IECEE GUIDANCE DOCUMENT

IEC System of Conformity Assessment Schemes for Electrotechnical Equipment and Components (IECEE System)

Committee of Testing Laboratories (CTL)
Guidance - Test Chamber Verification
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FOREWORD

Document Owner

CTL WG 1 Metrology and Accuracy/Uncertainty

History of changes

<table>
<thead>
<tr>
<th>Revision Date</th>
<th>Brief summary of changes</th>
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<tr>
<td>2021-02-03</td>
<td>N/A, as first edition</td>
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<tr>
<th>Effective date</th>
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<tr>
<td>2023-08-01</td>
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<td>2024-01-01 (Maintenance due date extended at the request of the CTL)</td>
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The content in this document is to be applied as guidance until the stated effective date. This is to allow laboratories opportunity to implement processes related to climatic chamber verification.
1 Purpose

1.1 The purpose of this document is to provide guidance for the verification of performance specifications for temperature / humidity (test) chambers.

2 Scope

2.1 This Operational Document provides guidance when the test standard does not provide criteria for verification of test chamber performance specifications.

3 Normative References

<table>
<thead>
<tr>
<th>Normative Reference</th>
<th>Description</th>
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<tbody>
<tr>
<td>ISO/IEC 17025:2017</td>
<td>General requirements for the competence of testing and calibration laboratories</td>
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<tr>
<td>IEC 60068-1</td>
<td>Environmental testing – Part 1: General and guidance</td>
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<tr>
<td>IEC 60068-3-5</td>
<td>Environmental testing – Part 2-2: Tests – Test B: Dry heat</td>
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<tr>
<td>IEC 60068-3-6</td>
<td>Supporting documentation and guidance - Confirmation of the performance of temperature/humidity chambers</td>
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<tr>
<td>IEC 60068-3-7</td>
<td>Supporting documentation and guidance – Measurements in temperature chambers for tests A and B (with load)</td>
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<tr>
<td>IEC 60068-3-11</td>
<td>Environmental testing – Part 3-11: Supporting documentation and guidance – Calculation of uncertainty of conditions in climatic test chambers</td>
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4 Terms and definitions

For purposes of this document, the following terms definitions apply:

4.1 Test Chamber – An enclosure or space in some parts of which the temperature / humidity conditions specified in IEC 60068-2-X documents can be achieved. The selected part ‘X’ is determined according to the intended use of the chamber.

4.2 Calibration (C) - metrological traceability of measuring equipment by means of an unbroken chain of calibrations or comparisons linking them to relevant primary standards of the SI units of measurement.

4.3 Verification (Z) – Characterization of the working space of a climate chamber or oven using 9 or 15 sensors and related calibrated measuring equipment as specified by IEC 60068-3-5 or IEC 60068-3-6.

4.4 Interim Verification (v) – A check of the chamber working space conditions through measurement of temperature and humidity at a designated location in the working space of the chamber or oven utilizing calibrated equipment.

5 Responsibility of the laboratory

5.1 The Laboratory is to assure proper selection of test equipment in accordance with ISO/IEC 17025:2017 section 6.4.1 “The laboratory shall have access to equipment (including but not limited to, measuring instruments, software, measurement standards, reference materials, reference data, reagents, consumables or auxiliary apparatus) that is required for the correct performance of laboratory activities and that can influence the results.” and section 6.4.4 “The laboratory shall verify that equipment conforms to specified requirements before being placed or returned to service.” Test chamber working space conditions are verified. Related measurement and indicating equipment is calibrated.
6 Requirements

6.1 The default requirements given in this document are applied when the test standard does not provide criteria.

7 Test Chamber Verification

7.1 ISO/IEC 17025:2017 distinguishes between measurement equipment and other laboratory equipment. Paragraph 6.4.5 states “the equipment used for measurement shall be capable of achieving the measurement accuracy and/or measurement uncertainty required to provide a valid result”. The generated conditions in a test chamber working space are not considered as “equipment used for measurement”.

7.1.1 The environmental conditions within a test chamber working space are verified to determine compliance to the applicable test standard or verification procedure. Calibrated measurement equipment is used to perform the verification.

7.2 Where a verification procedure for a test chamber is not provided in the test standard, one or more of the following documents are applied according to the intended use of the chamber:

7.2.1 Cold test chamber verification (unloaded): Apply IEC 60068-3-5. Utilize nine (9) temperature sensors for chambers 2000 liters or less, utilize fifteen (15) sensors over 2000 liters.

7.2.2 Dry heat test chamber verification (unloaded): Apply 60068-3-5. Utilize nine (9) temperature sensors for chambers 2000 liters or less, utilize fifteen (15) sensors over 2000 liters. The protocol for dry heat test chambers is IEC 60068-2-2 (humidity in chamber not to exceed 50%).

7.2.3 Humidity / Temperature test chamber: Apply IEC 60068-3-6 (unloaded). Utilize nine (9) temperature sensors for chambers 2000 liters or less, utilize fifteen (15) sensors over 2000 liters. A single humidity and temperature sensor are positioned at the center of the working space. The relative humidity is then calculated at each point in the working space, where a temperature sensor is located, by using the temperature difference as indicated in 60068-3-6. If the chamber is also used for dry heat tests, the requirements of IEC 60068-3-5 are applied.

7.2.4 For cold or dry heat tests, where verification of a test chamber with load is required: Apply IEC 60068-3-7 “Supporting documentation and guidance – Measurements in temperature chambers for tests A and B (with load)”. The load utilized may be the intended test specimen or the artificial loads described in IEC 60068-3-7. In accordance with paragraph 5.3.2, six (6) additional temperature sensors are required if the chamber walls are directly heated or cooled.

7.2.5 In accordance with IEC 60068-1: “Environmental testing – Part 1: General and guidance”, consideration is given for specimens that are heat dissipating and non-heat dissipating. Additionally, paragraph 8 states that the test specification shall determine whether the specimen is to be energized: “Application of tests - General guidance on environmental testing is given in Annex B. The relevant specification shall prescribe whether tests are to be carried out on specimens in the “energized” or “non-energized” condition”

8 Calibration of Measurement and Indicating Equipment

8.1 Calibration is performed on test chamber measurement and indicating equipment which monitors conditions within the chamber working space. Equipment which is used for the verification of the working space is also calibrated. Refer to OD 5011 regarding traceable calibrations and calibration intervals for equipment.

Note: the accuracy of a humidity sensor used for verification of a climate chamber working space should be equal to, or better than, the tolerance of the test chamber set point.
9 Measurement Uncertainty

9.1 IEC 60068-3-6 specifies the determination of measurement uncertainty for the system used to verify the working space of climate chambers.

NOTE: IEC 60068-3-11 provides guidance for analyzing uncertainties of temperature and humidity in climatic test chambers. For purposes of this document, the indication in IEC 60068-3-11 to ‘calibrate’ the working space of a chamber is considered the verification of the working space environmental conditions.

10 Verification and calibration intervals

10.1 Verification of the chamber working space conditions and the calibration of the chamber measurement and indicating equipment is performed at intervals to assure the required performance of the chamber. Interval extensions are permitted where objective evidence supports that the chamber will continue to perform to the requirements throughout the extended interval.

10.2 Initially, calibration (C) of the measurement equipment is performed. Following this calibration activity, a full verification (Z) using a 9 (or 15) point verification to determine characteristics of the chamber environment is performed. After a 12 month period, the calibration (C) and verification (Z) are repeated for comparison to the initial data. The interval for chamber measurement equipment calibration (C) may be extended if supporting data indicates longer intervals are appropriate.

10.3 Following any modifications or repairs, a verification (Z) according to IEC 60068-3-5 or IEC 60068-3-6, is performed before recommissioning the chamber. This includes, but is not limited to cooling / heating system repairs, ventilation system repairs or alterations, door seal replacement or similar repairs to the chamber enclosure.

10.4 Intervals for calibration (C) and full verification (Z) are independent events that are applied following the initial calibration and verification of the chamber. The maximum permitted interval for measurement equipment calibration (C) and full 9 (or 15) point verification (Z) is 36 months unless supporting data indicates longer intervals are appropriate. Examples of verification and calibration intervals are shown in table 1.

11 Interim verification

11.1 Climate chamber interim verification (v) may be performed with a single RH probe and single temperature sensor at a designated location in the working space. Interim verification using a single point is only valid if requirements of Section 10 have been met and no modifications or repairs have been made to the chamber working space or the chamber measurement equipment / control equipment. If not permanently mounted, the location of the single sensors are identified to permit correct placement when performing future interim verifications (v).

11.2 In order for the chamber measurement equipment and sensors to be utilized for a single point interim verification (v), a full verification (Z) is first performed to determine correlation between readings at the location of the single point sensors and readings at other sensor locations within the chamber working space.

11.3 The measurement equipment provided with the test chamber may be utilized for the single point interim verification providing the equipment and related sensor calibrations are traceable to SI units in accordance with ISO / IEC 17025.
### Table 1
Examples of verification and calibration intervals

<table>
<thead>
<tr>
<th>C = Calibration  Z = Full 9 or 15 point verification  v = 1 point interim verification  ♦ = 3 month period</th>
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<tr>
<td>**CZ ****CZ ****CZ ****CZ ****CZ **<strong>CZ etc.</strong></td>
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<tr>
<td><strong>CZ ***** C <em>v</em></strong>* CZ ***** C <em>v</em>*</td>
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