IEC 61300-2-46

Edition 2.0 2019-03
REDLINE VERSION

INTERNATIONAL STANDARD

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Fibre optic interconnecting devices and passive components – Basic test and measurement procedures –
Part 2-46: Tests – Damp heat, cyclic

IEC 61300-2-46:2019-03 RLV(en)

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INTERNATIONAL
ELECTROTECHNICAL
COMMISSION

ICS 33.180.20

ISBN 978-2-8322-6682-3

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INTERNATIONAL ELECTROTECHNICAL COMMISSION

FIBRE OPTIC INTERCONNECTING DEVICES AND PASSIVE COMPONENTS – BASIC TEST AND MEASUREMENT PROCEDURES –

Part 2-46: Tests – Damp heat, cyclic

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International Standard IEC 61300-2-46 has been prepared by subcommittee 86B: Fibre optic interconnecting devices and passive components, of IEC technical committee 86: Fibre optics.

This second edition cancels and replaces the first edition published in 2006. This edition constitutes a technical revision.

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

a) complete revision to harmonize with IEC 60068-2-30;
b) addition of detail description Clause 4, General description;
c) addition of detail description Clause 5, Apparatus;
d) addition of detail description Clause 6, Procedure.

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

FDIS	Report on voting
86B/4167/FDIS	86B/4182/RVD

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

This document has been drafted in accordance with the ISO/IEC Directives, Part 2.

A list of all parts in the IEC 61300 series, published under the general title *Fibre optic interconnecting devices and passive components – Basic test and measurement procedures*, 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 "http://webstore.iec.ch" in the data related to the specific document. At this date, the document will be

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- withdrawn,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

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FIBRE OPTIC INTERCONNECTING DEVICES AND PASSIVE COMPONENTS – BASIC TEST AND MEASUREMENT PROCEDURES –

Part 2-46: Tests – Damp heat, cyclic

1 Scope

The purpose of this part of IEC 61300 is to describe a test to determine the suitability of a fibre optic device to withstand the environmental condition of high humidity and change of temperature which ~~may~~ can occur in actual use, storage and/or transport.

The test is primarily intended to determine the suitability of fibre optic components under conditions of high humidity – combined with cyclic temperature changes and, in general, producing condensation on the surface of the ~~specimen~~ device under test (DUT). Absorption of moisture ~~may~~ can result in swelling that would destroy functional utility, cause loss of physical strength, and cause changes in other important mechanical properties. Degradation of optical properties ~~may~~ can also occur.

Although not necessarily intended as a simulated tropical test, this test can, nevertheless, be useful in determining moisture absorption of insulating or covering materials.

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 60068-1:2013, *Environmental testing – Part 1: General and guidance*

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

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

IEC 61300-1, *Fibre optic interconnecting devices and passive components – Basic test and measurement procedures – Part 1: General and guidance*

IEC 61300-3-1, *Fibre optic interconnecting devices and passive components – Basic test and measurement procedures – Part 3-1: Examinations and measurements – Visual examination*

IEC 61300-3-3, *Fibre optic interconnecting devices and passive components – Basic test and measurement procedures – Part 3-3: Examinations and measurements – Active monitoring of changes in attenuation and return loss*

3 Terms and definitions

No terms and definitions are listed in this document.

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

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

4 General description

The test described in this document comprises one or more temperature cycles in which the relative humidity is maintained at a high level.

The upper temperature of the cycle and the number of cycles (see Clause 7) determine the test severity.

Test profiles illustrating the procedure are shown in Figure 1, Figure 2, and Figure 3.

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

5 Apparatus

5.1 Chamber

~~The apparatus consists of an environmental chamber in accordance with IEC 60068-2-30, test Db. The chamber shall be capable of housing the specimen and of allowing access for measurement during conditioning. It shall also be capable of maintaining the specified temperatures and humidity within the specified tolerances. Forced air circulation may be used to maintain homogeneous conditions. The chamber and accessories shall be constructed and arranged in such a manner as to avoid condensation on the specimens.~~

~~Water: use distilled, demineralized or deionized water to obtain the specified humidity. No rust or corrosion contaminants shall be imposed on the specimen by the test facility.~~

a) The temperature can be varied cyclically between 25 °C ± 3 °C and the appropriate upper temperature specified with the tolerance and rate of change specified in 6.3.3 and Figure 1, as applicable.

b) The relative humidity in the working space can be maintained within the limits given in 6.3.3 and in Figure 1 as applicable.

c) 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.

d) The DUTs shall not be subjected to radiant heat from the chamber conditioning processes.

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

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

g) The dimensions, properties and/or electrical loading of the DUTs shall not appreciably influence conditions within the chamber.

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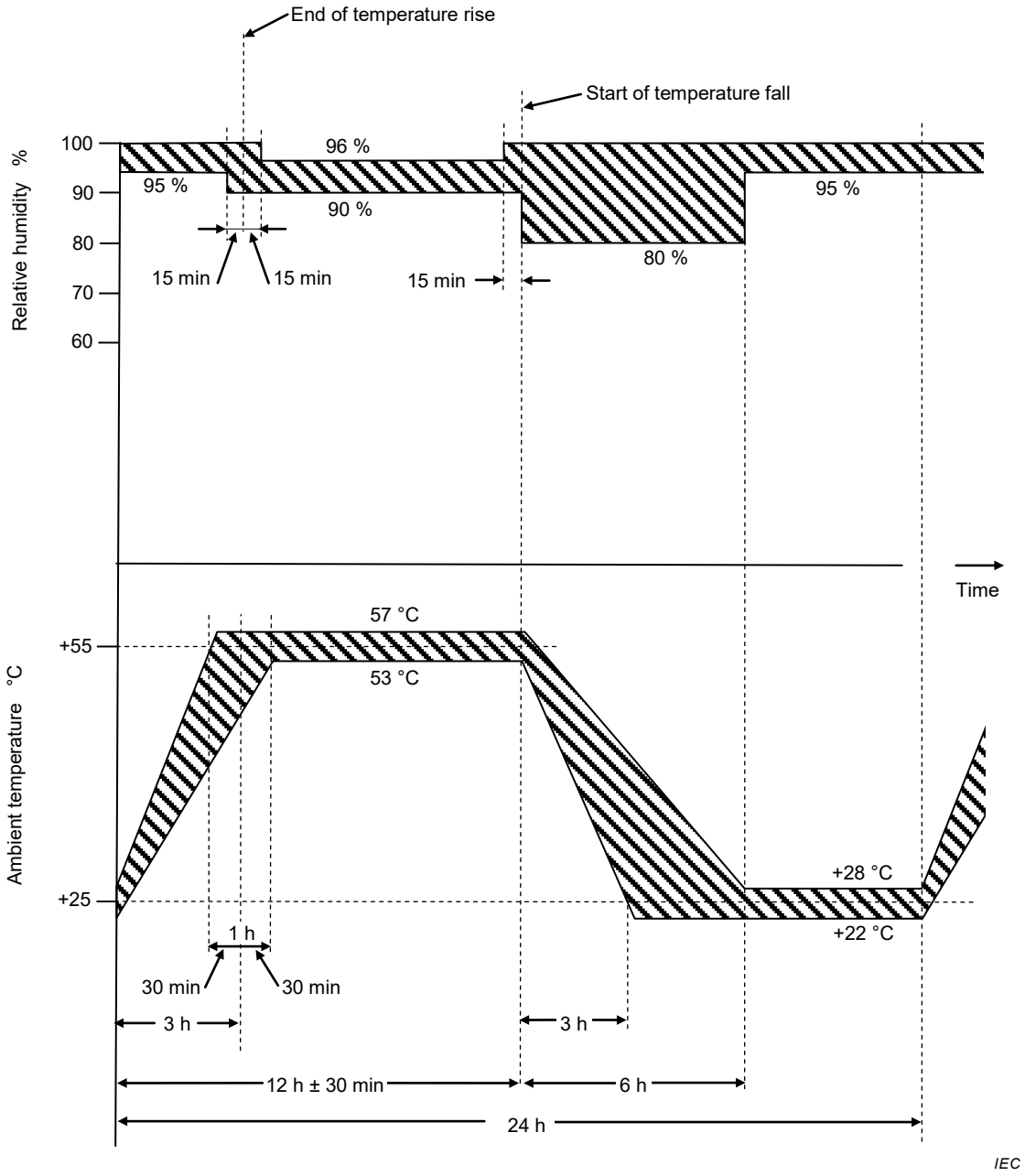

Figure 1 – Test – Test cycle

5.2 Others ~~apparatus~~

Additional apparatus may be necessary to perform the examinations and measurements specified by the relevant specification.

6 Procedure

6.1 Preparation of ~~specimens~~ DUT

Prepare the ~~specimen~~ DUT according to the manufacturer's instructions or as specified in the relevant specification. The ~~specimen~~ DUT shall be terminated with a sufficient length of fibre cable to facilitate connection with the optical source and detector.

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Maintain the ~~specimen~~ DUT under standard atmospheric conditions ~~(room temperature condition)~~ per IEC 61300-1 for 2 h minimum.

Clean the mechanical and optical alignment parts of the ~~specimen~~ DUT according to the manufacturer's instructions.

6.2 Initial examinations and measurements

If specified, perform initial examinations and measurements as required by the relevant specification.

6.3 Conditioning

~~**5.3.1** Stabilize the chamber and the specimen to standard atmospheric conditions. Place the specimen in the chamber in its normal operating position, including hook-ups to peripheral equipment (when required).~~

~~**5.3.2** Adjust the chamber temperature and humidity to the specified severity. The rate of change of temperature shall not exceed 1 °C/min, averaged over a maximum period of 5 min. In any case the rising temperature should stay within the limits indicated in Figure 1.~~

~~**5.3.3** At the completion of the test, allow the specimen to remain in the chamber while the temperature is gradually reduced to standard atmospheric conditions. The rate of change of temperature shall not exceed 1 °C/min, averaged over a maximum period of 5 min. In any case the decreasing temperature should stay within the limits indicated in Figure 1.~~

~~**5.3.4** Where optical measurements are required during the test, measurements shall be made at a maximum interval of 1 h. Do not remove the specimen(s) from the chamber when taking these measurements. Measurements shall be made in accordance with IEC 61300-3-3.~~

6.3.1 Placing the DUT

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

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

6.3.2 Stabilizing

6.3.2.1 Temperature tolerance

The total temperature tolerances of ±2 °C and ±3 °C given in this document are 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 °C. It may also be necessary to keep short-term fluctuations within ±0,5 °C to maintain the required humidity.

6.3.2.2 Stabilization period

The temperature of the DUT shall be stabilized at 25 °C ± 3 °C (the definition of temperature stability is given in IEC 60068-1 and IEC 60068-5-2) – see Figure 2. This shall be achieved by either

a) placing the DUT in a separate chamber before introducing it into the test chamber, or

a) adjusting the temperature of the test chamber to 25 °C ± 3 °C after the introduction of the DUT and maintaining it at this level until the DUT attains temperature stability.

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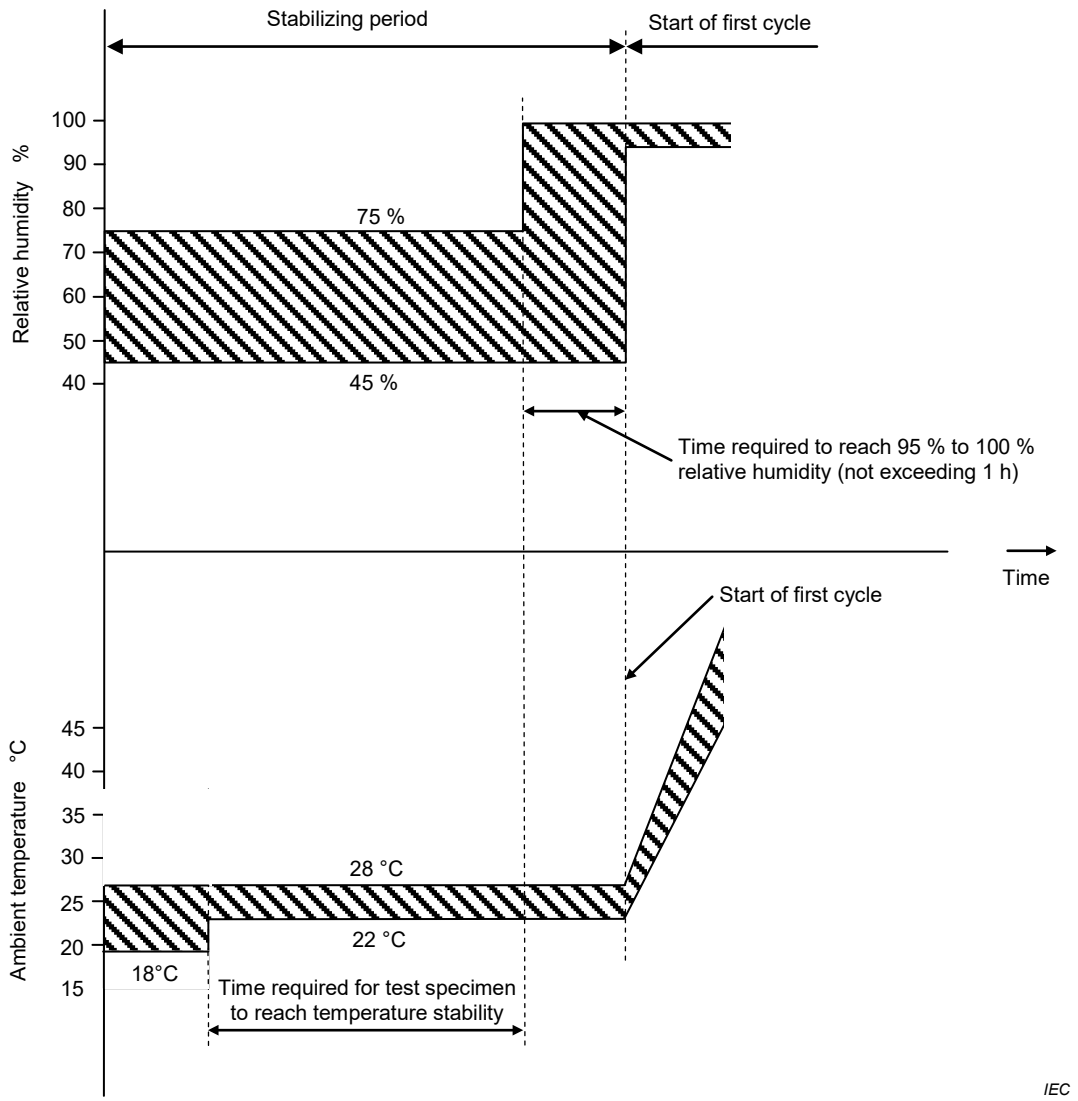

Figure 2 – Test – Stabilizing period

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

Following stabilization, with the DUT in the test chamber, the relative humidity shall not be less than 95 % RH at an ambient temperature of 25 °C ± 3 °C.

6.3.3 24 h cycle

a) The temperature of the chamber shall be raised to the appropriate upper temperature specified by the relevant specification. The upper temperature shall be achieved in a period of 3 h ± 30 min and at a rate within the limits defined by the shaded areas in Figure 1.

   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 DUT during this temperature-rise period.

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

b) The temperature shall then be maintained within the specified limits for the upper temperature (±2 °C) until 12 h ± 30 min from the start of the cycle.

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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.

c) The temperature shall be lowered to 25 °C ± 3 °C within 3 h to 6 h. The relative humidity shall be not less than 80 % RH.

d) The temperature shall then be maintained at 25 °C ± 3 °C with a relative humidity of not less than 95 % RH until the 24 h cycle is completed.

6.4 Intermediate measurement

Where optical measurements are required during the test, measurements shall be made at a maximum interval of 1 h. The DUT(s) shall not be removed from the chamber when taking these measurements. Measurements shall be made in accordance with IEC 61300-3-3.

6.5 Recovery

~~Allow the specimen to remain under standard atmospheric conditions for a period of 2 h.~~

The relevant specification shall specify whether recovery shall be made at standard atmospheric conditions for testing (see 4.3 of IEC 60068-1:2013), or at controlled recovery conditions (see 4.4.2 of IEC 60068-1:2013).

When controlled recovery conditions are required (see Figure 3), the DUT may be transferred to another chamber for this recovery period or may remain in the damp heat chamber.

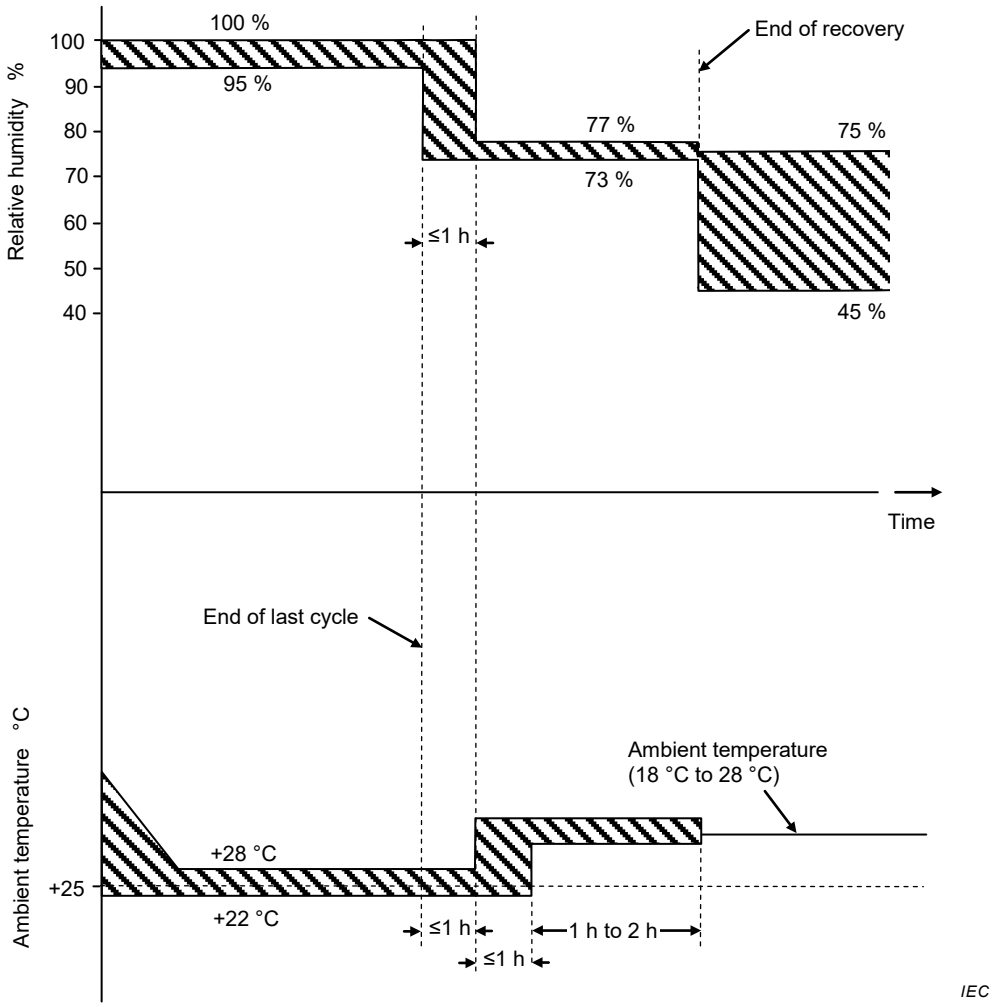

Figure 3 – Test – Recovery at controlled conditions

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Where the DUT is transferred to another chamber, the change-over time shall be as short as possible and not more than 10 min.

In case the DUT remains in the damp heat chamber, the relative humidity shall be reduced to 75 % RH ± 2 % RH in not more than 1 h. The temperature shall then be adjusted to ambient temperature within ±1 °C in not more than 1 h. For large DUTs, 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 specified recovery conditions have been obtained.

DUTs having a large thermal time constant may be submitted to recovery for a period sufficient to attain temperature stability (see Clause 4 of IEC 60068-1:2013).

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

6.6 Final examinations and measurements

Perform final examinations and measurements as required by the relevant specification. Unless otherwise specified, final visual examination shall be in accordance with IEC 61300-3-1.

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.

7 Severities

~~Details:~~

- Test cycle: See Figure 1, Figure 2, and Figure 3
- High temperature: +55 °C ± 2 °C
- Low temperature: +25 °C ±~~2~~ 3 °C
- Humidity: ~~>90 %~~ ≥ 80 %RH
- Duration of each cycle: 24 h
- Number of cycles: 6

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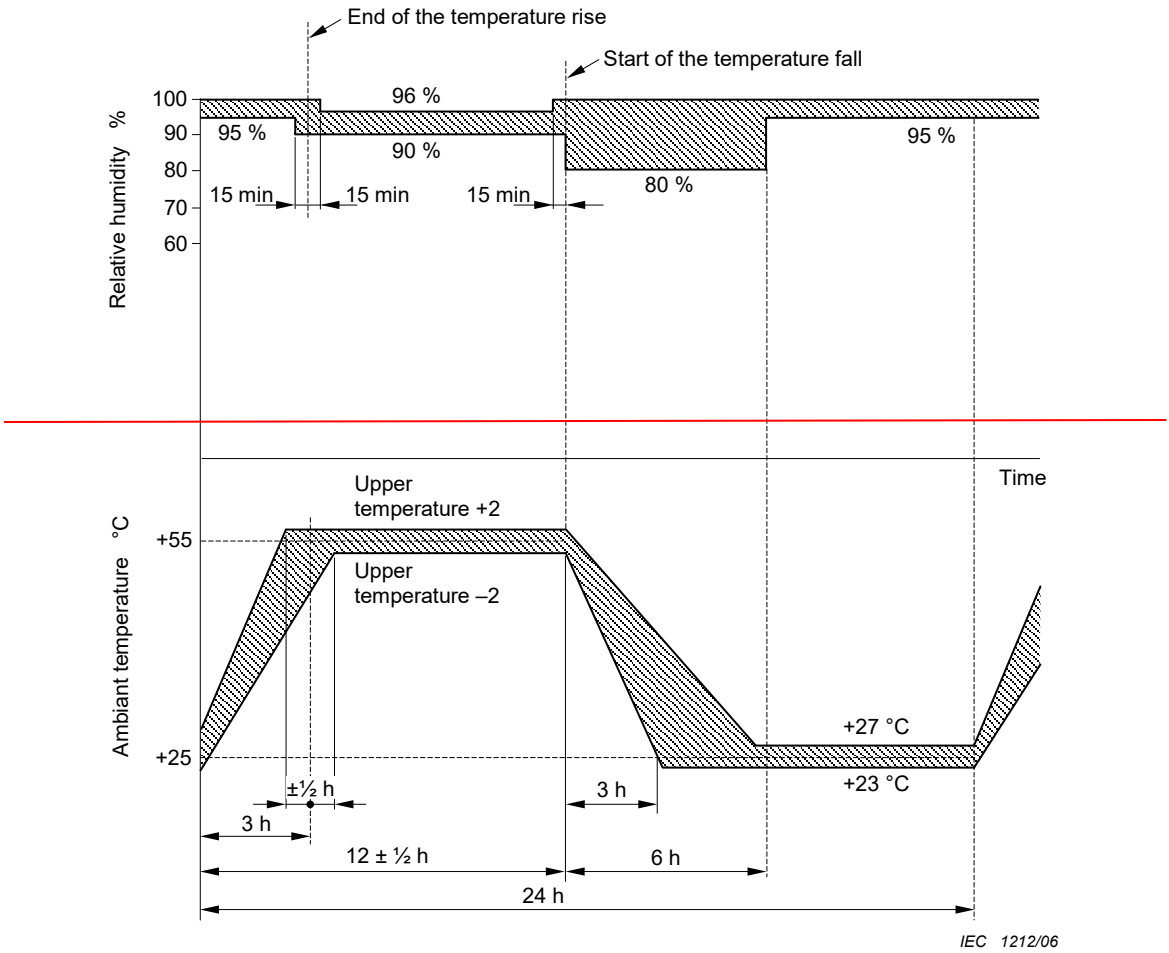

~~Figure 1 – Test Db – Test cycle~~

8 Details to be specified

The following details, as applicable, shall be specified in the relevant specification:

– ~~specimen~~ DUT optically functioning or non-functioning;
– ~~specimen~~ DUT mated or unmated (for connectors);
– initial examinations and measurements and performance requirements;
– examinations and measurements during test and performance requirements;
– final examinations and measurements and performance requirements;
– deviations from test procedure;
– additional pass/fail criteria.

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