

Auxiliaries for lamps — A.C. supplied electronic ballasts for tubular fluorescent lamps — General and safety requirements

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Committees responsible for this British Standard

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- BEAMA Capacitor Manufacturers' Association
- British Lighting Association for the Preparation of Standards (BRITLAPS)
- British Sign Association
- Department of Trade and Industry (Consumer Safety Unit, CA Division)
- Institution of Lighting Engineers
- Lighting Industry Federation Ltd.
- London Regional Transport

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National foreword

This British Standard has been prepared by Subcommittee CPL/34/3 and is the English language version of EN 60928:1995 *Auxiliaries for lamps — A.C. supplied electronic ballasts for tubular fluorescent lamps — General and safety requirements* including amendment A1:1999, published by the European Committee for Electrotechnical Standardization (CENELEC). It is identical with IEC 60928:1995 including amendment 1:1999, published by the International Electrotechnical Commission (IEC).

This British Standard supersedes BS EN 60928:1991, which is withdrawn. For products which have complied with BS EN 60928:1991 and amendment 1:1994 before 1996-02-15, as shown by the manufacturer or by a certification body, this previous standard may continue to apply to production until 2001-02-15.

Certificates or Marks will not be awarded after this date with respect to the withdrawn British Standard. However such Certificates and Marks, already awarded, may continue to apply to production until 2001-02-15.

From 1 January 1997, all IEC publications have the number 60000 added to the old number. For instance, IEC 27-1 has been renumbered as IEC 60027-1. For a period of time during the changeover from one numbering system to the other, publications may contain identifiers from both systems.

The following print types are used in this standard:

requirements proper	in roman type
<i>test specifications</i>	<i>in italic type</i>
explanatory matter	in smaller roman type

Cross-references

The British Standards which implement international or European publications referred to in this document may be found in the BSI Standards Catalogue under the section entitled “International Standards Correspondence Index” or by using the “Find” facility of the BSI Standards Electronic Catalogue.

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Summary of pages

This document comprises a front cover, an inside front cover, pages i and ii, the EN title page, pages 2 to 24, an inside back cover and a back cover.

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English version

Auxiliaries for lamps — A.C. supplied electronic ballasts for tubular fluorescent lamps — General and safety requirements

(includes amendment A1:1999)
(IEC 60928:1995 + A1:1999)

Appareils auxiliaires pour lampes —
Ballasts électroniques alimentés en courant
alternatif pour lampes tubulaires à
fluorescence —
Prescriptions générales et prescriptions de
sécurité
(inclut l'amendement A1:1999)
(CEI 60928:1995 + A1:1999)

Geräte für Lampen —
Wechselstromversorgte elektronische
Vorhaltgeräte für röhrenförmige
Leuchtstofflampen —
Allgemeine und Sicherheitsanforderungen
(enthält Änderung A1:1999)
(IEC 60928:1995 + A1:1999)

This European Standard was approved by CENELEC on 1995-05-15 amendment A1 was approved by CENELEC on 1999-08-01. CENELEC members are bound to comply with the CEN/CENELEC Internal Regulations which stipulate the conditions for giving this European Standard the status of a national standard without any alteration.

Up-to-date lists and bibliographical references concerning such national standards may be obtained on application to the Central Secretariat or to any CENELEC member.

This European Standard exists in three official versions (English, French, German). A version in any other language made by translation under the responsibility of a CENELEC member into its own language and notified to the Central Secretariat has the same status as the official versions.

CENELEC members are the national electrotechnical committees of Austria, Belgium, Denmark, Finland, France, Germany, Greece, Iceland, Ireland, Italy, Luxembourg, Netherlands, Norway, Portugal, Spain, Sweden, Switzerland and United Kingdom.

CENELEC

European Committee for Electrotechnical Standardization
Comité Européen de Normalisation Electrotechnique
Europäisches Komitee für Elektrotechnische Normung

Central Secretariat: rue de Stassart 35, B-1050 Brussels

Foreword

The text of document 34C/279/DIS future amendment to IEC 928:1990, prepared by SC 34C, Auxiliaries for lamps, of IEC TC 34, Lamps and related equipment, was submitted to the IEC-CENELEC parallel vote.

The text of this document, together with that of IEC 928:1990 and its amendments 1:1992 and 2:1993, was published by IEC as the second edition of IEC 928 in February 1995 and was approved by CENELEC as EN 60928 on 1995-05-15.

The following dates were fixed:

- latest date which the EN has to be implemented at national level by publication of an identical national standard or by endorsement (dop) 1996-02-15
- latest date by which the national standards conflicting with the EN have to be withdrawn (dow) 1996-02-15

For products which have complied with EN 60928:1991 and its amendment A2:1994 before 1996-02-15, as shown by the manufacturer or by a certification body, this previous standard may continue to apply for production until 2001-02-15.

Annexes designated “normative” are part of the body of the standard. In this standard, Annex A, Annex B, Annex C, Annex D and Annex ZA are normative. Annex ZA has been added by CENELEC.

Foreword to amendment A1

The text of document 34C/450/FDIS, future amendment 1 to IEC 60928, prepared by SC 34C, Auxiliaries for lamps, of IEC TC 34, Lamps and related equipment, was submitted to the IEC-CENELEC parallel vote and was approved by CENELEC as amendment A1 to EN 60928:1995 on 1999-08-01.

The following dates were fixed:

- latest date by which the amendment has to be implemented at national level by publication of an identical national standard or by endorsement (dop) 2000-05-01
- latest date by which the national standards conflicting with the amendment have to be withdrawn (dow) 2006-08-01

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Section 1. General requirements

1 Scope

This standard specifies general and safety requirements for electronic ballasts for use on a.c. supplies up to 1 000 V at 50 Hz or 60 Hz with operating frequencies deviating from the supply frequency, associated with tubular fluorescent lamps as specified in IEC 81 and other tubular fluorescent lamps for high-frequency operation.

Particular requirements for electronic ballasts with means of protection against overheating are given in Annex B.

Particular requirements for a.c./d.c. supplied electronic ballasts for maintained emergency lighting are given in Annex C.

2 Normative references

The following normative documents contain provisions which, through reference in this text, constitute provisions of this International Standard. At the time of publication, the editions indicated were valid. All normative documents are subject to revision, and parties to agreements based on this International Standard are encouraged to investigate the possibility of applying the most recent editions of the normative documents indicated below. Members of IEC and ISO maintain registers of currently valid International Standards.

IEC 81:1984, *Tubular fluorescent lamps for general lighting service*.

IEC 112:1979, *Method for determining the comparative and the proof tracking indices of solid insulating materials under moist conditions*.

IEC 249, *Base materials for printed circuits*.

IEC 317, *Specifications for particular types of winding wires*.

IEC 417C:1977, *Graphical symbols for use on equipment — Index, survey and compilation of the single sheets — Third supplement*.

CEI 479, *Effects of current passing through the human body*.

IEC 529:1989, *Degrees of protection provided by enclosures (IP code)*.

IEC 598-1:1992, *Luminaires — Part 1: General requirements and tests*.

IEC 598-2-22:1990, *Luminaires — Part 2: Particular requirements — Section 22: Luminaires for emergency lighting*.

IEC 664-3:1992, *Insulation coordination for equipment within low-voltage systems — Part 3: Use of coatings to achieve insulation coordination of printed board assemblies*.

IEC 691:1993, *Thermal-links — Requirements and application guide*.

IEC 695-2-1:1991, *Fire hazard testing — Part 2: Test methods — Glow-wire test and guidance*.

IEC 695-2-2:1991, *Fire hazard testing — Part 2: Test methods — Needle-flame test*.

IEC 730-2-3:1990, *Automatic electrical controls for household and similar use — Part 2: Particular requirements for thermal protectors for ballasts for tubular fluorescent lamps*.

IEC 901:1987, *Single-capped fluorescent lamps — Safety and performance requirements*.

IEC 920:1990, *Ballasts for tubular fluorescent lamps — General and safety requirements*.

IEC 929:1990, *A.C. supplied electronic ballasts for tubular fluorescent lamps — Performance requirements*.

IEC 990:1990, *Methods of measurement of touch-current and protective conductor current*.

ISO Standard 4046:1978, *Paper, board, pulp and related terms — Vocabulary*.

3 Definitions

For the purpose of this standard, the following definitions apply:

3.1

ballast

unit inserted between the supply and one or more discharge lamps which by means of inductance, capacitance, or a combination of inductance and capacitance serves mainly to limit the current of the lamp(s) to the required value. The ballast may consist of one or more separate components it may also include means for transforming the supply voltage and arrangements which help provide the starting voltage and preheating current, prevent cold starting, reduce stroboscopic effects, correct the power-factor and/or suppress radio interference

3.1.1

independent ballast

ballast which can be mounted separately outside a luminaire without any additional enclosure. This may consist of a built-in ballast housed in a suitable enclosure which provides all the necessary protection according to its markings

3.1.2

built-in ballast

ballast exclusively designed to be built into a luminaire, a box, an enclosure or the like. The control gear compartment in the base of a road lighting column is considered to be an enclosure

3.1.3

integral ballast

ballast which forms a non-replaceable part of a luminaire and which cannot be tested separately from the luminaire

3.1.4

A.C. supplied electronic ballast

mains supplied a.c. to a.c. inverter including stabilizing elements for starting and operating one or more tubular fluorescent lamps, generally at high frequency

3.1.5

controllable ballasts

lamp power (light output) of the electronic ballast is controlled between the minimum value (or off) and the maximum value by the signal on the control input of the ballast

3.1.6

maximum value of lamp power (of a controllable ballast)

lamp power (light output) which complies with IEC 929, subclause 8.1, unless otherwise declared by the manufacturer or responsible vendor

3.1.7

minimum value of lamp power (of a controllable ballast)

lowest percentage of the lamp power defined in 2.1.6 declared by the manufacturer or responsible vendor

3.1.8

a.c./d.c. supplied electronic ballast for maintained emergency lighting

mains/battery supplied a.c./d.c. to a.c. inverter including stabilizing elements for starting and operating one or more tubular fluorescent lamps, generally at high frequency for emergency lighting

3.2

supply voltage

voltage applied to the complete circuit of lamp(s) and ballast

3.3

working voltage

highest r.m.s. voltage which may occur across any insulation, transients being neglected, in open-circuit conditions or during lamp operation, when the ballast is operated at its rated voltage

3.4 maximum allowed peak voltage

highest permitted peak voltage across any insulation under open-circuit condition and any normal and abnormal operating conditions. The maximum peak voltage is related to the declared r.m.s. working voltage; see Table 3

3.5**supply current**

current supplied to the complete circuit of lamp(s) and ballast

3.6**live part**

conductive part which may cause an electric shock in normal use. The test to determine whether or not a conductive part is a live part which may cause an electric shock is given in Annex A. Nevertheless, the neutral conductor shall be regarded as a live part

3.7**rectifying effect**

effect which may occur at the end of a lamp life when one cathode is broken or has insufficient electron emission resulting in the arc current being constantly unequal in consecutive half-cycles

3.8**type test**

test or 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 standard

3.9**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

3.10**rated maximum operating temperature of a ballast case. Symbol t_c**

highest permissible temperature which may occur on the outer surface (at the indicated place, if marked) under normal operating conditions and at the rated voltage or the maximum of the rated voltage range

3.11**control terminals**

connections to the electronic ballast which are used to apply a control signal for changing the light output. The power supply terminals can also act as control terminals

3.12**control signal**

signal, which may be an a.c. or d.c. voltage, and which by analog, digital or other means may be modulated to convey the necessary information to the ballast for the purpose of changing the light output

3.13**cathode dummy resistor**

cathode substitution resistor as specified on the relevant lamp data sheet of IEC 60081 or IEC 60901 or as declared by the relevant lamp manufacturer or by the responsible vendor