

BS IEC 61988-4-1:2015



BSI Standards Publication

Plasma display panels

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

bsi.

...making excellence a habit.
AVA Documents™
Document Sharing Hub

National foreword

This British Standard is the UK implementation of IEC 61988-4-1:2015.

The UK participation in its preparation was entrusted to Technical Committee EPL/47, Semiconductors.

A list of organizations represented on this committee can be obtained on request to its secretary.

This publication does not purport to include all the necessary provisions of a contract. Users are responsible for its correct application.

© The British Standards Institution 2015.

Published by BSI Standards Limited 2015

ISBN 978 0 580 83908 5

ICS 31.260

Compliance with a British Standard cannot confer immunity from legal obligations.

This British Standard was published under the authority of the Standards Policy and Strategy Committee on 30 April 2015.

Amendments/corrigenda issued since publication

Date	Text affected
------	---------------



INTERNATIONAL STANDARD



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

INTERNATIONAL
ELECTROTECHNICAL
COMMISSION

ICS 31.260

ISBN 978-2-8322-2392-5

Warning! Make sure that you obtained this publication from an authorized distributor.

CONTENTS

FOREWORD.....	5
1 Scope.....	7
2 Normative references.....	7
3 Terms, definitions and letter symbols	8
4 Environmental tests	8
4.1 General.....	8
4.2 Test items	8
4.3 Structure of testing equipment	8
5 Standard conditions	8
5.1 Standard reference atmosphere.....	8
5.2 Standard atmospheric conditions for reference measurements and tests	9
5.3 Standard atmospheric conditions for measurements and tests.....	9
5.4 Standard atmospheric conditions for assisted drying	9
5.5 Recovery conditions	9
5.6 Standard installation conditions	10
5.7 Standard measuring conditions.....	10
5.8 PDP module state	10
5.9 Operating conditions	10
6 Measurements.....	10
6.1 General.....	10
6.2 Measurement item.....	10
6.3 Initial measurements	10
6.4 Intermediate measurements	10
6.5 Final measurements	11
6.6 Information to be given in the relevant specification	11
7 Report.....	11
8 Temperature and humidity testing methods (operation and storage).....	11
8.1 High temperature (storage).....	11
8.1.1 Purpose	11
8.1.2 Test conditions	11
8.1.3 Testing equipment	12
8.1.4 Testing procedures	12
8.1.5 Recovery	12
8.1.6 Measurements	12
8.1.7 Information to be given in the relevant specification	12
8.2 Low temperature (operation).....	13
8.2.1 Purpose	13
8.2.2 Test conditions	13
8.2.3 Testing equipment	13
8.2.4 Testing procedures	13
8.2.5 Recovery	14
8.2.6 Measurements	14
8.2.7 Information to be given in the relevant specification	15
8.3 Low temperature (storage)	15
8.3.1 Purpose	15
8.3.2 Test conditions	15

8.3.3	Testing equipment	15
8.3.4	Testing procedures	15
8.3.5	Recovery	16
8.3.6	Measurements	16
8.3.7	Information to be given in the relevant specification	16
8.4	Damp heat at steady state (operation)	16
8.4.1	Purpose	16
8.4.2	Test conditions	16
8.4.3	Testing equipment	17
8.4.4	Testing procedures	17
8.4.5	Recovery	17
8.4.6	Measurements	17
8.4.7	Information to be given in the relevant specification	17
8.5	Damp heat at steady state (storage)	17
8.5.1	Purpose	17
8.5.2	Test conditions	17
8.5.3	Testing equipment	18
8.5.4	Testing procedures	18
8.5.5	Recovery	18
8.5.6	Measurements	18
8.5.7	Information to be given in the relevant specification	18
8.6	Damp heat, cyclic	19
8.6.1	Purpose	19
8.6.2	Test conditions	19
8.6.3	Testing equipment	19
8.6.4	Testing procedure	19
8.6.5	Recovery	19
8.6.6	Measurements	19
8.6.7	Information to be given in the relevant specification	19
8.7	Rapid change of temperature with prescribed time of transition	20
8.7.1	Purpose	20
8.7.2	Test conditions	20
8.7.3	Testing equipment	20
8.7.4	Testing procedures	20
8.7.5	Recovery	20
8.7.6	Measurements	20
8.7.7	Information to be given in the relevant specification	21
8.8	Change of temperature with specified rate of change	21
8.8.1	Purpose	21
8.8.2	Test condition	21
8.8.3	Testing equipment	21
8.8.4	Testing procedures	21
8.8.5	Recovery	21
8.8.6	Measurements	21
8.8.7	Information to be given in the relevant specification	22
9	Air pressure testing methods	22
9.1	Low air pressure (operation)	22
9.1.1	Purpose	22
9.1.2	Test conditions	22

9.1.3	Testing equipment	22
9.1.4	Testing procedures	22
9.1.5	Recovery	23
9.1.6	Measurements	23
9.1.7	Information to be given in the relevant specification	23
9.2	Low air pressure (storage).....	23
9.2.1	Purpose	23
9.2.2	Test conditions	23
9.2.3	Testing equipment	24
9.2.4	Testing procedures	24
9.2.5	Recovery	24
9.2.6	Measurements	24
9.2.7	Information to be given in the relevant specification	24
10	Mechanical testing methods.....	24
10.1	Vibration (sinusoidal)	24
10.1.1	Purpose	24
10.1.2	Equipment	25
10.1.3	Test conditions	25
10.2	Shock	25
10.2.1	Purpose	25
10.2.2	Equipment	25
10.2.3	Test conditions	26
10.3	Transportation drop.....	27
10.4	Toppling.....	27
	Figure 1 – Testing procedure at low temperature (operation)	14
	Figure 2 – Configuration of PDP module directions	25
	Figure 3 – Example of PDP shock testing equipment	26
	Table 1 – Standard conditions for reference measurements and tests	9
	Table 2 – Peak value and duration	26

INTERNATIONAL ELECTROTECHNICAL COMMISSION

PLASMA DISPLAY PANELS –

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

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.
- 2) The formal decisions or agreements of IEC on technical matters express, as nearly as possible, an international consensus of opinion on the relevant subjects since each technical committee has representation from all interested IEC National Committees.
- 3) IEC Publications have the form of recommendations for international use and are accepted by IEC National Committees in that sense. While all reasonable efforts are made to ensure that the technical content of IEC Publications is accurate, IEC cannot be held responsible for the way in which they are used or for any misinterpretation by any end user.
- 4) In order to promote international uniformity, IEC National Committees undertake to apply IEC Publications transparently to the maximum extent possible in their national and regional publications. Any divergence between any IEC Publication and the corresponding national or regional publication shall be clearly indicated in the latter.
- 5) IEC itself does not provide any attestation of conformity. Independent certification bodies provide conformity assessment services and, in some areas, access to IEC marks of conformity. IEC is not responsible for any services carried out by independent certification bodies.
- 6) All users should ensure that they have the latest edition of this publication.
- 7) No liability shall attach to IEC or its directors, employees, servants or agents including individual experts and members of its technical committees and IEC National Committees for any personal injury, property damage or other damage of any nature whatsoever, whether direct or indirect, or for costs (including legal fees) and expenses arising out of the publication, use of, or reliance upon, this IEC Publication or any other IEC Publications.
- 8) Attention is drawn to the Normative references cited in this publication. Use of the referenced publications is indispensable for the correct application of this publication.
- 9) Attention is drawn to the possibility that some of the elements of this IEC Publication may be the subject of patent rights. IEC shall not be held responsible for identifying any or all such patent rights.

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.

IMPORTANT – The 'colour inside' logo on the cover page of this publication indicates that it contains colours which are considered to be useful for the correct understanding of its contents. Users should therefore print this document using a colour printer.

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 5.1 and if