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INTERNATIONAL STANDARD

colour inside

Plasma display panels –
Part 4-1: Environmental testing methods – Climatic and mechanical

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IEC Central Office
3, rue de Varembé
CH-1211 Geneva 20
Switzerland

Tel.: +41 22 919 02 11
Fax: +41 22 919 03 00
info@iec.ch
www.iec.ch

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FOREWORD

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International Standard IEC 61988-4-1 has been prepared by IEC technical committee 110: Electronic display devices.

The text of this standard is based on the following documents:

FDIS	Report on voting
110/637/FDIS	110/653/RVD

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

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

A list of all the parts in the IEC 61988 series, under the general title *Plasma display panels*, can be found on the IEC website.

The committee has decided that the contents of this publication will remain unchanged until the stability date indicated on the IEC web site under "http://webstore.iec.ch" in the data related to the specific publication. At this date, the publication will be

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- withdrawn,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

A bilingual version of this publication may be issued at a later date.

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PLASMA DISPLAY PANELS –

Part 4-1: Environmental testing methods – Climatic and mechanical

1 Scope

This part of IEC 61988 defines the following test methods for evaluating the climatic and mechanical endurance characteristics of plasma display modules (PDP modules):

a) temperature and humidity tests

b) air pressure tests

c) mechanical tests

2 Normative references

The following documents, in whole or in part, are normatively referenced in this document and are indispensable for its application. 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 60068-2-1:2007, *Environmental testing – Part 2: Tests – Test A: Cold*

IEC 60068-2-2:2007, *Environmental testing – Part 2: Tests – Test B: Dry heat*

IEC 60068-2-6, *Environmental testing – Part 2: Tests – Test Fc: Vibration (sinusoidal)*

IEC 60068-2-13:1983, *Basic environmental testing procedures – Part 2-13: Tests – Test M: Low air pressure*

IEC 60068-2-14:2009, *Environmental testing – Part 2-14: Tests – Test N: Change of temperature*

IEC 60068-2-27:2008, *Environmental testing – Part 2-27: Tests – Test Ea and guidance: Shock*

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

IEC 60068-2-78:2012, *Environmental testing – Part 2-78: Tests – Test Cab: Damp heat, steady state*

IEC 61747-5:1998, *Liquid crystal and solid-state display devices – Part 5: Environmental, endurance and mechanical test methods*

IEC 61988-1, *Plasma display panels – Part 1: Terminology and letter symbols*

IEC 61988-2-1, *Plasma display panels – Part 2-1: Measuring methods – Optical and optoelectrical*

IEC 61988-2-5, *Plasma display panels – Part 2-5: Measuring methods – Acoustic noise*

ISO 2248, *Packaging – Complete, filled transport packages – Vertical impact test by dropping*

ISO 4180, *Packaging – Complete, filled transport packages – General rules for the compilation of performance test schedules – Part 1: General principles*

ISO 10531, *Packaging – Complete, filled transport packages – Stability testing of unit loads*

3 Terms, definitions and letter symbols

For the purposes of this document, the terms, definitions and letter symbols given in IEC 60068-1 and IEC 61988-1, as well as the following apply.

3.1
P_{op}
air pressure at which the PDP module is operated during the tests

3.2
P_{st}
air pressure at which the PDP module is stored in a non-operating state during the tests

4 Environmental tests

4.1 General

In this document, tests mean storage or operation tests at high or low temperature, high humidity, low pressure, or combinations thereof, and vibration tests or shock tests, while measurements mean the characteristic evaluations, i.e. initial, intermediate and final measurements.

4.2 Test items

This document describes the following test items:

a) temperature and humidity tests (operation);

b) temperature and humidity tests (storage);

c) air pressure tests;

d) mechanical tests.

4.3 Structure of testing equipment

The system diagrams and/or driving conditions of the testing equipment shall comply with the structure specified in each item.

5 Standard conditions

5.1 Standard reference atmosphere

Temperature: 25 °C

Air pressure: 101,3 kPa

NOTE No requirement for relative humidity is given because correction by calculation is generally not possible.

If the parameters to be measured depend on temperature and/or pressure, and the law of dependence is known, the values shall be measured in the conditions specified in 5.3 and, if

necessary, be corrected by calculation to the standard reference atmospheric conditions above.

5.2 Standard atmospheric conditions for reference measurements and tests

If the parameters to be measured depend on temperature, pressure and humidity and the law of dependence is unknown, the atmospheric conditions to be specified shall be selected from the following values, as shown in Table 1.

Table 1 – Standard conditions for reference measurements and tests

Temperature °C	Relative humidity [a] % RH	Air pressure [a] kPa
20 ± 3 25 ± 3 30 ± 3 35 ± 3	45 to 75	86 to 106
[a] Inclusive values.		

5.3 Standard atmospheric conditions for measurements and tests

Unless otherwise specified, all tests and measurements shall be carried out under standard atmospheric conditions:

temperature: 15 °C to 35 °C;

relative humidity: 25 % to 85 %, where appropriate;

air pressure: 86 kPa to 106 kPa.

The absolute humidity of the atmosphere shall not exceed 22 g/m^3.

5.4 Standard atmospheric conditions for assisted drying

Where assisted drying is required before commencing a series of measurements, the conditions listed below shall be used on the PDP module for at least 2 h, unless otherwise prescribed by the relevant specification:

temperature: (55 ± 3) °C;

relative humidity: not exceeding 20 %;

air pressure: 86 kPa to 106 kPa.

When the specified temperature for the dry heat test is lower than 55 °C, assisted drying shall be carried out at that lower temperature.

5.5 Recovery conditions

The recovery shall be carried out in the conditions specified in IEC 60068-1:2013, 5.3:

temperature: 15 °C to 35 °C;

relative humidity: 25 % to 75 %;

air pressure: 86 kPa to 106 kPa.

5.6 Standard installation conditions

Unless otherwise specified in the relevant specification, stand the PDP module keeping adequate clearance to avoid airflow disturbance. The mounting structure of the PDP module shall be specified in the relevant specification.

5.7 Standard measuring conditions

The standard measuring conditions described in IEC 61988-2-1 shall be applied.

5.8 PDP module state

For the non-operating test, the PDP module shall be either unpacked and turned off, or as otherwise specified in the relevant specification.

For the operating test, the PDP module shall be either in the unpacked, turned off and ready-for-use state, or as otherwise specified in the relevant specification. In the operating test, the module shall be turned on in each test procedure.

5.9 Operating conditions

Full screen: The signal input sets at (15 ± 1) % of white level without gamma correction or an equivalent input level when gamma correction is used.

In case a different signal input is used, it shall be noted in the report.

NOTE The 15 % signal input level is a typical value for video.

6 Measurements

6.1 General

Measurement items are defined in each testing method. An initial measurement is required before each test, and a final measurement is required after the test. If necessary, intermediate measurements can be carried out during the test. If necessary, recovery conditioning defined in each test shall be applied before final and intermediate measurements.

6.2 Measurement item

The following items shall be evaluated on initial, intermediate and final measurements:

a) visual and optical performance (refer to IEC 61988-2-1);

b) electrical performance (refer to IEC 61988-2-1);

c) acoustic noise (refer to IEC 61988-2-5);

d) mechanical performance.

If additional measurements are carried out, they shall be noted in the report. Data about initial, intermediate and final measurements shall be recorded in the report.

6.3 Initial measurements

Initial measurements shall be carried out as specified under the standard atmospheric conditions for the reference measurements and tests.

6.4 Intermediate measurements

The relevant specification may require functional tests during the conditioning programme. When intermediate measurements are required, the relevant specification shall define the