

**SLOVENSKI  
STANDARD**

**SIST EN 60924:1995**

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december 1995

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D.C. supplied electronic ballasts for tubular fluorescent lamps - General and safety requirements (IEC 924:1990)

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EUROPEAN STANDARD

EN 60924

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EUROPÄISCHE NORM

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Descriptors: Lighting equipment, tubular lamp, fluorescent lamp, electric ballast, direct current, safety requirement, test

## ENGLISH VERSION

D.C. SUPPLIED ELECTRONIC BALLASTS  
FOR TUBULAR FLUORESCENT LAMPS  
GENERAL AND SAFETY REQUIREMENTS  
(IEC 924:1990)

Ballasts électroniques alimentés  
en courant continu pour lampes  
tubulaires à fluorescence  
Prescriptions générales et  
prescriptions de sécurité  
(CEI 924:1990)

Gleichstromversorgte  
elektronische Vorschaltgeräte  
für röhrenförmige  
Leuchtstofflampen - Allgemeine  
und Sicherheits-Anforderungen  
(IEC 924:1990)

SIST EN 60924:1995

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This European Standard was approved by CENELEC on 1990-12-10.  
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 CENELEC questionnaire procedure, performed for finding out whether or not the International Standard IEC 924:1990 could be accepted without textual changes, has shown that no CENELEC common modifications were necessary for the acceptance as European Standard. The reference document was submitted to the CENELEC members for formal vote and was approved by CENELEC as EN 60924 on 10 December 1990.

The following dates were fixed:

- latest date of publication of  
an identical national standard (dop) 1991-09-01
- latest date of withdrawal of  
conflicting national standards (dow) 1991-09-01

For products which have complied with the relevant national standard before 1991-09-01, as shown by the manufacturer or by a certification body, this previous standard may continue to apply for production until 1996-09-01.

Annexes designated "normative" are part of the body of the standard. In this standard, annex ZA is normative.

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The text of the International Standard IEC 924:1990 was approved by CENELEC as a European Standard without any modification.

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## ANNEX ZA (normative)

OTHER INTERNATIONAL PUBLICATIONS QUOTED IN THIS STANDARD  
WITH THE REFERENCES OF THE RELEVANT EUROPEAN PUBLICATIONS

When the international publication has been modified by CENELEC common modifications, indicated by (mod), the relevant EN/HD applies.

<u>IEC</u>	<u>Publication</u>	<u>Date</u>	<u>Title</u>	<u>EN/HD</u>	<u>Date</u>
81		1984	Tubular fluorescent lamps for general lighting service	EN 60081**	1989
249		-	Base materials for printed circuits	HD 313	-
249-1		1982	Part 1: Test methods	HD 313.1 S3*	1984
317		-	Specifications for particular types of winding wires	HD 555	-
417C		1977	Graphical symbols for use on equipment - Index, survey and compilation of the single sheets Third supplement	HD 243 S3*	1978
529		1976	Classification of degrees of protection provided by enclosures	HD 365 S1*	1978
598-1, mod		1986	Luminaires - Part 1: General requirements and tests	EN 60598-1*	1989
598-2-22		1980	Part 2: Particular requirements Section twenty-two - Luminaires for emergency lighting	EN 60598-2-22	1990

\* Superseded by:

IEC 249-1:1982 + A1:1984 + A2:1989	HD 313.1 S5	1991
IEC 417 + Supplements A up to H	HD 243 S8	1989
IEC 529:1976 + A1:1978 + A2:1983	HD 365 S3	1985
IEC 598-1:1986 + A1:1988, mod	EN 60598-1 (Reprint October)	1989

\*\* Also endorses IEC amendments 1:1987 and 2:1988

<u>IEC</u> <u>Publication</u>	<u>Date</u>	<u>Title</u>	<u>EN/HD</u>	<u>Date</u>
695-2-1	1980	Fire hazard testing - Part 2: Test methods - Glow-wire test and guidance	HD 444.2.1 S1	1983
695-2-2	1980	Fire hazard testing - Part 2: Test methods - Needle-flame test	HD 444.2.2 S1	1983
742, mod	1983	Isolating transformers and safety isolating transformers - Requirements	EN 60742	1989
920	1990	Ballasts for tubular fluorescent lamps - General and safety requirements	EN 60920	1991
921, mod	1988	Ballasts for tubular fluorescent lamps - Performance requirements	EN 60921	1991
925	1989	D.C. supplied electronic ballasts for tubular fluorescent lamps - Performance requirements	EN 60925	1991

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Other publication quoted:  
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ISO Standard 40046 (1978): Paper, board, pulp and related terms -  
Vocabulary

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Première édition  
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1990-07

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Ballasts électroniques alimentés en courant  
continu pour lampes tubulaires à fluorescence

Prescriptions générales et prescriptions de  
sécurité

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General and safety requirements



Numéro de référence  
Reference number  
CEI/IEC 924: 1990

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## INTERNATIONAL ELECTROTECHNICAL COMMISSION

D.C. SUPPLIED ELECTRONIC BALLASTS FOR  
TUBULAR FLUORESCENT LAMPS

## General and safety requirements

## FOREWORD

- 1) The formal decisions or agreements of the IEC on technical matters, prepared by Technical Committees on which all the National Committees having a special interest therein are represented, express, as nearly as possible, an international consensus of opinion on the subjects dealt with.
- 2) They have the form of recommendations for international use and they are accepted by the National Committees in that sense.
- 3) In order to promote international unification, the IEC expresses the wish that all National Committees should adopt the text of the IEC recommendation for their national rules in so far as national conditions will permit. Any divergence between the IEC recommendation and the corresponding national rules should, as far as possible, be clearly indicated in the latter.
- 4) The IEC has not laid down any procedure concerning marking as an indication of approval and has no responsibility when an item of equipment is declared to comply with one of its recommendations.

## PREFACE

This standard has been prepared by Sub-Committee 34C: Auxiliaries for discharge lamps, of IEC Technical Committee No. 34: Lamps and related equipment.

The text of this standard is based upon the following documents:

Six Months' Rule	Reports on Voting	Two Months' Procedure	Report on Voting
34C(C0)142 34C(C0)169	34C(C0)153 34C(C0)180	34C(C0)184	34C(C0)194

Full information on the voting for the approval of this standard can be found in the Voting Reports indicated in the above table.

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In this standard, the following print types are used:

- requirements proper: in roman type;
- test specifications: in italic type;
- explanatory matter: in smaller roman type.

The following IEC publications are quoted in this standard:

Publications Nos. 81 (1984): Tubular fluorescent lamps for general lighting service.

249: Base materials for printed circuits.

249-1 (1982): Part 1: Test methods.

317: Specifications for particular types of winding wires.

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

529 (1976): Classification of degrees of protection provided by enclosures.

598-1 (1986): Luminaires. Part 1: General requirements and tests.

598-2-22 (1980): Part 2: Particular requirements. Section Twenty-two Luminaires for emergency lighting.

695-2-1 (1980): Fire hazard testing. Part 2: Test methods - Glow-wire test and guidance.  
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695-2-2 (1980): Fire hazard testing. Part 2: Test methods - Needle-flame test.

742 (1983): Isolating transformers and safety isolating transformers - Requirements.

920 (1990): Ballasts for tubular fluorescent lamps - General and safety requirements.

921 (1988): Ballasts for tubular fluorescent lamps - Performance requirements.

925 (1989): D.C. supplied electronic ballasts for tubular fluorescent lamps. Performance requirements.

Other publication quoted:

ISO Standard 4046 (1978): Paper, board, pulp and related terms - Vocabulary.

## D.C. SUPPLIED ELECTRONIC BALLASTS FOR TUBULAR FLUORESCENT LAMPS

### General and safety requirements

#### INTRODUCTION

This standard covers general and safety requirements for d.c. supplied electronic ballasts for tubular fluorescent lamps, formerly called "transistorized ballasts". Performance requirements for these ballasts are the subject of IEC Publication 925.

*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 properly installed and maintained and used in applications for which it was intended.

This standard refers only to d.c. supplied electronic ballasts for use with lamps which are internationally the most in demand.

Each section in this standard specifies the safety requirements for one specific field of application.

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#### SECTION ONE - GENERAL REQUIREMENTS

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##### 1. Scope

This standard specifies general and safety requirements for electronic ballasts for use on d.c. supplies, having rated voltages not exceeding 250 V, associated with fluorescent lamps complying with IEC Publication 81.

This standard also specifies electronic ballasts for lamps which are not yet standardized.

It does not specify independent ballasts.

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

##### 2. Definitions

2.1 *d.c. supplied electronic ballast*: D.C. to a.c. inverter using semiconductor devices which may include stabilizing elements for supplying power to one or more fluorescent lamps.

2.2 *rated voltage range*: Range of supply voltage over which the ballast is intended to be operated.

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- 2.3 *design voltage*: Voltage declared by the manufacturer to which all the ballast characteristics are related. This value shall be not less than 85% of the maximum value of the rated voltage range.
- 2.4 *working voltage (symbol  $U$ )*: Highest d.c. or r.m.s. a.c. voltage which may occur across any insulation, transients being neglected, in open-circuit conditions or during lamp operation at rated voltage.
- 2.5 *live part*: Conductive part which may cause an electric shock in normal use. The neutral conductor shall, however, be regarded as a live part.
- 2.6 *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 maximum of the rated voltage range.
- 2.7 *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 specification.
- 2.8 *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.

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### 3. General requirements

Ballasts shall be so designed and constructed that in normal use they operate without danger to the user or surroundings.

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

### 4. General notes on tests

a) *Tests according to this standard are type tests.*

*Note.-* The requirements and tolerances permitted by this standard are related to the testing of a type-test sample submitted for that purpose. Compliance of the type test sample does not ensure compliance of the whole production of a manufacturer with this safety standard.

Conformity of production is the responsibility of the manufacturer and may include routine tests and quality assurance in addition to type testing.

- b) Unless otherwise specified, the tests are carried out at an ambient temperature between 10 °C and 30 °C.
- c) The tests are carried out in the order of the clauses unless otherwise specified.
- d) Where ballasts are intended for use from battery supplies it is permissible to substitute a d.c. power source other than a battery, provided that the source impedance is equivalent to that of a battery.

Note.- A non-inductive capacitor of appropriate rated voltage and with a capacitance of at least 50 µF, connected across the supply terminals of the unit under test normally provides a source impedance simulating that of a battery.

- e) Tests to meet the safety requirements for d.c. supplied electronic ballasts for emergency lighting (see Section Six) are made under the conditions specified in Appendix A.
- f) The type test is carried out on one sample consisting of one or more items submitted for the purpose of the type test.

Certain countries require three ballasts to be tested and in such cases, if more than one ballast fails, then the type is rejected.

If one ballast fails, the test is repeated using three other ballasts and all of these shall comply with the test requirements.

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## 5. Category

D.C. supplied electronic ballasts are classified according to their intended application:

- a) general lighting;
- b) public transport lighting;
- c) aircraft lighting;
- d) emergency lighting.

## 6. Marking

6.1 Ballasts shall be clearly marked with the following mandatory markings:

- a) Mark or origin (trade mark, manufacturer's name or name of the responsible supplier).
- b) Model number or type reference of the manufacturer.
- c) Wiring diagram indicating the position of terminals. In the case of ballasts not having terminals, a clear indication shall be given on the wiring diagram of the significance of the code used for the connecting wires.

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- d) Rated voltage range.
- e) Open-circuit voltage (for warning only, not to be tested).
- f) Symbol for earthing as applicable, see Clause 9. This symbol shall not be placed on screws or other easily removable parts.
- g) The value of  $t_c$ .

6.2 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 catalogue or the like.

- a) Heat sink(s) required additional to the ballast.
- b) Whether the ballast is proof against supply voltage polarity reversal.
- c) Marking according to category.
- d) Design voltage.
- e) Rated supply current range for the maximum permissible lamp load and for the rated voltage range.

Note.- Ballasts designed to operate various numbers and ratings of lamps draw different supply currents at the same supply voltage according to the constitution of their load.

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- f) Rated lamp wattage on the designation as indicated on the lamp data sheet of the type(s) of lamp(s) for which the ballast is designed. If the ballast is to be used with more than one lamp, the number and wattages of each lamp shall be indicated.
- g) A declaration if the ballast does not rely upon the luminaire enclosure for protection against accidental contact.
- h) A declaration of the cross-section of conductors for which the terminals, if any, are suitable.  
Symbol: relevant value(s) in mm<sup>2</sup> followed by a small square ... □.

6.3 Marking shall be durable and legible.

*Compliance is checked by inspection and by trying to remove the marking by rubbing lightly, for 15 s each, with two pieces of cloth, one soaked with water and the other with petroleum spirit.*

*The marking shall be legible after the test.*

Note.- The petroleum spirit used should consist of a solvent hexane with a content of aromatics of maximum 0.1 volume percentage, a kauri-butanol value of 29, an initial boiling-point of approximately 65 °C, a dry-point of approximately 69 °C and a density of approximately 0.68 g/cm<sup>3</sup>.