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PUBLICLY AVAILABLE SPECIFICATION

PRE-STANDARD

External electrode fluorescent lamps –
Part 2: Performance specifications

IEC/PAS 62816-2:2013(E)

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FOREWORD

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IEC/PAS 62816-2 has been processed by subcommittee 34A: Lamps, of IEC technical committee 34: Lamps and related equipment.

The text of this PAS is based on the following document:	This PAS was approved for publication by the P-members of the committee concerned as indicated in the following document
Draft PAS	**Report on voting**
34A/1598/PAS	34A/1617/RVD

Following publication of this PAS, which is a pre-standard publication, the technical committee or subcommittee concerned may transform it into an International Standard.

This PAS shall remain valid for an initial maximum period of 3 years starting from the publication date. The validity may be extended for a single period up to a maximum of 3 years, at the end of which it shall be published as another type of normative document, or shall be withdrawn.

EXTERNAL ELECTRODE FLUORESCENT LAMPS –

Part 2: Performance specifications

1 Scope

This part of IEC/PAS 62816 specifies the performance requirements for tubular type external electrode fluorescent lamps for backlight unit purposes used in flat panel displays such as TVs and monitors, etc., hereafter called “lamps”. The PAS will be revised to include other types of lamp when a need for them is recognized.

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 60050 (all parts), *International Electrotechnical Vocabulary* (available at <http://www.electropedia.org>)

IEC 60410, *Sampling plans and procedures for inspection by attributes*

IEC/PAS 62816-1, *External Electrode Fluorescent Lamps – Part 1: Safety specifications*

3 Terms and definitions

For the purposes of this document, the terms and definitions given in IEC 60050-845 and the following apply.

3.1
external electrode fluorescent lamp
discharge lamp of gases by the attached electrode outside the lamp, in which most of the light is emitted by the excitation of phosphors coated in glass tube

3.2
nominal value
approximate quantity value used to designate or identify a lamp

3.3
rated value
quantity value for a characteristic of a lamp for specified operating conditions

Note 1 to entry: The value and the conditions are specified in this standard, or assigned by the manufacturer or responsible vendor.

3.4
lumen maintenance
ratio of the luminous flux of a lamp at a given time in its life to its initial luminous flux, the lamp being operated under specific conditions

Note 1 to entry: The ratio is generally expressed as a percentage.

3.5
initial readings
starting characteristics of a lamp, measured before ageing, and the electrical, photometric and cathode characteristics of a lamp, measured at the end of the 100 h ageing period

3.6
reference inverter
special electronic type inverter, designed for the purpose of providing comparison standards for use in testing inverters, for the selection of reference lamps and for testing regular production lamps under standardized conditions, and which, at its rated frequency, has a stable voltage/current ratio which is relatively uninfluenced by variations in current, temperature and magnetic surroundings

3.7
lamp current
true r.m.s. type of current across the lamp

3.8
lamp voltage
true r.m.s. type of voltage across a lamp when measuring the lamp current

3.9
lamp power
product of lamp current, lamp voltage, and power factor

3.10
power factor
ratio of the effective power used to the apparent power, in which it is expressed as the effective power divided by the apparent power

3.11
starting voltage
voltage between the electrodes required to start the discharge in a lamp

3.12
effective luminance length
length of the lamp having a ratio of 80 % from the centre luminance for the distribution of the uniform luminance in a tube-axis direction

3.13
luminance uniformity
ratio of maximum and minimum luminance measured on the horizontally divided points of the lamp, in which the percentage of minimum/maximum luminance among both ends and the centre shall be reported

3.14
luminance stabilization time
when centre luminance is regarded as 100 % after 5 min of starting, time required after switching on a lamp to reach 95 % of centre luminance

3.15
light source colour
for the light source colour, the definitions of methods of measurement for light source colour apply

a)	coordinates x and y	coordinates x and y of a lamp centre
b)	Δx & Δy	the difference value between maximum and minimum for each (x, y) coordinates on lamp centre and both ends (1/10, 9/10)

3.16
life
length of time during which a complete lamp operates to burn-out or any other end-of-life event described in this PAS

3.17
rated life
life stated on the basis of mean value of life for the same types of lamp manufactured for long-term period

3.18
calibration current of a reference ballast
value of the current on which the calibration and control of the reference ballast are based

3.19
type test
test or a series of tests made on a type test sample for the purpose of checking compliance of the design of a given product with the requirements of the relevant PAS

3.20
type test sample
sample consisting of one or more similar units submitted by the manufacturer or responsible vendor for the purpose of a type test

4 Classification

According to design specifications, the function and type of lamps shall be classified as follows:

a) by function (by application):
- TV,
- monitor,
- communication device, etc.

b) by type:
- lamp diameter & lamp length,
- lamp shape(straight type),

c) by rated current of lamp,

d) by chromaticity coordinates of lamp.

5 Lamp requirements

5.1 General

A lamp, on which compliance with this PAS is claimed, shall conform to the safety requirements of external electrode fluorescent lamps given in IEC/PAS 62816-1.

A lamp shall be so designed that its performance is reliable in normal and accepted use. In general, this can be achieved by satisfying the following requirements.

It can be expected that lamps which conform to this PAS will start and operate satisfactorily at voltages of 94 % and 106 % of the rated supply voltage and at an ambient air temperature of between 23 °C and 27 °C.

The requirements and tolerances permitted by this PAS are based on testing of a type test sample submitted by the manufacturer for that purpose. In principle, this type of test sample should consist of units having characteristics typical of the manufacturer's production and be as close to the production centre-point values as possible. For guidance on sampling plans and procedures, see IEC 60410.

5.2 Tests

5.2.1 General

All tests shall be performed in accordance with Annex C, according to the order arranged by each group in Table 1. In the case of sequential tests with the same sample, the former test result shall not influence the following test result, and the destructive test shall be performed last of all.

NOTE However, the destructive test can be performed with another sample.

5.2.2 Construction

Values of measurement of a lamp diameter, length, and lead wire length shall be in accordance with Annex A.

The surface of the lamp and external electrode shall be free from bubbles, flaws and stains that would be an inconvenience during use.

5.2.3 Starting characteristic

5.2.3.1 General starting test

Immediately prior to the general starting test, the lamps shall be kept inoperative and in an ambient temperature of between 23 °C and 27 °C and a relative humidity of 65 % maximum for a period of at least 24 h. When tested under windless conditions, the lamp shall start within 1 s.

5.2.3.2 Low temperature starting test

Immediately prior to the starting test of low temperature the lamps shall be kept inoperative and in an ambient temperature of between 9 °C and 11 °C and a relative humidity of 65 % maximum for a period of at least 24 h. When tested under windless conditions, the lamp shall start within 1s.

5.2.3.3 Lamp voltage

When measured after setting the rated supply voltage, the lamp voltage shall be in the range ±10 % of the values assigned by the manufacturer.

5.2.3.4 Lamp current

When measured with a high-frequency ammeter, the lamp current shall be in the range ±10 % of the values assigned by the manufacturer.

5.2.4 Luminance

The centre of aperture of the luminance measurement device shall be always placed at the middle of the external diameter of the lamp with the appropriate working distance. Measurement points shall be set at the centre (5 in Figure B.1) and at both end points (1 and 9 in Figure B.1) when the full length of the lamp is divided into 10 equal parts. Measurements shall be performed at 0˚, 90˚, 180˚, and 270˚ in circumference direction for 3 points and each average of 3 points shall be reported. The measuring luminance shall be within ±10 % of specification.

5.2.5 Luminance uniformity

The luminance uniformity in the tube-axis direction for the centre and measurement point 1 and 9 of Figure B.1 with the same method of measurement as given in 5.2.6 shall not be less than 80 %.

5.2.6 Effective luminance length (under consideration)

Effective luminance length shall not be less than rated value when measuring the length of luminance part which has not less than 80 % of the centre luminance at normal operating condition with rated input.

5.2.7 Chromaticity coordinates (under consideration)

Colour coordinates shall be within ±0.01 of rated value for each of the (x, y) coordinates at centre (5 in Figure B.1)) with the same method of measurement as given in 5.2.6.

5.2.8 Colour uniformity

Δx and Δy measured to the centre and measurement point 1 and 9 of Figure B.1 with the same method of measurement as given in 5.2.6 shall not be more than 0,015.

5.2.9 Dark starting time

The lamp shall start within 1 s at rated input in the same dark condition after being laid aside in the dark of 0,1 lx or less for 24 hours.

5.2.10 Tube surface temperature

The lamp's surface temperature difference between both ends after 10 min from light-up at rated input in the testing environment condition shall not be more than 10 °C.

5.2.11 Life (Reference)

5.2.11.1 Test conditions

The test conditions are:

a) accelerating test temperature — 0 °C+2/-0 °C

b) input — rated current

c) sample quantity — 10 ea

d) criteria of failure — after items of measurement specified in Table 1 are tested, criteria of failure are checked in accordance with method of quality test.

Table 1 – Measurement items of test for life and criteria of failure

Measurement item	Criteria of failure
Operational state	In case, flashing phenomenon, local discharge and snake discharge are found during operation.
Luminance characteristics	In case of not more than 50 % of the initial reading of luminance
NOTE The pink discharge is not involved in the criteria of failure as the accelerating test.	

5.2.11.2 Assurance

Life B_{10} assures a running time of 11 270 h in the normal operating conditions (confidence level 90 %).

Table 2 – Assurance

Assurance life (Life B_{10})	Accelerated life tests	
	Life B_{10} of accelerated life test	Acceleration factor
11 270 h	7 564 h	1,49

5.2.11.3 Method of assurance

When failure has not occurred or level of life is are at a satisfied level from the point of view of life B_{10} for acceleration test, life B_{10} assures 11 270 h for the normal test of confidence level 90 %.

5.3 Marking

The date of manufacture, model and equipment of manufacture shall be legibly and durably marked on the lamps.

The following information shall be marked on either the lamp or (when it is difficult to mark it on the lamp) the packaging unit:

a) tube length, tube diameter, and the name of the product;

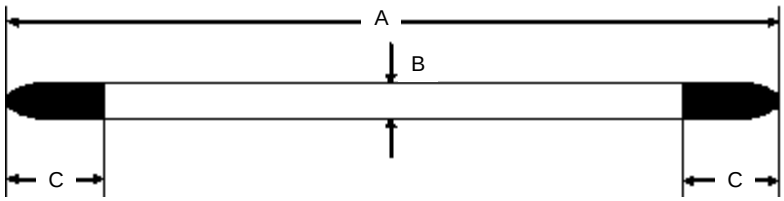
b) mark of origin (this may take the form of a trade mark, the manufacturer's name or the name of the responsible vendor).

Table 3 – Inspection levels and the criteria for decision

Group no.	Test item	Test method & performances specification	Sample quantity	Acceptance number
A	Structure & dimension	Performance specifications 5.2.1	10	0
	Appearance			
B	Starting characteristic	Performance specifications 5.2.3	10	1
B	Lamp voltage	Performance specifications 5.2.3.3	10	0
B	Lamp current	Performance specifications 5.2.3.4	10	0
B	Luminance	Performance specifications 5.2.4	10	0
B	Luminance uniformity	Performance specifications 5.2.5	10	0
B	Color coordinates	Performance specifications 5.2.7	10	0
B	Color uniformity	Performance specifications 5.2.8	10	0
B	Dark starting time	Performance specifications 5.2.9	10	0
B	Tube surface temperature	Performance specifications 5.2.10	3	0

Annex A
(normative)

Dimensions and criteria of EEFL



Key

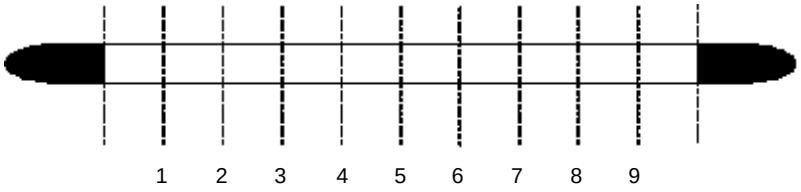
A Lamp length
B Lamp's external diameter
C Lead wire length

Criteria of dimensions shall be within A ± 1,0 mm, B ± 0,1 mm, C ± 1,0 mm of design specifications

Figure A.1 – Dimensions and criteria of EEFL

Annex B
(normative)

Measurement points of EEFL



Measurement point division method of effective luminance length into 10 equal parts

Figure B.1 – Measurement point division method of EEFL

Annex C
(normative)

Method of test for EEFL

C.1 General

The lamps shall be tested in a draught-free atmosphere at an ambient temperature of between 23 °C and 27 °C and a relative humidity of 65 % maximum.

Immediately prior to the starting test, the lamps shall be kept inoperative and in an ambient temperature of between 23 °C and 27 °C and a relative humidity of 65 % maximum for a period of at least 1 h.

Measurements shall be made after a stabilization time of 3 min.

Lamps shall be tested in a horizontal operating position.

The connections of the lamp contacts, with reference to the terminations of the inverter, shall not be changed for the whole course of the tests.

C.2 Test circuit

Lamps shall be tested in the circuit shown in Figure C.1

Before making the measurements, any device used to start the lamp shall be disconnected from the test circuit.

In the test circuit for lamps, given in Figure C.1, a wire covered with low leakage shall be as short and straight as possible to avoid parasitic capacitance.

In the circuit, given in Figure C.1, the frequency shall be between 35 kHz and 100 kHz, unless otherwise specified on the relevant lamp data sheet.

NOTE The frequency range specified for this lamp test is not necessarily applicable to the design of inverters.

C.3 Inverter

The inverter shall be adjusted so that the lamp current is equal to the value as specified on the relevant lamp data sheet.

C.4 Supply voltage

The supply voltage shall be equal to the rated voltage of the reference inverter. During periods of stabilization, the supply voltage shall be stable within ±2 %, this tolerance being reduced to ±1 % during measurement.

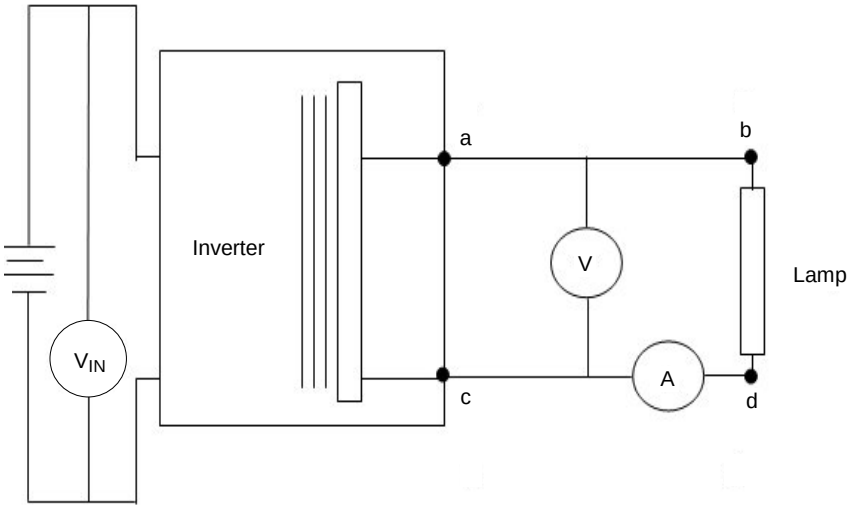
For a.c. power supplies, the frequency shall be equal to the rated frequency of the reference inverter with a tolerance of 0,5 %.

C.5 Electrical instruments

Instruments shall be of the true r.m.s. type, essentially free from waveform errors and suitable for the frequency of operation.

The voltage measuring circuit of the instruments shall have an impedance not less than 10 MΩ, and shall be disconnected when not in use. The current measuring circuit of the instruments shall have the lowest possible resistance and, if necessary, shall be short-circuited when not in use.

When measuring the lamp wattage, no correction shall be made for the wattmeter consumption (the circuit connection being made on the lamp side of the current measuring circuit).



a-b length shall not be more than 300 mm.
c-d length shall not be more than +300 mm of the nominal length of lamp.
Each lead wire shall maintain a distance of 15 mm or more from the lamp surface.
Lamp voltage measurement shall be performed after lamp current being stabilized at the specified value (3 min or more).
A voltmeter shall be disconnected while measuring lamp current.
Lamp voltage measurement shall be performed with a voltmeter while adjusting an ammeter to the specified value.
Optical measurement shall be performed while not being connected with a voltmeter.

Figure C.1 – Test circuit

Bibliography

IEC 60410, *Sampling planes and procedures for inspection by attributes*

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