



DPC: 24 / 30488096 DC

BSI Group Headquarters

389 Chiswick High Road London W4 4AL

Tel: +44 (0)20 8996 9000

Fax: +44 (0)20 8996 7400

www.bsigroup.com

Date: 15 April 2024

Origin: International

Latest date for receipt of comments: 5 June 2024

Project No. 2024/00591

Responsible committee: CPL/34/1 Electric Light Sources including Caps and Holders

Interested committees:

Title: BS EN IEC 62031 LED modules - Safety requirements

Please notify the secretary if you are aware of any keywords that might assist in classifying or identifying the standard or if the content of this standard

- i) has any issues related to 3rd party IPR, patent or copyright
- ii) affects other national standard(s)
- iii) requires additional national guidance or information

**WARNING: THIS IS A DRAFT AND MUST NOT BE REGARDED OR USED AS A BRITISH STANDARD.
THIS DRAFT IS NOT CURRENT BEYOND 5 June 2024**

This draft is issued to allow comments from interested parties; all comments will be given consideration prior to publication. No acknowledgement will normally be sent. **See overleaf for information on the submission of comments.**

No copying is allowed, in any form, without prior written permission from BSI except as permitted under the Copyright, Designs and Patent Act 1988 or for circulation within a nominating organization for briefing purposes. Electronic circulation is limited to dissemination by e-mail within such an organization by committee members.

Further copies of this draft may be purchased from BSI Shop <http://shop.bsigroup.com> or from BSI Customer Services, Tel: +44(0) 20 8996 9001 or email cservices@bsigroup.com. British, International and foreign standards are also available from BSI Customer Services.

Information on the co-operating organizations represented on the committees referenced above may be obtained from <http://standardsdevelopment.bsigroup.com>

Introduction

This draft standard is based on national and international discussions. Your comments on this draft are invited and will assist in the preparation of the consequent standard.

For international standards, comments will be reviewed by the relevant UK national committee before sending the consensus UK vote and comments to the international committee, which will then decide appropriate action. If the international standard is approved, it is usual for the text to be published as a British Standard.

For national standards, comments will be reviewed by the relevant UK national committee and the resulting standards published as a British Standard.

UK Vote

Please indicate whether you consider the UK should submit a negative (with supporting technical reasons) or positive vote on this draft. Please indicate if you are aware of any reason why this draft standard should not be published as a British Standard.

Submission of Comments

- **Annotated drafts are not acceptable and will be rejected.**
- All comments should be submitted online at <https://standardsdevelopment.bsigroup.com/>. You will need to register in order to comment.

Template for comments and secretariat observations

Date: xx/xx/20xx	Document: ISO/DIS xxxx
------------------	------------------------

1	2	(3)	4	5	(6)	7
MB	Clause No./ Subclause No./Annex (e.g. 3.1)	Paragraph/Figure/ Table/Note	Type of comment	Commend (justification for change) by the MB	Proposed change by the MB	Secretariat observations on each comment submitted
	3.1	Definition 1	ed	Definition is ambiguous and needs clarifying.	Amend to read '...so that the mains connector to which no connection...'	
	6.4	Paragraph 2	te	The use of the UV photometer as an alternative cannot be supported as serious problems have been encountered in its use in the UK.	Delete reference to UV photometer.	

COMMITTEE DRAFT FOR VOTE (CDV)

PROJECT NUMBER: IEC 62031 ED3	
DATE OF CIRCULATION: 2024-04-12	CLOSING DATE FOR VOTING: 2024-07-05
SUPERSEDES DOCUMENTS: 34A/2389/RR	

IEC SC 34A : ELECTRIC LIGHT SOURCES	
SECRETARIAT: United Kingdom	SECRETARY: Mr Petar Luzajic
OF INTEREST TO THE FOLLOWING COMMITTEES: TC 34,SC 34B,SC 34C,SC 34D	PROPOSED HORIZONTAL STANDARD: ☐ Other TC/SCs are requested to indicate their interest, if any, in this CDV to the secretary.
FUNCTIONS CONCERNED: ☐ EMC ☐ ENVIRONMENT ☐ QUALITY ASSURANCE ☒ SAFETY	
☒ SUBMITTED FOR CENELEC PARALLEL VOTING Attention IEC-CENELEC parallel voting The attention of IEC National Committees, members of CENELEC, is drawn to the fact that this Committee Draft for Vote (CDV) is submitted for parallel voting. The CENELEC members are invited to vote through the CENELEC online voting system.	☐ NOT SUBMITTED FOR CENELEC PARALLEL VOTING

This document is still under study and subject to change. It should not be used for reference purposes.

Recipients of this document are invited to submit, with their comments, notification of any relevant patent rights of which they are aware and to provide supporting documentation.

Recipients of this document are invited to submit, with their comments, notification of any relevant "In Some Countries" clauses to be included should this proposal proceed. Recipients are reminded that the CDV stage is the final stage for submitting ISC clauses. (SEE [AC/22/2007](#) OR [NEW GUIDANCE DOC](#)).

TITLE: LED modules - Safety requirements
--

PROPOSED STABILITY DATE: 2028

NOTE FROM TC/SC OFFICERS:

Copyright © 2024 International Electrotechnical Commission, IEC. All rights reserved. It is permitted to download this electronic file, to make a copy and to print out the content for the sole purpose of preparing National Committee positions. You may not copy or "mirror" the file or printed version of the document, or any part of it, for any other purpose without permission in writing from IEC.

CONTENTS

FOREWORD.....	5
1 Scope.....	7
2 Normative references	8
3 Terms and definitions	8
4 Classification.....	11
5 General requirements	11
6 General conditions for tests	12
6.1 General.....	12
6.1.1 Type test	12
6.1.2 Test samples	12
6.1.3 Compliance by inspection of relevant data	12
6.2 Default test conditions	12
6.2.1 General	12
6.2.2 Electrical supply conditions.....	12
6.2.3 Ambient test conditions.....	13
7 Marking	13
7.1 Overview	13
7.2 Marking content	14
7.3 LED module marking.....	15
7.4 Marking of control terminals	15
7.5 Durability and legibility of marking.....	16
8 Electrical safety	16
8.1 General.....	16
8.2 Electrical connections	16
8.3 Protection against electric shock.....	16
8.3.1 Construction	16
8.3.2 Tests for accessibility of hazardous-live-parts.....	18
8.3.3 Requirements for accessible parts	18
8.3.4 Requirements for SELV circuits and PELV circuits.....	20
8.3.5 Capacitor discharge requirements	20
8.4 Electric strength.....	21
8.4.1 General	21
8.4.2 Humidity conditioning	21
8.4.3 Electric strength test.....	21
8.5 Creepage distances, clearances and distances through insulation	22
8.6 Terminals.....	22
8.7 Earthing	23
8.7.1 General	23
8.7.2 Protective conductor current.....	23
8.8 Insertion orientation of LED modules	23
9 Thermal safety.....	23
9.1 Resistance to heat and fire	23
9.1.1 Resistance to heat.....	23
9.1.2 Resistance to flame and ignition	24
9.2 Heat management.....	25
9.2.1 General	25

50	9.2.2	Thermal interface material	25
51	9.2.3	Testing	25
52	9.2.4	Compliance	26
53	10	Mechanical safety	26
54	10.1	General.....	26
55	10.2	Common requirements for mechanical safety	27
56	10.3	Mechanical strength.....	27
57	10.4	Fixing of conductors.....	27
58	10.4.1	Requirements	27
59	10.4.2	Compliance criteria.....	27
60	10.5	Screws and mechanical connections	27
61	10.6	Ingress protection	28
62	11	Photobiological safety.....	28
63	11.1	Actinic UV hazards for skin and eye (200 nm to 400 nm wavelength)	28
64	11.2	UV-A hazard for the eye lens (315 nm to 400 nm).....	29
65	11.3	Retinal blue light hazard (300 nm to 700 nm)	29
66	11.4	Retinal thermal hazard (380 nm to 1 400 nm).....	29
67	11.5	Infrared radiation hazard for the eye (780 nm to 3 000 nm)	29
68	11.6	Thermal hazard for the skin (380 nm to 3 000 nm)	29
69	12	Fault conditions	29
70	12.1	General.....	29
71	12.2	Applicable fault conditions	30
72	12.2.1	Electronic components	30
73	12.2.2	PCB tracks	30
74	12.2.3	Insulation layers	30
75	12.3	Test power supply requirements	30
76	12.3.1	LED modules supplied by voltage sources	30
77	12.3.2	LED modules supplied by current sources	30
78	12.4	Test procedures and compliance.....	30
79	12.4.1	Test procedures.....	30
80	12.4.2	Compliance	31
81	13	Abnormal conditions	31
82	13.1	General.....	31
83	13.2	DC supply polarity test.....	32
84	13.3	Maximum load at output terminals.....	32
85	13.4	LED light sources specified for AC mains operation which are declared not suitable for use with phase cut dimmers.....	32
87	13.4.1	Requirements	32
88	13.4.2	Tests	32
89	13.5	Compliance.....	33
90	Annex A (normative)	Measurement of touch current and protective conductor current	34
91	A.1	General conditions	34
92	A.2	Measurement of protective conductor current.....	34
93	A.3	Measurement of touch current in case of normal and abnormal conditions	34
94	A.4	Measurement of touch current in case of failure of basic protection	35
95	A.5	Test procedure.....	35
96	Annex B (informative)	Information for luminaire design	38
97	B.1	General.....	38
98	B.2	Water contact	38
99	B.3	Blue light hazard assessment	38
100	B.3.1	LED modules classified as BLH-A.....	38

101	B.3.2	LED modules classified as BLH-B.....	38
102	B.3.3	LED modules classified as BLH-C.....	38
103	B.4	Special information	38
104	B.4.1	Interchangeability	38
105	B.4.2	Heat management	38
106	B.4.3	Working voltage.....	40
107	B.4.4	LED module protection against electric shock.....	40
108	B.4.5	LEDi module not suitable for use in phase cut circuits	40
109	Annex C (informative)	Information for controlgear design.....	41
110	C.1	Guidelines for safe LED module operation	41
111	Bibliography.....		42
112			
113	Figure 1 – Symbol for built-in LED modules		15
114	Figure 2 – Marking on control terminals, if control circuits are not insulated from the		
115	mains supply.....		15
116	Figure 3 – Ball-pressure test apparatus		24
117	Figure 4 – Abnormal temperature test set-up		26
118	Figure 5 – Test circuit		32
119	Figure A.1 – Test configuration: single-phase equipment on star TN or TT system.....		35
120	Figure A.2 – Measuring network, touch current weighted for perception or reaction		36
121	Figure A.3 – Measuring network, touch current weighted for let-go		36
122	Figure A.4 – Measuring network, weighted for high frequency.....		36
123	Figure A.5 – Test configuration for touch currents between different accessible parts		37
124	Figure B.1 – Diagrammatic cross section of an LED module fixed by means of a holder		
125	for LED modules to a luminaire		39
126			
127	Table 1 – Informative overview on marking provisions		13
128	Table 2 – Required number and type of Y capacitors		17
129	Table 3 – Touch voltage limits		19
130	Table 4 – Reduced touch voltage limits.....		19
131	Table 5 – Touch current limits.....		19
132	Table 6 – Voltage limits for a charged capacitor.....		21
133	Table 7 – Electric strength test voltage		22
134	Table 8 – Torque tests on screws		28
135	Table A.1 – Position of switches n and p for the measurement.....		35
136			
137			

INTERNATIONAL ELECTROTECHNICAL COMMISSION

LED MODULES – SAFETY REQUIREMENTS

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.
- IEC 62031 ED3 has been prepared by subcommittee 34A: Electric light sources, of IEC technical committee 34: Lighting. It is an International Standard.
- This third edition cancels and replaces the second edition IEC 62031:2018. This edition constitutes a technical revision.
- This edition includes the following significant technical changes with respect to the documents it cancels and replaces:
- a) Complete review of the document structure, detailed technical requirements and tests, including but not limited to what is individually described under items b) to i);
 - b) Clarification of the scope and revision of the applicability of this document to independent and integral LED modules;
 - c) Updated terms and definitions;
 - d) Clearer specification for clause general requirements and clause general test requirements;
 - e) Update of the marking clause, such as marking of control terminals;
 - f) A full review and update of the electrical safety, thermal safety, and mechanical safety requirements preventing misinterpretation and ambiguity;
 - g) Updated photobiological safety requirements;
 - h) Revised and updated fault conditions and abnormal conditions requirements.

i) Removal of the annex relating to conformity testing during manufacture.

The text of this International Standard is based on the following documents:

Draft	Report on voting
34A/XX/FDIS	34A/XX/RVD

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

The language used for the development of this International Standard is English.

This document was drafted in accordance with ISO/IEC Directives, Part 2, and developed in accordance with ISO/IEC Directives, Part 1 and ISO/IEC Directives, IEC Supplement, available at www.iec.ch/members_experts/refdocs. The main document types developed by IEC are described in greater detail at www.iec.ch/standardsdev/publications.

NOTE In this document, the following print type is used:

— compliance statements: *in italic type*.

The committee has decided that the contents of this document will remain unchanged until the stability date indicated on the IEC website under webstore.iec.ch in the data related to the specific document. At this date, the document will be

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

IMPORTANT – The "colour inside" logo on the cover page of this document 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.

LED MODULES – SAFETY REQUIREMENTS

1 Scope

This document specifies safety requirements for LED modules for operation at supply of a DC supply of up to 1 500 V or an AC supply up to 1 000 V. This document does not include requirements for performance characteristics of LED light sources.

NOTE 1 LED light sources as defined in IEC 60050-845:2020, 845-27-053 can take the form of an LED module or an LED lamp.

This document does not apply to:

- LED packages;
- LED light sources for automotive lighting;
- OLED light sources;

NOTE 2 Independent LED modules (see IEC 60050, 845-27-064) are considered luminaires with integral LED module(s) and are covered by the IEC 60598 series.

NOTE 3 LED modules that are an integral component of the luminaire are covered by the requirements within IEC 60598-1:XXXX, Clause 4.3.1, referencing this document as far as applicable.

NOTE 4 Where the word "LED module" is used in this document, it is understood to be "built-in LED module" as defined in IEC 60050-845:2020, 845-27-062."

2 Normative references

The following documents are referred to in the text in such a way that some or all of their content constitutes requirements of this document. For dated references, only the edition cited applies. For undated references, the latest edition of the referenced document (including any amendments) applies.

IEC 60384-14, *Fixed capacitors for use in electronic equipment – Part 14: Sectional specification – Fixed capacitors for electromagnetic interference suppression and connection to the supply mains*

IEC 60417, *Graphical symbols for use on equipment (available from: <http://www.graphical-symbols.info/equipment>)*

IEC 60598 (all parts), *Luminaires*

IEC 60598-1:2020, *Luminaires – Part 1: General requirements and tests*

IEC 60695-2-10, *Fire hazard testing – Part 2-10: Glowing/hot-wire based test methods – Glow-wire apparatus and common test procedure*

IEC 60695-2-11:2021, *Fire hazard testing – Part 2-11: Glowing/hot-wire based test methods – Glow-wire flammability test method for end products (GWEPT)*

IEC 60990:2016, *Methods of measurement of touch current and protective conductor current*

IEC 61032:1997, *Protection of persons and equipment by enclosures – Probes for verification*

IEC 61347-1:202X, *Controlgear for electric light sources – Safety, Part 1: General requirements*

IEC 62471-7:2023, *Photobiological safety of lamps and lamp systems*

ISO 4046-4:2016, *Paper, board, pulp and related terms – Vocabulary – Part 4: Paper and board grades and converted products*

ISO 7089:2000, *Plain washers – Normal series – Product grade A*

3 Terms and definitions

For the purposes of this document, the following terms and definitions apply.

ISO and IEC maintain terminological databases for use in standardization at the following addresses:

– IEC Electropedia: available at <http://www.electropedia.org/>

– ISO Online browsing platform: available at <http://www.iso.org/obp>

3.1 ultraviolet hazard efficacy of luminous radiation

$K_{S,v}$

quotient of an ultraviolet hazard quantity by the corresponding photometric quantity

Note 1 to entry: Ultraviolet hazard efficacy of luminous radiation is expressed in mW/klm.

Note 2 to entry: The ultraviolet hazard efficacy of luminous radiation is obtained by weighting the spectral power distribution of the lamp or LED module with the UV hazard function $S_{UV}(\lambda)$. Information about the relevant UV hazard function is given in IEC 62471:2006. It only relates to possible hazards regarding UV exposure of human beings. It does not deal with the possible influence of optical radiation on materials, such as mechanical damage or discoloration.

3.2 replaceable LED module

LED module designed to be replaced by an ordinary person or a qualified person

Note 1 to entry: When incorporated into a luminaire, a replaceable LED module can be classified as replaceable, non-user replaceable or non-replaceable depending on the luminaire design.

3.3 non-user replaceable LED module

LED module designed to be replaced only by the manufacturer, his service agent, or similar qualified person

285 Note 1 to entry: When incorporated into a luminaire a non-user replaceable LED module can become classified as
286 non-replaceable due to the luminaire design.

287 **3.4**

288 **LED light source**

289 electric light source based on LED technology

290 Note 1 to entry: An LED light source can take the form of an LED module or an LED lamp.

291 [SOURCE: IEC 60050-845:2020, 845-27-053]

292 **3.5**

293 **integrated LED module**

294 **LEDi module**

295 LED module, incorporating controlgear and any additional elements necessary for stable
296 operation of the light source, designed for direct connection to the supply voltage

297 [SOURCE: IEC 60050-845:2020, 845-27-059]

298 **3.6**

299 **semi-integrated LED module**

300 **LEDsi module**

301 LED module that carries the control unit of the controlgear, and is operated by the separated
302 power supply of the controlgear

303 Note 1 to entry: The term control unit is specified in IEC 60050-845-28-057.

304 [SOURCE: IEC 60050-845:2020, 845-27-060]

305 **3.7**

306 **non-integrated LED module**

307 **LEDni module**

308 LED module which needs a separate control circuitry or control gear to operate

309 Note 1 to entry: One or more LED packages on a printed circuit board or substrate in a geometric structure are
310 regarded as an LED array. No further components are included like electrical, optical, mechanical, and thermal
311 components.

312 [SOURCE: IEC 60050-845:2020, 845-27-061]

313 **3.8**

314 **rated value**

315 <of light sources > value of a quantity, used for specification purposes, declared by the
316 manufacturer or responsible vendor and established under standard test conditions

317 Note 1 to entry: To express the "rated value" of a particular quantity, the term "value" is replaced by the quantity
318 name; for example, rated power, rated voltage, rated current, and rated temperature.

319 Note 2 to entry: The standard test conditions are given in this document.

320 [SOURCE: IEC 60050-845:2020, 845-27-100 modified – "...the relevant standard" in note to
321 entry 2 replaced by "...this document"]

322 **3.9**

323 **type test**

324 test or series of tests for the purpose of checking compliance of the design of a given product
325 with the requirements of the relevant standard

326 **3.10**

327 **type test sample**

328 sample consisting of one or more similar units being representative of the production and
329 submitted by the manufacturer or responsible vendor for the purpose of the type test

330 **3.11**

331 **t_c -point**

332 designated location of the point where to measure the t_c -temperatures at the surface of the LED
333 module

334 **3.12**

335 **t_c -temperature**

336 temperature at the t_c -point, related to the safety of the LED module

3.13**maximum operating temperature** $t_{c \text{ rated}}$

<of an LED module> maximum operating temperature to which the rated safety characteristics are declared by the manufacturer or responsible vendor

3.14**thermal power** P_d

power to be transferred from an LED light source to the luminaire by means of heat conduction

Note 1 to entry: Thermal power is expressed in Watt (W).

Note 2 to entry: P_d is below the rated power of an LED light source.

Note 3 to entry: For LED light sources which do not require heat conduction to the luminaire, P_d is equal to zero.

3.15**terminal**

conductive part of an LED module, provided for connecting that LED module to one or more external conductors

[SOURCE: IEC 60050-151:2001, 151-12-12, modified – "device, electric circuit or electric network" has been replaced by "LED module" and the Note has been deleted]

3.16**mains**

AC or DC power distribution system that supplies operating power to electrical equipment

Note 1 to entry: Mains include public or private utilities and, unless otherwise specified in this document, equivalent sources such as motor-driven generators and uninterruptible power supplies.

3.17**interrupted DC voltage**

voltage changing periodically between a DC level and zero

Note 1 to entry: In interrupted DC voltage waveforms, the duration of the signal at the DC level can vary within one period.

3.18**live part**

conductive part intended to be energized under normal operating conditions, including the neutral conductor and mid-point conductor, but excluding the PEN conductor, PEM conductor and PEL conductor

Note 1 to entry: PEN conductor, PEM conductor and PEL conductor are defined in IEC 60050-195:2021, 195-02-12, 195-02-13 and 195-02-14.

Note 2 to entry: This concept does not necessarily imply a risk of electric shock.

[SOURCE: IEC 60050-195:2021, 195-02-19, modified – Note 1 and Note 2 to entry added]

3.19**hazardous-live-part**

live part that, under certain conditions, can give a harmful electric shock

[SOURCE: IEC 60050-195:2021, 195-06-05, modified – Note 1 to entry removed]

3.20**pulse width modulation control****PWM control**

pulse control in which the pulse width or frequency or both are modulated within each fundamental period to produce a certain output waveform

[SOURCE: IEC 60050-551:1998, 551-16-30]

3.21**working voltage**

highest RMS voltage across any insulation at any rated electrical supply conditions, transients being neglected, under normal and under abnormal conditions

Note 1 to entry: The rated electrical supply conditions can be the rated voltage, the rated current or a rated supply range.

3.22

extra-low voltage

ELV

voltage which does not exceed 50 V AC or 120 V ripple-free DC between conductors or between any conductor and earth

Note 1 to entry: Ripple-free is conventionally defined as an RMS ripple voltage of not more than 10 % of the d.c. component.

Note 2 to entry: Extra-low voltage (ELV) is part of the low-voltage (LV) band, See Clause 4.2 and Table 1 of IEC 61140:2016.

3.23

SELV circuit

electric circuit in which the voltage cannot exceed the value of extra-low voltage:

- under normal conditions and
- under single fault conditions, including earth faults in other electric circuits

Note 1 to entry: SELV is the abbreviation for safety extra-low voltage.

[SOURCE: IEC 61140:2016, 3.26.1. Modified "system" replaced by "circuit"]

3.24

PELV circuit

electric circuit in which the voltage cannot exceed the value of extra-low voltage:

- under normal conditions and
- under single fault conditions, except earth faults in other electric circuits

Note 1 to entry: PELV is the abbreviation for protective extra-low voltage.

[SOURCE: IEC 61140:2016, 3.26.2. Modified "system" replaced by "circuit"]

3.25

FELV circuit

electrical circuit in which the voltage cannot exceed the value of ELV used for functional purposes and having simple separation from LV

Note 1 to entry: FELV is the abbreviation for functional extra-low voltage.

Note 2 to entry: An FELV circuit does not fulfil the requirements for SELV circuits (or PELV circuits).

Note 3 to entry: An FELV circuit is not safe to touch and may be connected to protective earth.

[SOURCE: IEC 60669-2-5, 3.204]

4 Classification

LED modules are classified, according to the level of controlgear integration, as:

- integrated LED modules, LEDi;
- semi-integrated LED modules, LEDsi;
- non-integrated LED modules, LEDni.

5 General requirements

LED modules shall be so designed and constructed that, for their intended use, they cause no danger to the user or surroundings.

Parts of LED modules providing hazard protection, as covered by this document, shall not become loose during normal operation and handling.

Requirements, tests and compliances are provided in this document to reduce the risk of harm to a tolerable level under normal operating conditions, abnormal operating conditions and single fault conditions.

Where the terms "voltage" and "current" are used, they imply the RMS values unless otherwise stated.

Annex B and Annex C provide information for luminaire design and information for controlgear design, respectively.

6 General conditions for tests

6.1 General

6.1.1 Type test

Tests according to this document are type tests.

NOTE The requirements and tolerances specified in this document are related to testing of a type test sample submitted by the manufacturer for that purpose. Compliance of type test samples does not ensure compliance of the whole production of a manufacturer with this document. Conformity of production is the responsibility of the manufacturer and routine tests and quality insurance in addition to the type test can be necessary.

6.1.2 Test samples

Tests shall be carried out with type test samples.

NOTE 1 For example, damage to marking as a result of the marking test has no impact on electrical testing, thus the light source is still considered to be representative of production for other tests.

Unless otherwise specified, the type test shall be carried out on one sample consisting of one or more sample items submitted for the purpose of the type test.

In general, all tests shall be carried out on each type of the LED module. Where there is a range of similar LED modules for testing, samples representing the most onerous case within the range shall be selected as relevant to the test criteria and agreed with the manufacturer.

NOTE 2 As an example, it is not necessary to carry out overload condition tests separately on LED modules of one type having different colour temperatures.

Factory-sealed LED modules shall not be opened for any tests unless otherwise required in this document.

If required in this document, tests shall be performed using sample items specially prepared in agreement with the manufacturer or responsible vendor.

6.1.3 Compliance by inspection of relevant data

Where in this document compliance of materials, components or subassemblies is checked by inspection or by testing of properties, compliance may be confirmed by reviewing any relevant data or previous test results that are available.

6.2 Default test conditions

6.2.1 General

Unless otherwise specified in this document, the tests shall be conducted under the most onerous operating conditions within the specified operating range. It can be necessary to request information about the most onerous test conditions from the manufacturer. In addition to 6.2.2 and 6.2.3 the following parameters shall be taken into account:

- operating mode, including loading by external connected equipment;
- control settings;
- position of movable parts;
- operating position.

6.2.2 Electrical supply conditions

6.2.2.1 General

Where the terms "voltage" and "current" are used without modifiers, they imply the RMS values. The supply voltage, current and frequency shall be stabilized within ± 1 % of the specified test value.

6.2.2.2 LED modules supplied by voltage sources

LED modules supplied by voltage sources usually comprise means to adjust their operating current so that they can be supplied by a voltage source that, ideally, has no impedance.

EXAMPLE Mains driven integrated LED modules (LEDi modules).

In case of a single rated voltage, tests shall be carried out at the most onerous boundary of the 90 % to 110 % range around that rated voltage.