# SLOVENSKI STANDARD
# SIST EN 60922:1999

**01-julij-1999**

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**Auxiliaries for lamps - Ballasts for discharge lamps (excluding tubular fluorescent lamps) - General and safety requirements (IEC 60922:1997)**

Auxiliaries for lamps - Ballasts for discharge lamps (excluding tubular fluorescent lamps) - General and safety requirements

Geräte für Lampen - Vorschaltgeräte für Entladungslampen (ausgenommen röhrenförmige Leuchtstofflampen) - Allgemeine und Sicherheitsanforderungen



Appareils auxiliaires pour lampes - Ballasts pour lampes à décharge (à l'exclusion des lampes tubulaires à fluorescence) - Prescriptions générales et prescriptions de sécurité



**Ta slovenski standard je istoveten z:** **EN 60922:1997**

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# EUROPEAN STANDARD
# NORME EUROPÉENNE
# EUROPÄISCHE NORM

**EN 60922**

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Descriptors: Lighting equipment, discharge lamp, electrical ballast, specification, safety, test

English version

## Auxiliaries for lamps - Ballasts for discharge lamps (excluding tubular fluorescent lamps) General and safety requirements (IEC 60922:1997)

Appareils auxiliaires pour lampes
Ballasts pour lampes à décharge
(à l'exclusion des lampes tubulaires à fluorescence) - Prescriptions générales et prescriptions de sécurité
(CEI 60922:1997)

Geräte für Lampen
Vorschaltgeräte für Entladungslampen (ausgenommen röhrenförmige Leuchtstofflampen) - Allgemeine und Sicherheitsanforderungen
(IEC 60922:1997)



This European Standard was approved by CENELEC on 1996-12-09. 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.

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

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Ref. No. EN 60922:1997 E

## Foreword

The text of document 34C/375/FDIS, future edition 2 of IEC 60922, 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 EN 60922 on 1996-12-09.

This European Standard supersedes EN 60922:1991 and its amendment A2:1993.

The following dates were fixed:

- latest date by which the EN has to be implemented at national level by publication of an identical national standard or by endorsement (dop) 1997-10-01
- latest date by which the national standards conflicting with the EN have to be withdrawn (dow) 1997-10-01

For products which have complied with EN 60922:1991 and its amendment A2:1993 before 1997-10-01, as shown by the manufacturer or by a certification body, this previous standard may continue to apply for production until 2002-10-01.

Annexes designated "normative" are part of the body of the standard.
Annexes designated "informative" are given for information only.
In this standard, annexes A, B, D, E, F and ZA are normative and annex C is informative.
Annex ZA has been added by CENELEC.





## Endorsement notice

The text of the International Standard IEC 60922:1997 was approved by CENELEC as a European Standard without any modification.

# CONTENTS

# INTRODUCTION

This standard covers general and safety requirements for ballasts for discharge lamps, excluding tubular fluorescent lamps. Performance requirements for these ballasts are the subject of IEC 923.

NOTE – Safety requirements ensure that electrical equipment constructed in accordance with these requirements does not endanger the safety of persons, domestic animals or property when the equipment is properly installed and maintained, and used in applications for which it was intended.

Relevant sections of this specification, e.g. thermal endurance tests for windings, apply also to ballasts which form an integral part of a luminaire and which cannot be tested separately.

The thermal characteristics of ballasts are specified by the rated maximum operating temperature of the winding (symbol $t_w$), which shall not be exceeded in order to ensure a sufficient length of life for the ballast when it is built into a luminaire. In addition, for ballasts which are subjected to abnormal conditions, the limiting temperature is given, which shall not be exceeded when the ballast is built into a luminaire. Moreover, an indication of the rated temperature rise of a winding (symbol $\Delta t$) may be added as an optional requirements.

For checking the rated maximum operating temperature $t_w$, this standard specifies an endurance test period for 30 days as the standard method. At the manufacturer's choice, optional endurance test periods of 60, 90 or 120 days may be used.



This standard permits the use of constants $S$ other than 4500 in $t_w$ tests. If a claim is not made to the contrary, the endurance testing of ballasts is based on the constant $S$, given in annex A, having a value of 4500. A manufacturer may claim the use of other values if this can be justified by either of the tests specified.



For the present, this specification refers only to inductive ballasts for use with those types of lamp which are internationally the most popular in demand.

Many high-pressure sodium lamps and metal halide lamps are started by the superimposition of short repetitive voltage pulses on the normal ballast circuit voltage. These high-voltage pulses are often generated by electronic ignitors and, in some circuit arrangements, the pulses are applied to both lamp and ballast terminals.

It is therefore necessary to ensure that ballasts used in these types of circuit are capable of withstanding a suitable high voltage impulse test.

This standard specifies particular tests for ballasts designed for operating in a circuit with a starting device external to the lamp and for ballasts designed for operating lamps with an internal starting device.

Some ballasts incorporate internal or external surge voltage suppression devices, and therefore this specification includes test procedures for this type of ballast, as it is necessary to ensure the safety of these devices, if fitted.

These requirements acknowledge that ballasts may be subjected to voltage pulses when lamp and ballasts are both in hot or cold conditions.

These requirements apply only to those circuits incorporating lamps the standardization of which is already completed, or is at present under discussion.

# AUXILIARIES FOR LAMPS – BALLASTS FOR DISCHARGE LAMPS (EXCLUDING TUBULAR FLUORESCENT LAMPS) –

## General and safety requirements

## Section 1: General requirements

### 1 General

#### 1.1 *Scope and object*

This standard specifies safety requirements for ballasts for discharge lamps such as high-pressure mercury vapour, low-pressure sodium vapour, high-pressure sodium vapour and metal halide lamps. Section 1 specifies general requirements and section 2 specifies thermal and mechanical requirements. The standard covers inductive ballasts for use on a.c. supplies up to 1000 V at 50 Hz or 60 Hz associated with discharge lamps, having rated wattages, dimensions and characteristics as specified in the relevant IEC lamp standards according to IEC 188, IEC 192 and IEC 662.

Tests in this standard are type tests. Requirements for testing individual ballasts during production are not included.



NOTES

1 For certain types of discharge lamp an ignitor is required.

2 Ballasts for tubular fluorescent discharge lamps are covered by IEC 920.



Particular requirements for thermally protected ballasts are given in annex F.

#### 1.2 *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 112: 1979, *Method for determining the comparative and the proof tracking indices of solid insulating materials under moist conditions*

IEC 188: 1974, *High-pressure mercury vapour lamps*

IEC 192: 1973, *Low-pressure sodium vapour lamps*

IEC 216, *Guide for the determination of thermal endurance properties of electrical insulating materials*

IEC 249-1: 1982, *Base materials for printed circuits – Part 1: Test methods*

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*

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

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

IEC 662: 1980, *High pressure sodium vapour lamps*

IEC 691: 1993, *Thermal links – Requirements and application guide*

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

IEC 595-2-2: 1991, *Fire hazard testing – Part 2: Test methods – Section 2: Needle-flame test*

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

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

IEC 921: 1988, *Ballasts for tubular fluorescent lamps – Performance requirements*



IEC 922: 1989, *Ballasts for discharge lamps (excluding tubular fluorescent lamps) – General and safety requirements*



IEC 923: 1988, *Ballasts for discharge lamps (excluding tubular fluorescent lamps) – Performance requirements*

IEC 926: 1995, *Auxiliaries for lamps – Starting devices (other than glow starters) – General and safety requirements*

ISO 4046: 1978, *Paper, board, pulp and related terms – Vocabulary*

## 2 Definitions

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

2.1 **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 starting voltage, prevent cold starting, reduce stroboscopic effects, correct the power factor and/or suppress radio interference.

2.1.1 **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.

2.1.2 **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.

2.1.3 **integral ballast:** Ballast which forms a non-replaceable part of a luminaire and which cannot be tested separately from the luminaire.

2.2 **reference ballast:** Special inductive ballast designed for the purpose of providing comparison standards for use in testing ballasts and for the selection of reference lamps. It is essentially characterized by a stable voltage-to-current ratio, which is relatively uninfluenced by variations in current, temperature and magnetic surroundings, as outlined in annex A of IEC 923.

2.3 **reference lamp:** Lamp selected for testing ballasts which, when associated with a reference ballast, has electrical characteristics which are close the nominal values as stated in the relevant lamp standard.

2.4 **calibration current of a reference ballast:** Value of the current on which are based the calibration and control of the reference ballast.



NOTE – Such a current should preferably be approximately equal to the running current of the lamps for which the reference ballast is suitable.



2.5 **supply voltage:** Voltage applied to the complete circuit of the lamp or lamps and ballast.

2.6 **supply current:** Current supplied to the complete circuit of the lamp or lamps and ballast.

2.7 **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.

2.8 **circuit power factor (symbol λ):** Power factor of the combination of a ballast and the lamp or lamps for which the ballast is designed.

2.9 **high power factor ballast:** Ballast having a circuit power factor of at least 0,85 (leading or lagging).

NOTE – The value 0,85 takes into account the distortion of the current waveform. For North America, a high power factor is defined as a power factor of at least 0,9.

2.10 **rated maximum operating temperature of a capacitor case (symbol $t_c$):** Highest permissible temperature which may occur at any place on the outer surface under normal operating conditions.

2.11 **rated maximum operating temperature of a ballast winding (symbol $t_w$):** Temperature assigned by the manufacturer as the highest at which the ballast may be expected to have a service life of at least 10 years' continuous operation.

2.12 **rated temperature rise of a ballast winding (symbol $\Delta t$):** Temperature rise assigned by the manufacturer under the conditions specified in this standard.

NOTE – The specifications for the supply and mounting conditions of the ballasts are given in 13.2.

2.13 **test duration of endurance test (symbol *D*):** Optional duration of the endurance test on which the temperature conditions are to be based.

2.14 **degradation of insulation of a ballast winding (symbol *S*):** Constant which determines the degradation of ballast insulation.

2.15 **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.

2.16 **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.

2.17 **high voltage impulse:** Intentionally applied aperiodic transient voltage which rises rapidly to a peak value and then falls, usually less rapidly, to zero. Such an impulse is, in general, well represented by the sum of two exponentials.

NOTE – The term "impulse" is to be distinguished from the term "surge" which refers to transients occurring in electrical equipment or networks in service.



2.18 **ignitor:** Starting device intended to generate voltage pulses to start discharge lamps and which does not provide for the preheating of electrodes (IEC 926 and IEC 927).



## 3 General requirements

Ballasts shall be so designed and constructed that in normal use they operate without danger to the user or surroundings. Capacitors and other components incorporated in ballasts shall comply with the requirements of the appropriate IEC standard.

Thermally protected ballasts shall comply with the requirements of annex F.

*In general, compliance of ballasts and other elements is checked by carrying out all the tests specified.*

The enclosure of independent ballasts shall, in addition, comply with the requirements of IEC 598-1, including the classification and marking requirements of that standard.

## 4 General notes on tests

4.1 *Tests according to this standard are type tests.*

NOTE – The requirements and tolerances permitted by the standard are related to testing of a type test sample submitted for that purpose. The compliance of the type test sample does not ensure compliance of the whole production of a manufacture with this safety standard. Conformity of production is the responsibility of the manufacturer, and should include routine tests and quality assurance in addition to type testing.

*4.2 The tests are carried out in the order of the clauses, unless otherwise specified.*

*4.3 The type test is carried out on one sample consisting of eight ballasts submitted for the purpose of the type test (see definition 2.15). Seven ballasts are for the endurance test and one for all other tests. For conditions of compliance for the endurance test, see clause 12.*

*With the exception of the endurance test, certain countries require three ballasts to be tested, and therefore ten ballasts are required, of which seven are for the endurance test and three for all other tests. In such cases, if more than one ballast fails, then the type shall be rejected. If one ballast fails, the test is repeated using three other ballasts, and all of these shall comply with the test requirements.*

*In addition, six ballasts are required for the high voltage impulse testing according to clause 11 for ballasts for metal halide and high-pressure sodium lamps. There shall be no failure during the test.*

*4.4 In general, all tests are made for each type of ballast or, where a range of similar ballasts is involved, for each rated wattage in the range, or on a representative selection from the range as agreed with the manufacturer. A reduction of the number of samples to be tested according to clause 12, including the use of constants S other than 4500 according to annex B, or even the omission of these tests, is allowed when ballasts of the same construction, but with different characteristics, are submitted together for approval, or when the test reports from the manufacturer or other authority are accepted by the testing station.*



## 5 Classification

Ballasts are classified, according to the mode of installation, as:



- independent ballasts;
- ballasts for building-in (built-in ballasts);
- integral ballasts.

## 6 Marking

Ballasts which form an integral part with the luminaire need not be marked. For ballasts intended to be mounted in the base compartment of a column, all necessary markings according to 6.1 and 6.2 shall be on the ballast.

### 6.1 *Mandatory markings*

Ballasts (other than integral ballasts) shall be clearly and durably marked with the following mandatory markings.

a) Mark or origin, which may take the form of a trade mark, or the manufacturer's name or the name of the responsible vendor.

b) Model number or type reference of the manufacturer.

c) When a ballast has more than two terminals or leads, other than earthing terminals, they shall be identified clearly and their rated voltage indicated. This may be implemented by numbering and/or lettering, and/or colouring of the terminal leads. The earthing terminal (if any) shall be identified by the symbol  , 417-IEC-5019. This symbol shall not be placed on screws or other easily removable parts.

Unless connections are self-evident, the position of terminals shall be clearly indicated by a wiring diagram.

d) Rated supply voltage (or voltages, if there are several), supply frequency and current(s); the supply current(s) may be given in the manufacturer's literature.

e) Rated maximum operating temperature of the winding following the symbol $t_w$, values increasing in multiples of 5 °C.

The following additional marking shall be added, if appropriate.

f) Where ballasts are intended to be used with ignitors (IEC 926), the terminals/ terminations subjected to the pulse voltage shall be marked on the ballast.

NOTE – This marking may be in the form of a wiring diagram. Simple reactor ballasts which have several uses, e.g. for controlling high-pressure mercury vapour lamps, certain metal halide lamps, etc., need not be marked in this way.

6.2 *Information to be provided, if applicable*

In addition to the above mandatory markings, the following information, if applicable, shall be given either on the ballast, or be made available in the manufacturer's literature.

a) Rated wattage or designation as indicated on the lamp data sheet of the type or types of lamp for which the ballast is designed. If the ballast is to be used with more than one lamp, the number of lamps and their wattage shall be indicated.

b) Limiting temperature of the winding under abnormal conditions which shall be respected when the ballast is built into a luminaire, as information for luminaire design.

NOTE – In the case of a ballast intended for circuits which do not produce abnormal conditions, or are for use only with starting devices which exempts the ballasts from the abnormal conditions of 13.2, then the winding temperature under abnormal conditions is not indicated.



c) Test period for the endurance test for ballasts which, at the manufacturer's choice, have to be tested for a longer period than 30 days.

This information may be indicated with the symbol D, followed by the appropriate number of days, 60, 90 or 120 in tenths and the whole being placed between brackets immediately after the $t_w$ indication. For example D6 for ballasts to be tested for a test period of 60 days.

d) For ballasts for which a constant *S* other than 4500 is claimed by the manufacturer, symbol *S* together with its appropriate value in thousands, e.g. "*S*6", if *S* has a value of 6000.

NOTE – Preferred values are: 4500 – 5000 – 6000 – 8000 – 11 000 – 16 000.

e) For ballasts for use with high-pressure sodium vapour or metal halide lamps:

i) Maximum peak value of the pulse voltage to which the ballast can be subjected if this value exceeds 1500 V;

ii) Catalogue reference of the ignitor(s) which may be used with the ballast.

f) Declaration of the cross-section of conductor(s) for which the ballast terminals, if any, are suitable.

Symbol: relevant value(s) in square millimetres followed by a small square ☐ .

g) Declaration if the ballast does not rely upon the luminaire enclosure for protection against accidental contact with live parts (see clause 7).