



SLOVENSKI STANDARD
SIST EN 50311:2003
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Željezniški promet - Vozni park - D.C. napajane elektronske svetilke za osvetlitev
fluorescentnih svetilk

Railway applications - Rolling stock - D.C. supplied electronic ballasts for lighting
fluorescent lamps

Bahnanwendungen - Schienenfahrzeuge - Gleichstromversorgte elektronische
Vorschaltgeräte für Leuchtstofflampen

Applications ferroviaires - Matériel roulant - Ballasts électroniques à courant continu pour
lampes fluorescentes d'éclairage

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ICS:

29.140.99	Drugi standardi v zvezi z žarnicami	Other standards related to lamps
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EUROPEAN STANDARD

EN 50311

NORME EUROPÉENNE

EUROPÄISCHE NORM

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ICS 29.140.99

English version

**Railway applications –
Rolling stock –
D.C. supplied electronic ballasts
for lighting fluorescent lamps**

Applications ferroviaires –
Matériel roulant –
Ballasts électroniques à courant continu
pour lampes fluorescentes d'éclairage

Bahnanwendungen –
Schienenfahrzeuge –
Gleichstromversorgte elektronische
Vorschaltgeräte für Leuchtstofflampen

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This European Standard was approved by CENELEC on 2002-12-03. 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, Czech Republic, Denmark, Finland, France, Germany, Greece, Hungary, Iceland, Ireland, Italy, Luxembourg, Malta, Netherlands, Norway, Portugal, Slovakia, 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

This European Standard was prepared by SC 9XB, Electromechanical material on board of rolling stock, of the Technical Committee CENELEC TC 9X, Electrical and electronic applications for railways.

The text of the draft was submitted to the formal vote and was approved by CENELEC as EN 50311 on 2002-12-03.

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) 2003-12-01
- latest date by which the national standards conflicting with the EN have to be withdrawn (dow) 2005-12-01

Annexes designated "informative" are given for information only.
In this standard, Annexes A to H are informative.

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Introduction

Environmental conditions and general requirements for electronics for rolling stock are given by the following standards EN 50125-1 and EN 50155.

This standard has been developed specifically for railway applications, to supplement the current standards. It covers general, safety and performance requirements in addition to or in place of those contained in EN 60925 and EN 60924.

NOTE 1 When applied unchanged the clauses of EN 60924 are either referred in this standard or introduced into if they are short texts.

NOTE 2 When a clause of EN 60924 applies with changes or is replaced by more specific requirements generally a short note explains the difference or the reason for that.

NOTE 3 Annex H gives clause by clause correspondence between EN 60924 and this standard.

NOTE 4 EN 60924 will be replaced by EN 61347-1, EN 61347-2-4, EN 61347-2-5, EN 61347-2-6 and EN 61347-2-7.

1 Scope

This standard specifies the performance and constructional requirements, and associated tests, for d.c. supplied electronic ballasts used to supply fluorescent lamps for lighting on railway rolling stock. Its requirements replace those of EN 60925 for all railway rolling stock applications and precise and complete those of EN 60924 for the specific needs of railway rolling stock applications.

This standard applies to electronic ballasts

- supplying pre-heated cathode fluorescent lamps without integrated starters, tubular or single capped, according to EN 60081 and EN 60901 respectively,
- having a single and non adjustable luminous flux level.

It does not apply to electronic ballasts supplying non pre-heated cathode lamps and/or lamps with integrated starters.

2 Normative references

This European Standard incorporates by dated or undated references, provisions from other publications. These normative references are cited at the appropriate place in the text and the publications are listed hereafter. For dated references, subsequent amendments to or revisions of any of these publications apply to this European Standard only when incorporated in it by amendment or revision. For undated references the latest edition of the publication referred to applies (including amendments).

EN 45545-5 ¹⁾		Railway applications - Fire protection on railway vehicles Part 5: Fire safety requirements for electrical equipment including that of trolley buses, track guided buses and magnetic levitation vehicles
EN 50121-3-2	2000	Railway applications - Electromagnetic compatibility Part 3-2: Rolling stock - Apparatus
EN 50124-1		Railway applications - Insulation coordination Part 1: Basic requirements - Clearances and creepage distances for all electrical and electronic equipment
EN 50125-1		Railway applications - Environmental conditions for equipment Part 1: Equipment on board rolling stock

¹⁾ At draft stage.

EN 50153		Railway applications - Rolling stock - Protective provisions relating to electrical hazards
EN 50155	1995 ²⁾	Railway applications - Electronic equipment used on rolling stock
EN 55015	1996 ³⁾	Limits and methods of measurement of radio disturbance characteristics of electrical lighting and similar equipment
EN 60068-1	1994	Environmental testing Part 1: General and guidance (IEC 60068-1:1998 + corr. Oct. 1998 + A1:1992)
EN 60068-2-1	1993	Part 2: Tests - Tests A: Cold (IEC 60068-2-1:1990)
EN 60068-2-2	1994	Part 2: Tests - Tests B: Dry heat (IEC 60068-2-2:1974 + IEC 60068-2-2A:1976)
EN 60068-2-30	1999	Part 2: Tests - Test Db and guidance: Damp heat, cyclic (12 + 12 hour cycle) (IEC 60068-2-30:1980 + A1:1985)
EN 60077-1	2002	Railway applications - Electric equipment for rolling stock Part 1: General service conditions and general rules (IEC 60077-1:1999, modified)
EN 60081		Double-capped fluorescent lamps - Performance specifications (IEC 60081)
EN 60417-1	1999	Graphical symbols for use on equipment - Part 1: Overview and application (IEC 60417-1:1998)
EN 60529	1991	Degrees of protection provided by enclosures (IP code) (IEC 60529:1989)
EN 60901	1996	Single-capped fluorescent lamps - Performance specifications (IEC 60901:1996)
EN 60924	1991 ⁴⁾	D.C. supplied electronic ballasts for tubular fluorescent lamps - General and safety requirements (IEC 60924:1990)
EN 60925	1991	D.C. supplied electronic ballasts for tubular fluorescent lamps - Performance requirements (IEC 60925:1989)
EN 60927	1996	Auxiliaries for lamps - Starting devices (other than glow starters) - Performance requirements (IEC 60927:1996)
EN 61373		Railway applications - Rolling stock equipment - Shock and vibration tests (IEC 61373)
IEC 60050-811		International electrotechnical vocabulary – Chapter 811: Electric traction
ISO 2859-1		Sampling procedures for inspection by attributes - Part 1: Sampling plans indexed by acceptable quality level (AQL) for lot-by-lot inspection

²⁾ A new edition of EN 50155 was published in 2001 (dow = 2003-08-01).

³⁾ A new edition of EN 55015 was published in 2000 (dow = 2003-08-01).

⁴⁾ To be superseded by EN 61347-1:2001, EN 61347-2-4:2001, EN 61347-2-5:2001, EN 61347-2-6:2001 and EN 61347-2-7:2001 (dow = 2003-11-01).

3 Definitions

For the purposes of this standard, the following definitions apply.

NOTE Most of the definitions listed in this clause are taken unchanged from the International Electrotechnical Vocabulary (IEC 60050) or from an European Standard. When this is the case, the reference is given in brackets with the title. Where relevant, the IEC chapter reference is indicated by the first group of 3 figures.

3.1 General terms

3.1.1

nominal value

a suitable approximate quantity value used to designate or identify a characteristic of a component, device or equipment

[IEC 60050 (811-11-01)]

3.1.2

rated value

a quantity value assigned, generally by a manufacturer, for a specified operating condition of a component, device or equipment

[IEC 60050 (811-11-02)]

3.1.3

rated voltage range

range of supply voltage over which the electronic ballast is intended to be operated

[EN 60924]

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3.1.4

rated voltage

voltage declared by the manufacturer to which all the electronic ballast characteristics are related and which is not less than 85 % of the maximum value of the rated voltage range

NOTE The term of « rated voltage » generally used in railway applications has been preferred to « design voltage » defined in EN 60924.

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3.1.5

rated maximum operating temperature of a ballast case (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

[EN 60924]

3.1.6

type test

a test of one or more devices made to a certain design to show that the design meets certain specifications

[IEC 60050 (811-10-04)]

3.1.7

routine test

a test to which each individual device is subjected during or after manufacture to ascertain whether it complies with certain criteria

[IEC 60050 (811-10-05)]

3.1.8

sampling test

a test on a number of devices taken at random from a batch

[IEC 60050 (811-10-06)]

3.1.9

investigation test

a special test of an optional character carried out in order to obtain additional information

[IEC 60050 (811-10-07)]

3.1.10

exposed conductive part

any metallic or other form of conductive material which is not energised except in case of failure, and which may be accessible to touch

[EN 50153]

3.1.11

protective bonding

equipotential connection for protective purpose

[EN 50153]

3.2 Lamps and characteristics

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3.2.1

d.c. supplied electronic ballast (standards.iteh.ai)

electronic ballast

d.c. to a.c. inverter using semi-conductor devices which may include stabilising elements for supplying power to one or more fluorescent lamps

[EN 60924]

NOTE 1 For the need of this standard d.c. supplied electronic ballast includes starter and ballast functions.

NOTE 2 The term of « electronic ballast » is more commonly used than d.c. supplied electronic ballast and will be used in this standard.

3.2.2

started fluorescent lamp

a fluorescent lamp when a current is crossing the space between the two cathodes

3.2.3

lighted fluorescent lamp

a fluorescent lamp emitting light that can be observed visually, uniformly distributed within the space between the two cathodes. A lamp is not lighted when the light emitted is only localised around the cathodes

3.2.4

extinguished fluorescent lamp

a fluorescent lamp emitting no light, when visually observed

NOTE A lamp which emits light around the cathode(s) is not considered as extinguished.

3.2.5

switching cycle

the complete power cycle between extinguished, started, lighted and extinguished states

4 Classification

Electronic ballasts are classified according to parameters determined by the performance required and the mechanical characteristics. These parameters which may be chosen or specified by the purchaser are the following:

- nominal supply voltage;
- number and type (power) of lamps;
- temperature operating class;
- bare or housed ballast;
- size and fixations;
- wiring diagram;
- type of terminals.

Other requirements (e.g. special length cables, burn-in, etc.) shall be defined by the purchaser.

5 Characteristics

5.1 Rated voltages

Rated voltages and rated voltage ranges defined in 7.1.5 of EN 50155 for each of the nominal voltage are given in Table 1.

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Table 1 - Rated voltages and rated voltage ranges according to nominal voltages

Nominal voltages V	Rated voltages V	Rated voltage ranges	
		Minimum V	Maximum V
24	27,6	16,8	32
26,5 ^a	30,5	18,5	35
36	41,4	25,2	48
48	55,2	33,6	64
72	82,8	50,4	96
96	110,4	67,2	128
110	126,5	77	147

NOTE For maintenance of existing rolling stock, other nominal voltage values and widened ranges should be agreed between user and manufacturer.

^a The nominal voltage of 26,5 V is due to special combinations of battery cells in use.

5.2 Overvoltages

Electronic ballasts shall withstand supply overvoltages as defined in EN 50155.

5.3 Type of fluorescent lamps

The manufacturer shall declare the types of lamps for which the ballast is designed and, from these types, those which shall be considered as reference for design and used for testing the ballast.

Informative Annex A lists the most commonly used types of lamps in the railway field.

6 Product information

6.1 Nature of information

The following information, which includes that required by EN 60924 when appropriate, shall be given by the manufacturer.


6.1.1 Identification

- manufacturer's name or trademark;
- mode number or type reference of the manufacturer;
- modification status given by letters or figures (e.g. A, B, C ... to tick off).

6.1.2 Characteristics

- rated voltage and voltage range;
- all possible wiring diagrams showing and identifying the terminals;
- open circuit voltage;
- temperature operating class;

NOTE Temperature operating class has been preferred to rated maximum operating temperature (t_c), (see 8.2.1.5).

- symbol for earthing (protective bonding to the car body) as applicable; graphic symbol  EN 60417-1;
- reference to this standard (instead of category defined in Clause 5 of EN 60924);
- type and nominal value of replaceable fuse, if any.

6.1.3 Other characteristics and information for installation

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

- nominal working frequency lamp operation and its range;
- mechanical characteristics;
- weight;
- installation recommendation such as
 - type of cable and wiring between electronic ballast and lamp,
 - type of terminals, etc.
- rated input withstand voltage;
- supplementary information if required.

6.2 Marking

All relevant information, as detailed in 6.1.1 and 6.1.2, shall be marked on the nameplate, away from the base plate and preferably on top of the electronic ballast. Marking shall be indelible and easily legible. Test of compliance is describe in 7.2 of EN 60924.

The symbol for earthing (protective bonding) shall be marked as close as possible to the earth terminal or one of the bolted fixation, if they are used as such. It may be marked away from the nameplate but shall not be marked on screws or other easily removable parts. It shall be visible after installation.

For traceability, markings shall also contain at least one of the following:

- the manufacturing serial number;
- the manufacturing date;
- the code of manufacturing.

It is preferred that all markings are placed on a nameplate. The nameplate shall not be conductive, if only stuck.

6.3 Instructions for storage, installation operation and maintenance

Only instructions needed to comply with the requirements shall be given by the manufacturer. Any other instructions are at the manufacturer's discretion.

7 Normal service conditions

Where relevant, requirements of Clause 2 and Clause 3 of EN 50155, which refers to EN 50125-1, shall apply with the following additions.

7.1 Temperature

The ambient air temperature surrounding the electronic ballast and the lamp(s) shall be

- either -25 °C to +55 °C for an operating class T1 of EN 50155,
- or -40 °C to +55 °C for an operating class T2 of EN 50155,
- or -25 °C to +70 °C for an operating class T3 of EN 50155,
- or -40 °C to +70 °C for an operating class Tx of EN 50155.

The ambient temperature for storage purposes shall be between -40 °C and +85 °C.

7.2 Other conditions

NOTE Electronic ballasts are always installed inside the vehicle and therefore protected from external conditions such as rain, snow, hail, ice, etc., but they may be subject to the moisture from condensation.

8 Constructional and performance requirements

8.1 Constructional requirements

Construction shall comply with the constructional requirements given in Clause 6 and Clause 7 of EN 50155, where relevant, with the following additions.

8.1.1 Dimensions and wiring diagram

For maintenance purposes and in order to achieve interchangeability with existing units, it is recommended that the electronic ballasts comply with dimensions and wiring diagrams given in one of the informative Annexes B to H, depending on the type of unit.