure 2, Figure 3 and Annex B). The applicable limits of the temperature and relative humidity are given in Clause B.3.

The relative humidity shall be not less than 95 % RH. During the first 15 min it shall be not less than 90 % RH.

NOTE 2 See Annex A for descriptions of the type of specimen suitable for Variant 1.

2) Variant 2, C₂

The temperature shall be lowered to 22 °C to 28 °C within 3 h to 6 h (see area C₂ in Figure 4, Figure 5 and Annex B). The applicable limits of the temperature and relative humidity are given in Clause B.4.

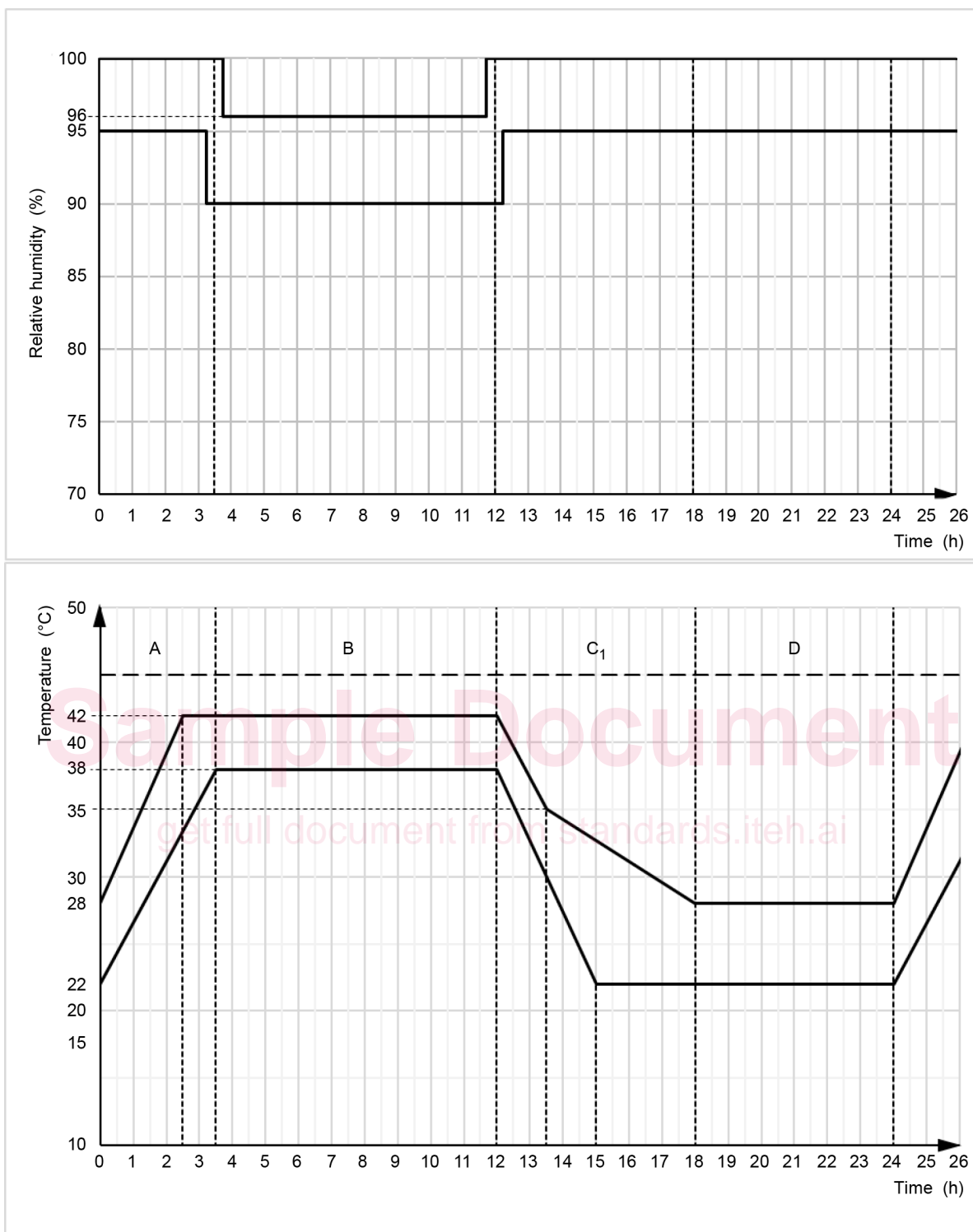
The relative humidity shall be not less than 80 % RH.

NOTE 3 See Annex A for descriptions of the type of specimen suitable for Variant 2.

- d) The temperature shall then be maintained between 22 °C and 28 °C with a relative humidity of not less than 95 % RH until the 24 h cycle is completed (see area D in Figure 2 to Figure 5 and Annex B).

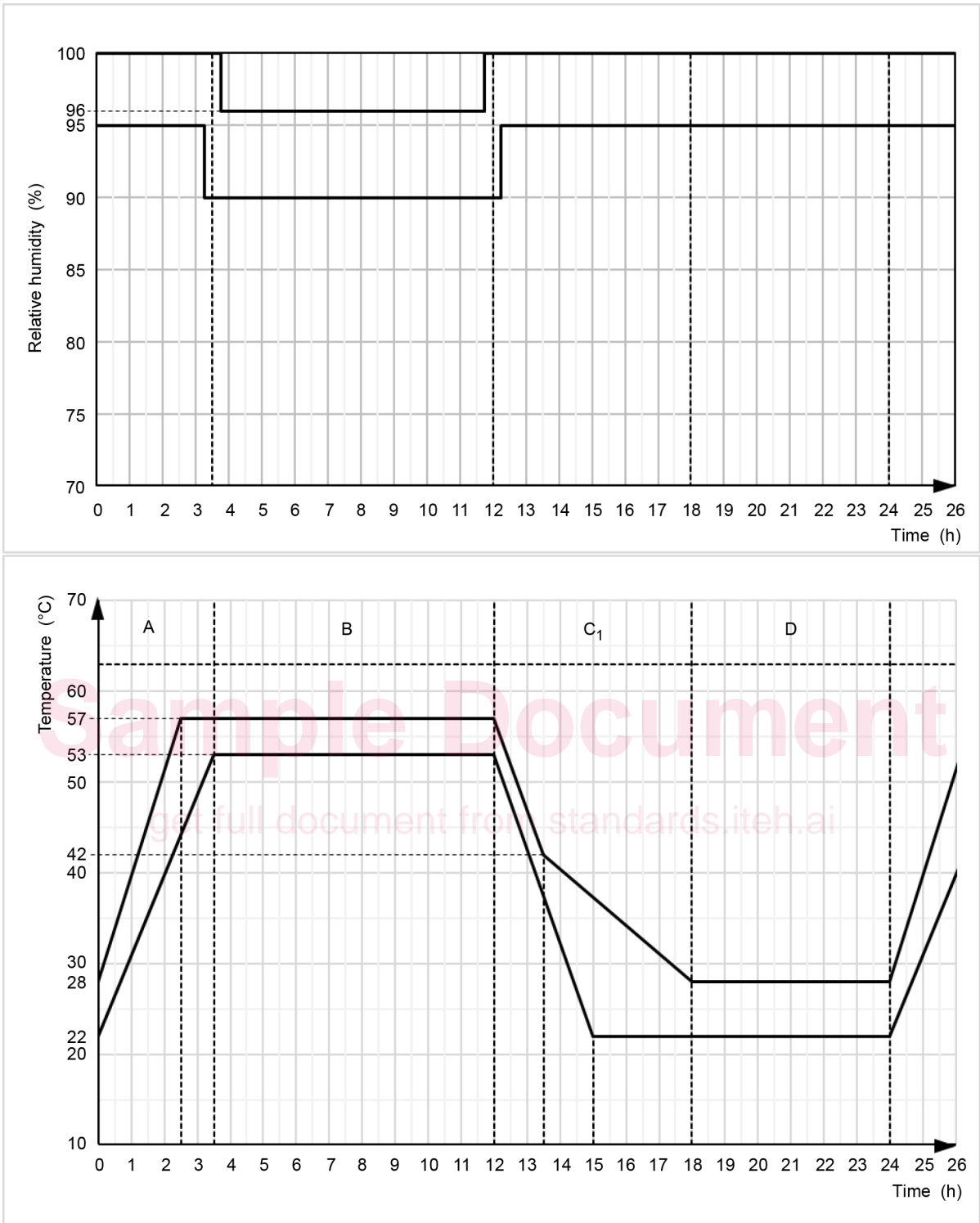
An example of test programming for each test procedure is given in Annex C.

NOTE 4 The type and design of the test system can affect its performance and require different features in the programming of the test procedures.



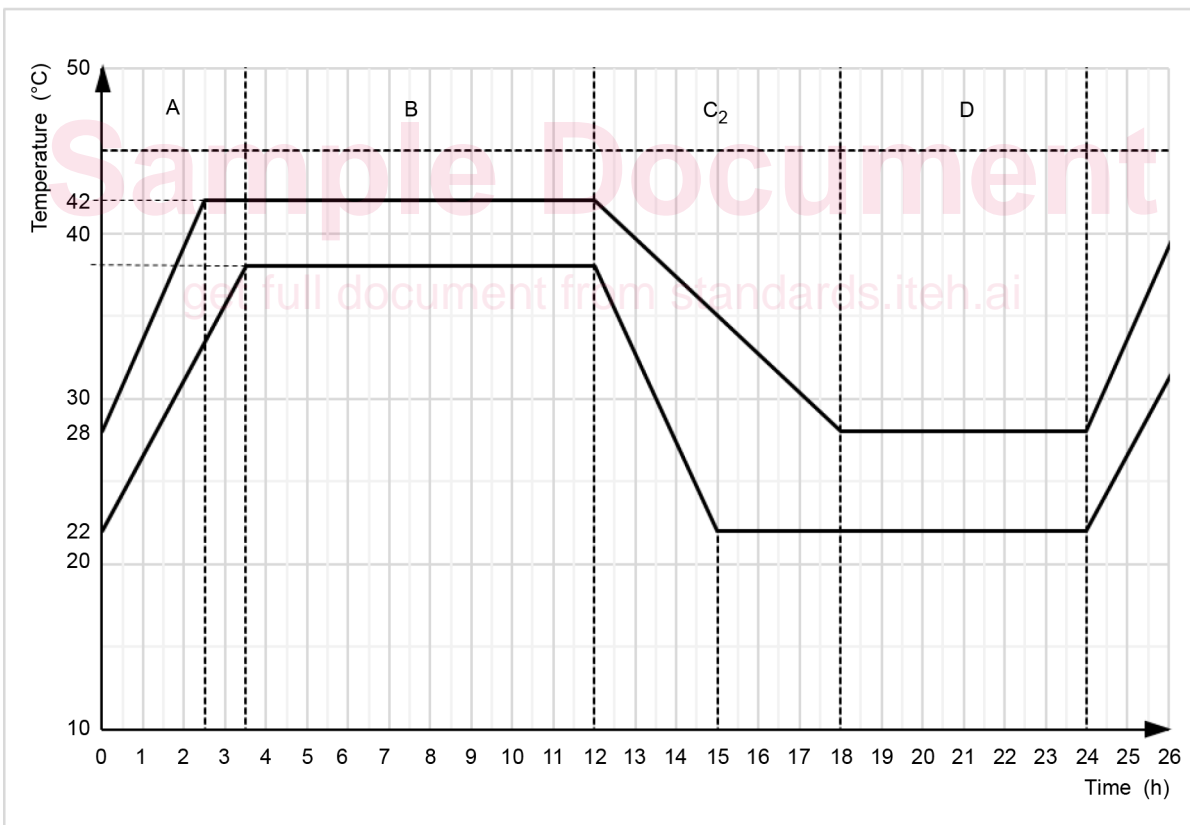
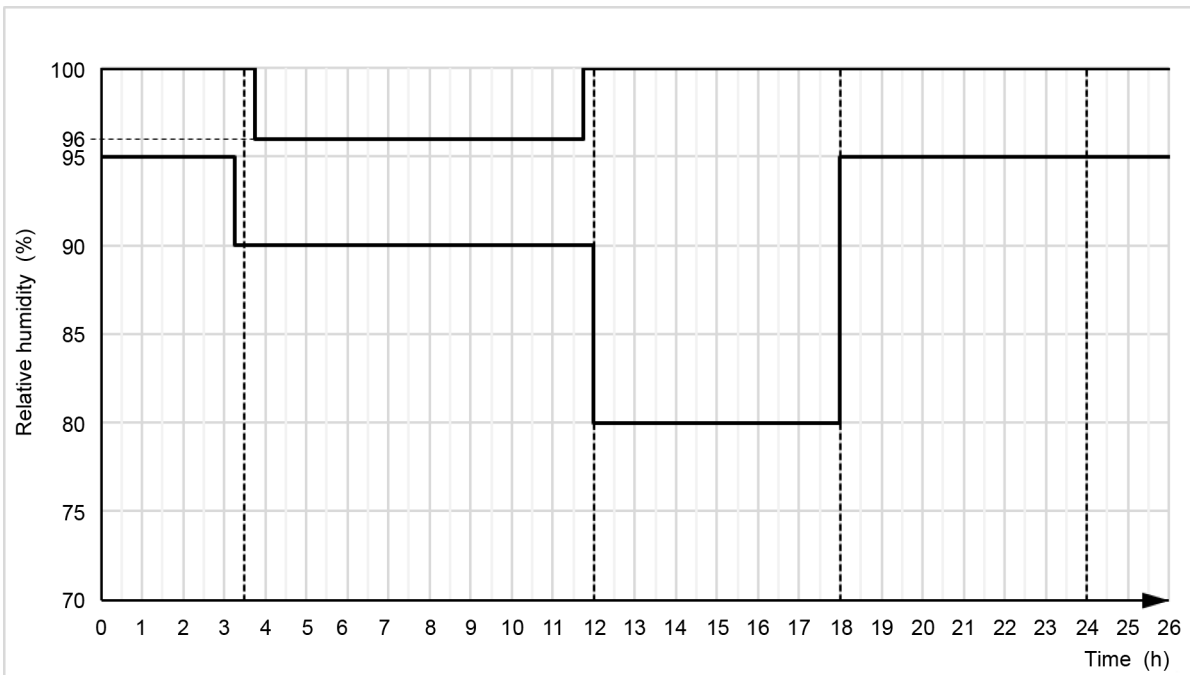
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Figure 2 – Test Db – Test cycle – Variant 1, Method I



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Figure 3 – Test Db – Test cycle – Variant 1, Method II



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Figure 4 – Test Db – Test cycle – Variant 2, Method III

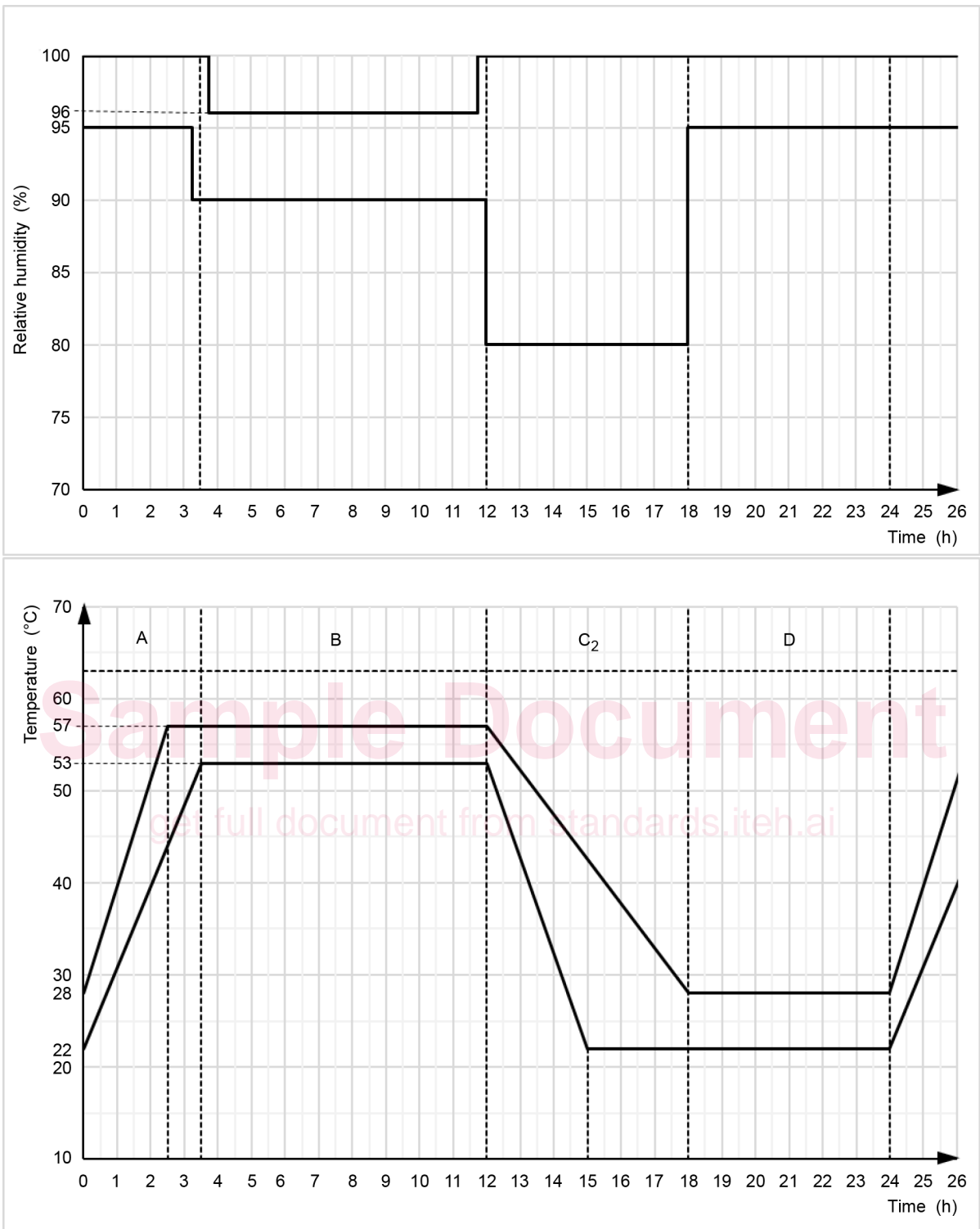


Figure 5 – Test Db – Test cycle – Variant 2, Method IV