



# SLOVENSKI STANDARD SIST EN 60077-1:2003

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Railway applications - Electric equipment for rolling stock -- Part 1: General service conditions and general rules

Bahnanwendungen - Elektrische Betriebsmittel auf Bahnfahrzeugen -- Teil 1: Allgemeine Betriebsbedingungen und allgemeine Regeln

Applications ferroviaires - Equipements électriques du matériel roulant -- Partie 1: Conditions générales de service et règles générales

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EUROPEAN STANDARD

**EN 60077-1**

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May 2002

ICS 29.280

English version

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

Applications ferroviaires -  
Equipements électriques  
du matériel roulant  
Partie 1: Conditions générales  
de service et règles générales  
(CEI 60077-1:1999, modifiée)

Bahnanwendungen -  
Elektrische Betriebsmittel auf  
Bahnfahrzeuge  
Teil 1: Allgemeine Betriebsbedingungen  
und allgemeine Regeln  
(IEC 60077-1:1999, modifiziert)

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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.

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# 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 the International Standard IEC 60077-1:1999, prepared by IEC TC 9, Electric railway equipment, together with the common modifications prepared by SC 9XB, Electromechanical material on board of rolling stock, of Technical Committee CENELEC TC 9X, Electrical and electronic applications for railways, was submitted to the Unique Acceptance Procedure and was approved by CENELEC as EN 60077-1 on 2002-03-01.

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) 2003-03-01
- latest date by which the national standards conflicting with the EN have to be withdrawn (dow) 2005-03-01

In this European Standard the common modifications to the International Standard are indicated by a vertical line in the left margin of the text.

Subclauses, tables and figures which are additional to those in IEC 60077-1 are prefixed "Z".

Annexes designated "normative" are part of the body of the standard.

Annexes designated "informative" are given for information only.

In this standard, annex ZA is normative and annex A is informative.

Annex ZA has been added by CENELEC.

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## Contents

Introduction.....	6
1 Scope.....	7
2 Normative references.....	7
3 Definitions .....	7
3.1 General.....	7
3.2 Circuits.....	8
3.3 Components .....	8
3.4 Test categories .....	8
3.5 Void.....	8
3.6 Characteristic quantities .....	9
4 Classification.....	9
5 Characteristics of the utilization category (see also annex A).....	10
5.1 Rated voltages.....	10
5.1.1 General.....	10
5.1.2 Rated operational voltage ( $U_e$ ).....	10
5.1.3 Rated insulation voltage ( $U_{Nm}$ ).....	10
5.1.4 Rated power frequency withstand voltage ( $U_{50}$ ) .....	11
5.1.5 Rated impulse voltage.....	11
5.2 Rated voltages for equipment.....	11
5.2.1 Supply from contact lines.....	11
5.2.2 Supply from a transformer .....	11
5.2.3 Supply from an independently driven generator/alternator or converter	11
5.2.4 Supply from a float charged battery .....	11
5.2.5 Supply from a battery.....	12
5.3 Rated currents for equipment .....	12
5.3.1 Rated operational current ( $I_e$ ).....	12
5.3.2 Rated short-time withstand current ( $I_{cw}$ ).....	12
5.4 Rated operational frequency.....	12
5.5 Rated air pressure .....	12
6 Product information.....	12
6.1 Nature of information .....	12
6.2 Marking.....	13
6.3 Instructions for storage, installation, operation and maintenance.....	13

7	Normal service conditions .....	13
7.1	Environmental conditions.....	13
7.2	Exposure to pollution .....	14
7.3	Exposure to overvoltages .....	14
8	Constructional and performance requirements .....	14
8.1	Constructional requirements.....	14
8.1.1	Electrical risks .....	14
8.1.2	Batteries.....	14
8.1.3	Electromagnetic compatibility (EMC).....	15
8.1.4	Fire protection .....	15
8.1.5	Other risks.....	15
8.2	Performance requirements .....	15
8.2.1	Operating conditions .....	15
8.2.2	Temperature rise.....	17
8.2.3	Operation following inactivity .....	19
8.2.4	Electromagnetic compatibility (EMC).....	21
8.2.5	Acoustic noise emission.....	21
8.2.6	Dielectric properties .....	21
8.2.7	Switching overvoltages.....	22
8.2.8	Operational performance.....	22
8.2.9	Ability to withstand vibration and shock .....	22
9	Tests .....	22
9.1	Kinds of tests .....	22
9.1.1	General .....	22
9.1.2	Type tests .....	23
9.1.3	Routine test.....	23
9.1.4	Sampling tests .....	24
9.1.5	Investigatory type tests .....	24
9.1.6	General test conditions .....	24
9.2	Verification of constructional requirements.....	24
9.2.1	General .....	24
9.2.2	Type tests .....	24
9.2.3	Routine tests .....	25
9.3	Verification of performance requirements.....	25
9.3.1	Operating limits .....	25
9.3.2	Temperature rise (Type test) .....	26
9.3.3	Dielectric properties .....	28
9.3.4	Operational performance capability .....	31

9.3.5	Vibration and shock .....	33
9.3.6	Electromagnetic compatibility .....	33
9.3.7	Acoustic noise emission.....	33
9.3.8	Climatic influence.....	34
Annex A (informative)	Coordination between definitions .....	35
Annex ZA (normative)	Normative references to international publications with their corresponding European publications.....	37
Figures		
Figure A.1	.....	36
Figure A.2	.....	36
Tables		
Table 1	Temperature rise limits for insulating materials.....	19
Table 2	Temperature rise limits of terminals .....	20
Table 3	Temperature rise limits of accessible parts .....	21
Table 4	Dielectric tests on single pieces of equipment .....	30
Table 5	Dielectric tests for equipment connected to a.c. contact line .....	31

[SIST EN 60077-1:2003](https://standards.iteh.ai/catalog/standards/sist/d90debd5-3157-4851-92b9-8099ec9e80ec/sist-en-60077-1-2003)

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## Introduction

Although this European Standard specifies the general service conditions and general rules for electric equipment for rolling stock, further special details of certain types of traction equipment may be given in other European standards. In particular, product standards give further details. The product standards which are part of the EN 60077 series are:

IEC 60077: Railway applications – Electric equipment for rolling stock:

- Part 2: Electrotechnical components - General rules,
- Part 3: Electrotechnical components - Rules for d.c. circuit-breakers,
- Part 4: Electrotechnical components - Rules for a.c. circuit-breakers,
- Part 5: Electrotechnical components - Rules for HV fuses.

Although all circuits of power or control electronic equipments connected to battery or line voltages and all circuits comprising switchgear or controlgear are covered by this standard, internal circuits of these may be subject to special requirements covered by relevant product standards.

For electric equipment for rolling stock which conforms to an appropriate European Standard, including items of industrial equipment, this standard, plus the relevant railway equipment product standard where appropriate, specifies only those additional requirements to ensure satisfactory operation on rolling stock.

This document has used IEC 60077-1 as its base, and its form and structure has been modified to take account of already existing European Standards covering related subjects.

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## 1 Scope

This European Standard specifies the general service conditions and requirements for all electric equipment installed in power circuits, auxiliary circuits and control circuits etc. on rolling stock.

NOTE 1 Certain of these rules may, after agreement between user and manufacturer, be used for electrical equipment installed on other vehicles such as mine locomotives, trolley-buses etc.

The purpose of this standard is to harmonize as far as practicable all rules and requirements of a general nature applicable to electric equipment for rolling stock. This is in order to obtain uniformity of requirements and tests throughout the corresponding range of equipment to avoid the need for testing to different standards.

This general standard is to be read in conjunction with the relevant equipment standard hereafter referred to as "the relevant product standard" or "product standard".

NOTE 2 In the event of there being a difference in requirements between the basic standard and a product standard produced by the Technical Committee TC 9X, the product standard requirements are to take precedence.

For a general rule to apply to a specific product standard, it is to be explicitly referred to in the latter, by quoting the relevant clauses of this standard e.g. see 7.7 of EN 60077-1.

A specific product standard may not require, and hence may omit, a general rule (as being not applicable), or it may add to it (if deemed inadequate in the particular case), but it may not deviate from it, unless there is a substantial technical justification.

All requirements relating to

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- the construction, <https://standards.iteh.ai/catalog/standards/sist/d90debd5-3157-4851-92b9-8099e9e80ee/sist-en-60077-1-2003>
- the performance and the associated tests which can be considered as general,

have therefore been gathered in this standard together with specific subjects of wide interest and application, for example temperature rise, dielectric properties, etc.

## 2 Normative references

NOTE Normative references to international publications are listed in Annex ZA (normative).

## 3 Definitions (see also Annex A)

For the purpose of this European Standard, the following definitions apply.

### 3.1 General

#### 3.1.1

##### rolling stock

a general term covering all vehicles with or without motors [IEV 811-02-01]

#### 3.1.2

##### vehicle

a general term denoting any single item of rolling stock, eg a locomotive, a coach or a wagon [IEV 811-02-02]

## 3.2 Circuits

### 3.2.1

#### **power circuit**

a circuit carrying the current of the machines and equipment, such as the converters and traction motor, which transmit the traction output [IEV 811-25-03]

### 3.2.2

#### **main circuit**

all the conductive parts of an equipment carrying the current for the function to which this equipment has been applied

### 3.2.3

#### **auxiliary circuit**

all the conductive parts of an equipment, which are intended to be included in a circuit other than the main circuit and the control circuit, used during the closing operation or opening operation, or both, of the equipment [IEV 441-15-04, mod.]

### 3.2.4

#### **control circuit**

all the conductive parts other than the main circuit of an equipment which are used for actuating the functioning of the equipment [IEV 441-15-03, mod.]

## 3.3 Components

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### 3.3.1

#### **battery**

an electrochemical system capable of storing in chemical form the electric energy received and which can give it back by reconversion [IEV 811-20-01]

## 3.4 Test categories

### 3.4.1

#### **type test**

a test of one or more devices made to a certain design to show that the design meets certain specifications [IEV 811-10-04]

### 3.4.2

#### **routine test**

a test to which each individual device is subjected during or after manufacture to ascertain whether it complies with certain criteria [IEV 811-10-05]

### 3.4.3

#### **sampling test**

a test on a number of devices taken at random from a batch [IEV 811-10-06]

### 3.4.4

#### **investigatory type test**

a special test of an optional character carried out in order to obtain additional information [IEV 811-10-07, mod.]

### 3.5 Void

### 3.6 Characteristic quantities

#### 3.6.1

##### **limiting value**

in a specification, the greatest or smallest admissible value of one of the quantities [IEV 151-04-02]

#### 3.6.2

##### **nominal value**

a suitable approximate quantity value used to designate or identify a characteristic of a component, device or equipment [IEV 811-11-01]

NOTE In this standard, the term nominal is only used as common practice to designate contact line and battery voltage circuits.

#### 3.6.3

##### **rated value**

a quantity value assigned, generally by a manufacturer, to a component, device or equipment and to which operation and performance characteristics are referred [IEV 811-11-02]

#### 3.6.4

##### **void**

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#### 3.6.Z1

##### **switching overvoltage**

the transient overvoltage at any point of the system due to a specific switching operation or fault

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#### 3.6.5

##### **equivalent continuous duty**

the duty of electrical equipment on rolling stock is generally characterized by values of current, voltage, compressed air pressure etc. which vary with time. The various parts of the equipment are defined by a complete statement of the conditions to be fulfilled. However, it is sometimes sufficient to specify an equivalent duty which corresponds from the point of view of either electrical, mechanical or thermal stresses to the service considered, and is known as being equivalent to the actual service. It is the equivalent continuous duty to which the relevant tests are referred

#### 3.6.6

##### **equivalent continuous rated current**

the current corresponding to the equivalent continuous duty

#### 3.6.7

##### **equivalent continuous rated voltage**

the voltage corresponding to the equivalent continuous duty

### 4 Classification

This clause is intended to list the characteristics of an equipment on which information may be given by the manufacturer and which may not necessarily have to be verified by testing. This clause is not mandatory in product standards which should however leave space for it in order to list, where necessary classification criteria.

## 5 Characteristics of the utilization category (see also Annex A)

The utilization category of equipment defines the intended application and shall be specified in the relevant product standard; it is characterized by one or more of the following parameters:

- current(s);
- voltage(s);
- frequency(ies);
- air pressure(s).

NOTE This list is not exhaustive and can include other parameters as applicable.

### 5.1 Rated voltages

#### 5.1.1 General

The term rated voltage can generally be related to both the input and output values of equipment. The quantity is assigned generally by the manufacturer.

#### 5.1.2 Rated operational voltage ( $U_e$ )

The rated operational voltage of an equipment is a value of voltage which combined with a rated operational current and rated operational frequency, determines the application of the equipment and to which the relevant tests and the utilization categories are referred.

#### 5.1.3 Rated insulation voltage ( $U_{Nm}$ )

An r.m.s. withstand voltage value assigned by the manufacturer to the equipment or a part of it, characterising the specified permanent (over five minutes) withstand capability of its insulation.

The rated insulation voltage is the value of voltage to which dielectric tests are referred. Values are given in EN 50124-1 (Table A.1 and Annex D).

In no case shall the maximum value of the rated operational voltage exceed that of the rated insulation voltage.

The rated insulation voltage is at least equal to the highest r.m.s. value of the voltage existing between electrodes and across the creepage distance for an extended period of time, e.g. for a contact line, greater than 5 min. Non repetitive transient voltages are neglected.

When the voltage is not purely of sinusoidal or of continuous form, the r.m.s. or mean value alone cannot be considered to prescribe the rated insulation voltage of the components.

In the absence of any knowledge of the influence on dielectric strength of

- the ratio between the duration of periodic impulses and their occurrence,
- the number of impulses during each occurrence,
- the voltage rate of rise of the impulse ( $du/dt$ ),

it is recommended that this voltage be considered as being equal to the real r.m.s. value, but not less than 70 % of the peak value.

#### 5.1.4 Rated power frequency withstand voltage ( $U_{50}$ )

The rated power frequency withstand voltage is the r.m.s. value of the 50 Hz sinusoidal voltage which does not cause an insulation failure under specified conditions of test.

#### 5.1.5 Rated impulse voltage

The rated impulse voltage is the highest peak value of an impulse voltage, of prescribed form and polarity, the equipment is capable of withstanding without failure.

The rated impulse voltage of the equipment shall be equal to or higher than the values stated for the transient overvoltages occurring in the circuit in which the equipment is fitted.

### 5.2 Rated voltages for equipment

#### 5.2.1 Supply from contact lines

The rated operational voltage  $U_e$  for an equipment supplied from the contact line is the greatest permanent value of the contact line voltage ( $U_{max1}$ ) as defined in EN 50163.

#### 5.2.2 Supply from a transformer

The rated operational voltage  $U_e$  for equipment supplied from a winding of a transformer is equal to the r.m.s. voltage at the terminals of the winding when the transformer primary is supplied at the rated operational voltage. If a second transformer is interposed between the above-mentioned transformer and the equipment, the rated operational voltage  $U_e$  is equal to the above-mentioned rated operational voltage multiplied by the transformer ratio of the second transformer.

SIST EN 60077-1:2003

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#### 5.2.3 Supply from an independently driven generator/alternator or converter

The rated operational voltage  $U_e$  for equipment supplied from an independently driven generator/alternator or converter is the greatest limiting voltage of this supply.

#### 5.2.4 Supply from a float charged battery

The nominal voltage  $U_n$  which is only used to designate a battery circuit and the equipment so supplied shall be selected from amongst the following preferred values:

24 V      48 V      72 V      96 V      110 V

NOTE 1 These nominal voltage values are given only as standardizing values for the design of equipment. They should not be considered as the off-load battery voltage which will be determined as functions of the type of battery, the number of cells and the operating conditions.

NOTE 2 A battery of 26,5 V nominal voltage may be used to supply equipment of 24 V nominal voltage. In this case, compliance with the requirements should be defined by agreement between manufacturer and user.

The rated operational voltage  $U_e$  for the equipment supplied from a float charged battery is equal to  $1,15 U_n$ .

NOTE 3 This value is considered as being the greatest limiting value of the charging device in normal operation.