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Plasma display panels –

Part 4:
Climatic and mechanical testing methods

Panneaux d'affichage à plasma –

Partie 4:
Méthodes d'essais climatiques et mécaniques

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INTERNATIONAL ELECTROTECHNICAL COMMISSION

PLASMA DISPLAY PANELS –

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FOREWORD

1) The International Electrotechnical Commission (IEC) is a worldwide organization for standardization comprising all national electrotechnical committees (IEC National Committees). The object of IEC is to promote international co-operation on all questions concerning standardization in the electrical and electronic fields. To this end and in addition to other activities, IEC publishes International Standards, Technical Specifications, Technical Reports, Publicly Available Specifications (PAS) and Guides (hereafter referred to as "IEC Publication(s)"). Their preparation is entrusted to technical committees; any IEC National Committee interested in the subject dealt with may participate in this preparatory work. International, governmental and non-governmental organizations liaising with the IEC also participate in this preparation. IEC collaborates closely with the International Organization for Standardization (ISO) in accordance with conditions determined by agreement between the two organizations.
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International Standard IEC 61988-4 has been prepared by IEC technical committee 110: Flat panel display devices.

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

FDIS	Report on voting
110/107/FDIS	110/110/RVD

Full information on the voting for the approval on 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 maintenance result 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- withdrawn;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.

PLASMA DISPLAY PANELS –

Part 4: Climatic and mechanical testing methods

1 Scope

This part of IEC 61988 defines test methods for evaluating environmental and mechanical endurance characteristics of plasma display modules (PDP modules).

2 Normative references

The following referenced standards are indispensable for the application of this standard. For standards with explicit dates, only the edition cited applies. For undated standards, the latest edition of the referenced standard (including any amendments) applies.

IEC 60068-1:1988, *Environmental testing – Part 1: General and guidance*

IEC 60068-2-1:1990, *Environmental testing – Part 2: Tests – Tests A: Cold*

IEC 60068-2-2:1974, *Environmental testing – Part 2: Tests – Tests B: Dry heat*

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

IEC 60068-2-13, *Environmental testing – Part 2: Tests – Test M: Low air pressure*

IEC 60068-2-27:1987, *Environmental testing – Part 2: Tests – Test Ea and guidance: Shock*

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

IEC 60068-2-78:2001, *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*

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

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

ISO 4180-2, *Complete, filled transport packages – General rules for the compilation of performance test schedules – Part 2: Quantitative data*

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

3 Terms, definitions and letter symbols

For the purposes of this document, most of the definitions used in this standard comply with IEC 60068-1 and IEC 61988-1. The following symbols are used in addition to those defined in IEC 61988-1.

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 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 measurement 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 5.3 of IEC 60068-1:

– 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 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.

5.9 Operating conditions

Full screen: The signal input sets at (15 ± 1) % of white level without gamma correction or 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

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

a) visual and optical performance (refer to IEC 61988-2-1 and IEC 61988-2-2);
b) electrical performance (refer to IEC 61988-2-1 and IEC 61988-2-2);
c) 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.

7 Climatic testing methods

The testing equipment used shall be noted in the relevant specification.

NOTE Make sure that the actual value, such as temperature, is within the specified value and a report on the actual value is made.

7.1 Storage at high temperature

7.1.1 Purpose

The purpose of this test is to evaluate the performance of the PDP module after high temperature storage.

7.1.2 Storage conditions

Test Bb of IEC 60068-2-2 shall be applied with the following specific conditions.

Test Bb: Dry heat for non heat-dissipating specimen with gradual change of temperature.

a) Temperature

The temperature shall be selected from the values given below:

(100 ± 3) °C
(95 ± 3) °C
(90 ± 3) °C
(85 ± 3) °C
(80 ± 3) °C
(75 ± 3) °C
(70 ± 3) °C
(65 ± 3) °C
(60 ± 3) °C
(55 ± 3) °C
(50 ± 3) °C
(45 ± 3) °C
(40 ± 3) °C
(35 ± 3) °C
(30 ± 3) °C

The temperature selected shall be noted in the report.

b) Duration

The duration shall be selected from the values given below:

2 h, 16 h, 24 h, 48 h, 72 h, 96 h, 120 h, 192 h, 240 h, 300 h, 500 h and 1 000 h.

The duration selected shall be noted in the report.

c) Humidity

The absolute humidity of the atmosphere should not exceed 20 g/m^3 (corresponding approximately to 50 % relative humidity at 35 °C).

7.1.3 Testing procedures

a) The chamber shall be at the temperature of the laboratory. The PDP module, while being at the ambient temperature of the laboratory, shall be introduced into the chamber in accordance with 5.6 or as otherwise specified.

b) The temperature in the chamber shall then be adjusted to the temperature appropriate to the degree of severity and time shall be allowed for the chamber to reach temperature stability. (Temperature stability is defined in 4.8 of IEC 60068-1.) The rate of change of temperature in the chamber shall not exceed 3 °C/min, averaged over a period of not more than 5 min. The test temperature shall be measured in accordance with 4.6 of IEC 60068-1.

c) The PDP module shall then be exposed to the high temperature conditions for the duration as specified in the relevant specification. The duration shall be measured from the moment temperature stability has been reached.

d) If required by the relevant specification, intermediate measurements shall be performed in accordance with 7.1.4.

e) At the end of this period, the PDP module shall remain in the chamber and the temperature shall be gradually lowered to a value lying within the limits of standard atmospheric conditions for testing. The rate of change of temperature in the chamber shall not exceed 3 °C/min, averaged over a period of not more than 5 min. At the end of this period, the PDP module shall be subject to the recovery procedure in the chamber or otherwise as appropriate.

7.1.4 Intermediate measurements

The relevant specification may require functional tests during the conditioning programme.

When intermediate measurements are required, the relevant specification shall define the measuring items and the period(s) during the conditioning, and the results shall be noted in the report.

7.1.5 Recovery

a) The PDP module shall then remain under standard atmospheric conditions for recovery for a period adequate for the attainment of temperature stability.

b) If required by the relevant specification, the PDP module shall be measured during the recovery period.

7.2 Storage at low temperature

7.2.1 Purpose

The purpose of this test is to evaluate the performance of the PDP module after low temperature storage.

7.2.2 Storage conditions

Test Ab of IEC 60068-2-1 shall be applied with the following specific conditions.

Test Ab: Cold for non heat-dissipating specimen with gradual change of temperature.

a) Temperature

The temperature shall be selected from the values given below:

(–50 ± 3) °C
(–45 ± 3) °C
(–40 ± 3) °C
(–35 ± 3) °C
(–30 ± 3) °C
(–25 ± 3) °C
(–20 ± 3) °C
(–15 ± 3) °C
(–10 ± 3) °C
(–5 ± 3) °C
(0 ± 3) °C

The temperature selected shall be noted in the report.

b) Duration

The duration shall be selected from the values given below:

2 h, 16 h, 24 h, 48 h, 72 h, 96 h, 120 h, 192 h, 240 h, 300 h, 500 h and 1 000 h.

The duration selected shall be noted in the report.

7.2.3 Testing procedures

a) The chamber shall be at the temperature of the laboratory. The PDP module, while being at the ambient temperature of the laboratory, shall be introduced into the chamber in accordance with 5.6, or as otherwise specified.

b) The temperature in the chamber shall then be adjusted to the temperature appropriate to the degree of severity and time shall be allowed for the chamber to reach temperature stability. (Temperature stability is defined in 4.8 of IEC 60068-1.) The rate of change of temperature in the chamber shall not exceed 3 °C/min, averaged over a period of not more than 5 min. The test temperature shall be measured in accordance with 4.6 of IEC 60068-1.

c) The PDP module shall then be exposed to the low temperature conditions for the duration as specified in the relevant specification. The duration shall be measured from the moment temperature stability has been reached.

d) If required by the relevant specification, intermediate measurements shall be performed in accordance with 7.2.4.