

INTERNATIONAL STANDARD

NORME INTERNATIONALE

Railway applications – Rolling stock – DC supplied electronic ballasts for
lighting fluorescent lamps

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

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

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INTERNATIONAL ELECTROTECHNICAL COMMISSION

**RAILWAY APPLICATIONS – ROLLING STOCK – DC SUPPLIED
ELECTRONIC BALLASTS FOR LIGHTING FLUORESCENT LAMPS**

FOREWORD

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International Standard IEC 62718 has been prepared by IEC technical committee 9: Electrical equipment and systems for railways.

This standard is based on EN 50311:2003.

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

FDIS	Report on voting
9/1769A/FDIS	9/1798/RVD

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

This publication has been drafted in accordance with the ISO/IEC Directives, Part 2.

The committee has decided that the contents of this publication will remain unchanged until the stability date indicated on the IEC web site under "<http://webstore.iec.ch>" in the data related to the specific publication. At this date, the publication will be

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- withdrawn,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

The contents of the corrigendum of February 2016 have been included in this copy.

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INTRODUCTION

This International 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 IEC 61347-1, IEC 61347-2-3 and 61347-2-7.

NOTE 1 When applied unchanged, the clauses of IEC 61347 are either referred in this standard or introduced into it if they are short texts.

NOTE 2 When a clause of IEC 61347 applies with changes or is replaced by more specific requirements, generally a short note explains the difference or the reason for that.

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RAILWAY APPLICATIONS – ROLLING STOCK – DC SUPPLIED ELECTRONIC BALLASTS FOR LIGHTING FLUORESCENT LAMPS

1 Scope

This International 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 IEC 61347 for all railway rolling stock applications and specify and complete those of IEC 61347 for the specific needs of railway rolling stock applications.

This international standard applies to electronic ballasts

- supplying pre-heated cathode fluorescent lamps without integrated starters, tubular or single capped, according to IEC 60081 and IEC 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

The following documents, in whole or in part, are normatively referenced in this document and are indispensable for its application. For dated references, only the edition cited applies. For undated references, the latest edition of the referenced document (including any amendments) applies.

IEC 60068-2-1:2007, *Environmental testing – Part 2-1: Tests – Test A: Cold*

IEC 60068-2-2:2007, *Environmental testing – Part 2-2: Tests – Test B: Dry heat*

IEC 60068-2-30:2005, *Environmental testing – Part 2-30: Tests – Test Db: Damp heat, cyclic (12h + 12h cycle)*

IEC 60077-1:1999, *Railway applications – Electric equipment for rolling stock – Part 1: General service conditions and general rules*

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

IEC 60529:1989, *Degrees of protection provided by enclosures (IP code)*¹

IEC 60571:2012, *Railway applications – Electronic equipment used on rolling stock*

IEC 60598-1:2008, *Luminaires – Part 1: General requirements and tests*

IEC 60929, *AC and/or DC-supplied electronic control gear for tubular fluorescent lamps – Performance requirements*

IEC 61140, *Protection against electric shock – Common aspects for installation and equipment*

¹ There is a consolidated edition 2.1 (2001), comprising edition 2 (1989) and Amendment 1 (1999).

NOTE IEC 60536 was replaced by IEC 61140.

IEC 61347-1:2007, *Lamp controlgear – Part 1: General and safety requirements*²

IEC 61347-2-3, *Lamp controlgear – Part 2-3: Particular requirements for a.c. and d.c. supplied electronic controlgear for fluorescent lamps*

IEC 61373, *Railway applications – Rolling stock equipment – Shock and vibration tests*

IEC 62236-3-2:2008, *Railway applications – Electromagnetic compatibility – Part 3-2: Rolling stock – Apparatus*

IEC 62497-1, *Railway applications – Insulation coordination – Part 1: Basic requirements – Clearances and creepage distances for all electrical and electronic equipment*

IEC 62498-1, *Railway applications – Environmental conditions for equipment – Part 1: Equipment on board rolling stock*

3 Terms and definitions

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

3.1 General terms

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3.1.1

nominal value

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

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[SOURCE: IEC 60050-811:1991, 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

[SOURCE: IEC 60050-811:1991, 811-11-02]

3.1.3

voltage range

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

[SOURCE: IEC 61347-1:2007, 3.8]

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 1 to entry: The term « rated voltage » generally used in railway applications has been preferred to « design voltage » defined in 3.7 of IEC 61347-1:2007.

² There is a consolidated edition 2.2 (2012), comprising edition 2 (2007), Amendment 1 (2010) and Amendment 2 (2012).

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

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

[SOURCE: IEC 60050-811:1991, 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

[SOURCE: IEC 60050-811:1991, 811-10-05]

3.1.8 sampling test

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

[SOURCE: IEC 60050-811:1991, 811-10-06]

3.1.9 investigation test

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

[SOURCE: IEC 60050-811:1991, 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

[SOURCE: IEC 61991:2000, 3.2.8]

3.1.11 protective bonding

equipotential connection for protective purpose

[SOURCE: IEC 61991:2000, 3.2.17]

3.2 Lamps and characteristics

3.2.1 d.c. supplied electronic ballast 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

Note 1 to entry: For the purposes of this standard d.c. supplied electronic ballast includes starter and ballast functions.

Note 2 to entry: The term « electronic ballast » is more commonly used than d.c. supplied electronic ballast and will be used in this standard.

[SOURCE: IEC 61347-1:2007, 3.2.1]

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 1 to entry: 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; [IEC 62718:2013](#)
- temperature operating class; [iteh.ai/catalog/standards/sist/1ccb626b-dee8-4042-a623-52e5b43f564c/iec-62718-2013](#)
- 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 are defined in IEC 60571.

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

5.2 Overvoltages

Electronic ballasts shall withstand supply overvoltages as defined in IEC 60571.

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.

6 Product information

6.1 Nature of information

6.1.1 General

The following information, which includes that required by IEC 61347-2-3 when appropriate, shall be given by the manufacturer.


6.1.2 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, etc., to tick off).

6.1.3 Characteristics

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

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  IEC 60417-5019(2012-11); (standards.iteh.ai)
- reference to this standard (instead of category defined in Clause 6 of IEC 61347-1:2007);
- type and nominal value of replaceable fuse, if any.

6.1.4 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 of 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 6.1.2 and 6.1.3, 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 described in 7.1 of IEC 61347-1:2007.

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 IEC 60571, which refers to IEC 62498-1, shall apply.

8 Constructional and performance requirements

8.1 Constructional requirements

8.1.1 General

Construction shall comply with the constructional requirements given in IEC 60571, where relevant, with the following additions.

8.1.2 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 G, depending on the type of unit.

Electronic ballasts without housing shall comply with the requirements agreed between the purchaser and the manufacturer.

8.1.3 Terminals

Type of terminals to be provided for the ballasts may be chosen by the purchaser.

Screws, current-carrying parts and mechanical connections shall comply with the requirements of Clause 8 and Clause 17 of IEC 61347-1:2007 when appropriate.

Electronic ballasts without housing shall comply with the requirements agreed between the purchaser and the manufacturer.

8.1.4 Provisions for repair

Unless the electronic ballast unit is the agreed lowest replaceable unit for repairing, electronic ballast shall be designed such that all necessary access for diagnosis and repair is possible without damage or undue deterioration to the components or wiring.

The enclosure shall provide the necessary protection against the environmental influences. It shall be possible to dismantle and repair or replace the components.

8.1.5 Clearance and creepage distances

Clearance and creepage distances shall comply with IEC 62497-1 considering

- pollution degree PD1 for housed printed circuit board and PD2 for external parts,
- overvoltage category OV2.

The values shall not be lower than those required by Clause 16 of IEC 61347-1:2007.

8.1.6 Protection

In order to maintain operability of the lighting equipment, the electronic ballast shall isolate itself from the circuit in case of an internal short-circuit and may include, for example

- either a calibrated fuse fitted as a replaceable component,
- or three printed tracks used as fuses which can be changed over during repair; then they shall not be used to protect against incorrect connection of polarity (see 8.2.2.2).

The protection calibration shall be, in case of short-circuit, such that the peak current value is limited to 20 times the continuous current I_r at the rated voltage.

The general protection value of the lighting circuit, chosen by the customer, should be at least equal to 25 times the current absorbed by one electronic ballast.

8.1.7 Inrush current

The peak inrush current which may occur at the time of switch-on, measured in specified conditions of low impedance source, shall be less than 20 times the continuous current I_r of the electronic ballast supplied at the rated voltage. Before 1,5 ms, the current shall be at its permanent value.

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A more restrictive limit of inrush current may be specified by the customer.

8.2 Performance requirements

8.2.1 Electronic ballast parameters in accordance with lamps characteristics

8.2.1.1 General

All requirements given hereinafter are only applicable for appropriate type(s) of lamp(s) for which the electronic ballast is designed, and the characteristics which comply with the requirements of their relevant standard.

8.2.1.2 Current wave form supplied to lamps

The current wave form supplied to the lamps shall be such that the electronic ballast complies with the electromagnetic compatibility requirements (see 8.2.3.4). In any case the ratio between the peak value and the r.m.s value shall not exceed 1,7.

NOTE In Japan, a crest factor of 2,1 maximum is permitted, when additional cathode heating is applied.

8.2.1.3 Luminous flux – Luminance

At the ambient air temperature of $22\text{ °C} \pm 5\text{ K}$, the lamp supplied by the electronic ballast at the rated voltage shall emit a luminous flux at least equal to those emitted by the same lamp supplied by any 50 Hz or 60 Hz a.c. reference ballast as defined in IEC 61347-1, the voltage of which being set to obtain the nominal power in the lamp.