SLOVENSKI STANDARD
oSIST prEN IEC 62590-1:2024

01-april-2024

Železniške naprave - Elektronski elektroenergetski pretvornik za fiksne postroje - 1. del: Splošne zahteve

Railway applications - Electronic power converters for fixed installations - Part 1: General requirements

Applications ferroviaires - Convertisseurs électroniques de puissance pour installations fixes - Partie 1: Exigences générales

Ta slovenski standard je istoveten z: **prEN IEC 62590-1:2024**

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45.040	Materiali in deli za železniško tehniko	Materials and components for railway engineering

oSIST prEN IEC 62590-1:2024 **en**

9/3043/CDV

COMMITTEE DRAFT FOR VOTE (CDV)

PROJECT NUMBER:	
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DATE OF CIRCULATION:	CLOSING DATE FOR VOTING:
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IEC TC 9 : ELECTRICAL EQUIPMENT AND SYSTEMS FOR RAILWAYS

SECRETARIAT:	SECRETARY:
France	Mr Denis MIGLIANICO
OF INTEREST TO THE FOLLOWING COMMITTEES:	PROPOSED HORIZONTAL STANDARD: ☐
	Other TC/SCs are requested to indicate their interest, if any, in this CDV to the secretary.

FUNCTIONS CONCERNED:

☐ EMC ☐ ENVIRONMENT ☐ QUALITY ASSURANCE ☐ SAFETY

☒ SUBMITTED FOR CENELEC PARALLEL VOTING	☐ NOT SUBMITTED FOR CENELEC PARALLEL VOTING
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TITLE:

Railway applications - Electronic power converters for fixed installations - Part 1: General requirements

PROPOSED STABILITY DATE: 2027

NOTE FROM TC/SC OFFICERS:

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INTERNATIONAL ELECTROTECHNICAL COMMISSION

RAILWAY APPLICATIONS – ELECTRONIC POWER CONVERTERS FOR FIXED INSTALLATIONS
Part 1 GENERAL REQUIREMENTS

FOREWORD

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International Standard IEC 62590 has been prepared by IEC technical committee 9: Electrical equipment and systems for railways.

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

FDIS	Report on voting
9/XXXX/FDIS	9/XXXX/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.

This document in conjunction with the other parts of IEC 62590 will replace the IEC 62589 and the former IEC 62590.

a) Split into common requirements and special requirements for different converters
b) Interface Model for the different Systems connected
c) Split into circuits with their requirements like insulation coordination
d) Energy efficiency addressed
e) More to be added

INTRODUCTION

Semiconductor converters for traction power supply differ from other converters for industrial use due to special electrical service conditions and due to the large range of load variation and the peculiar characteristics of the load.

For these reasons IEC 60146 series does not fully cover the requirements of railway applications and the decision was taken to have a specific series of standards for this use.

Specific requirements for the design of converter transformers for fixed installations of railway applications are specified in IEC 62695.

This document defines common vocabulary and requirements. Other parts will cover different applications.

IEC 62590-1 Railway applications – Electronic Power Converters for fixed installations– Part 1: General requirements

IEC 62590-2-1 Railway applications - Electronic Power Converters for fixed installations – Part 2-1: DC traction applications - Uncontrolled rectifiers

IEC 62590-2-2 Railway applications – Electronic Power Converters for fixed installations – Part 2-2: DC traction applications – Controlled converters

IEC 62590-3-1 Railway applications – Electronic Power Converters for fixed installations – Part 3-1: AC traction applications – Electronic power compensators

IEC 62590-3-2 Railway applications – Electronic Power Converters for fixed installations – Part 3-2: AC traction applications – Static frequency converters

RAILWAY APPLICATIONS – ELECTRONIC POWER CONVERTERS FOR FIXED INSTALLATIONS Part 1 GENERAL REQUIREMENTS

1 Scope

This document specifies the common requirements and definitions for all power converter applications in fixed installations for power supply of railway systems.

This document applies to fixed installations of following electric traction systems:

- railway networks,
- metropolitan transport networks including metros, tramways, trolleybuses and fully automated transport systems, magnetic levitated transport systems, electric road systems.

This document applies to AC/DC converters, DC converters and AC converters. Converters for improvement of power quality and for energy saving are also included.

Converters connected to electric traction systems feeding 3AC, 1AC or DC systems for auxiliary purpose are not in the scope of this document but some aspects such as insulation coordination and railway specific conditions may be referred to.

2 Normative references

The following documents are referred to in the text in such a way that some or all of their content constitutes requirements of this document. For dated references, only the edition cited applies. For undated references, the latest edition of the referenced document (including any amendments) applies.

IEC 60146-1-1, *Semiconductor converters - General requirements and line commutated converters - Part 1-1: Specification of basic requirements*

IEC TR 60146-1-2, *Semiconductor converters – General requirements and line commutated converters – Part 1-2: Application guide*

IEC 60146-2, *Semiconductor converters - Part 2: Self-commutated semiconductor converters including direct d.c. converters*

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

IEC 60850, *Railway applications - Supply voltages of traction systems*

IEC 61000-3 (all parts), *Electromagnetic compatibility (EMC), Limits*

IEC 61936-1, *Power installations exceeding 1 kV AC and 1,5 kV DC - Part 1: AC*

IEC 61992-7-1, *Railway applications - Fixed installations - DC switchgear - Part 7-1: Measurement, control and protection devices for specific use in d.c. traction systems - Application guide*

IEC 62236-5, *Railway applications - Electromagnetic compatibility - Part 5: Emission and immunity of fixed power supply installations and apparatus / Applies in conjunction with IEC 62236-1 (2008-12)*

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

IEC 62498-2, *Railway applications - Environmental conditions for equipment - Part 2: Fixed electrical installations*

IEC 62313, *Railway applications - Power supply and rolling stock - Technical criteria for the coordination between power supply (substation) and rolling stock*

IEC 62695, *Railway applications - Fixed installations - Traction transformers*

3 Terms and definitionsFor the purposes of this document, the following terms and definitions apply.

ISO and IEC maintain terminology databases for use in standardization at the following addresses:

• ISO Online browsing platform: available at https://www.iso.org/obp

• IEC Electropedia: available at https://www.electropedia.org

3.1 Electrical Circuits

3.1.1
electric traction power supply system
railway electric distribution network used to provide energy for rolling stock

Note 1 to entry: The system includes

- contact line systems,
- return circuit of electric traction power supply systems,
- electric installations in power plants and substations, which are utilized solely for generation and distribution of power directly to the contact line,
- electric installations of switching stations.

[SOURCE: IEC 60050-811:2017 811-36-21, modified – power supply inserted, Note 1 to entry exclusion of the points “running rails of non-electrified lines in the vicinity of, and conductively connected to the running rails of an electric traction power supply system”, and “electrical installations which are supplied from contact lines either directly or via a transformer”]

3.1.2
DC traction power supply system
electric traction power supply system operating with DC

3.1.3
single-phase traction power supply system
1AC traction power supply system
electric traction power supply system operating with single phase AC

Note 1 to entry: Autotransformer systems are having a phase-shift of 180 electrical degrees between their poles. Therefore, they are included in 1AC traction power supply systems from the electrical point of view.

3.1.4
three phase traction power supply system
3AC traction power supply system
electric traction power supply system operating with three phases AC

3.1.5
electric power network
particular installations, substations, lines or cables for the transmission and distribution of electricity

Note 1 to entry: The boundaries of the different parts of this network are defined by appropriate criteria, such as geographical situation, ownership, voltage, etc.

Note 2 to entry: In this document, this term is used to indicate a power supply network from which an electric traction power supply system receives electric power.

Note 3 to entry: A lot of synonyms are used indicating special properties like distribution network, transmission network, national grid, upstream network, or others. The term electric power network is chosen because it is the most general.

[SOURCE: IEC 60050-601:1985 601-01-02, modified – The notes 2 and 3 to entry have been added]

3.1.6
three-phase power network
3AC power network
electric power network operating with three phases AC

3.1.7
electronic power converter
operative unit for electronic power conversion, comprising one or more electronic valve devices, transformers and filters if necessary and auxiliaries if any

Note 1 to entry: In English, the two spellings "convertor" and "converter" are in use, and both are correct. In this document, the spelling "converter" is used in order to avoid duplications.

[SOURCE: IEC 60050-551:1998 551-12-01, modified – figure not used, and parentheses removed]

3.1.8
AC/DC converter
electronic converter for rectification or inversion or both

[SOURCE: IEC 60050-551:1998 551-12-02]

3.1.9
rectifier
AC/DC converter for rectification

Note 1 to entry: For purpose of this standard the rectifier includes the transformer. This is contradictory to common language in which rectifier means only the valve device assembly and does not include the transformer.

[SOURCE: IEC 60050-551:1998: 551-12-07, modified - Note 1 to entry added]

3.1.10
inverter
AC/DC converter for inversion

Note 1 to entry: – In English, the two spellings “invertor” and “inverter” are in use, and both are correct. In this document the spelling “inverter” is used in order to avoid duplications.

[SOURCE: IEC 60050-551:1998 551-12-10]

3.1.11
reversible converter
converter in which the direction of the power flow is reversible

[SOURCE: IEC 60050-551:1998 551-12-37]

3.1.12
AC converter
converter for AC conversion

[SOURCE: IEC 60050-551:1998 551-12-17]

3.1.13
DC converter
converter for DC conversion

[SOURCE: IEC 60050-551:1998 551-12-27]

3.2 Semiconductor devices and combinations

3.2.1
control equipment
entirety of devices and programs and, in a broader sense, all instructions and programs used for the task of controlling

Note 1 to entry: Control equipment also comprises the process control station and instructions include operating manuals.

[SOURCE: IEC 60050-351:2013 351-56-24]

3.2.2
valve device assembly
electrically and mechanically combined assembly of electronic valve devices or stacks, complete with all its connections and auxiliaries in its own mechanical structure.

[SOURCE: IEC 60050-551:1998 551-14-13, modified – note omitted and adaption to current ISO directive]

3.2.3
commutation
in an electronic power converter transfer of current from one conducting arm to the next to conduct in sequence, without interruption of the current, both arms conducting simultaneously during a finite time interval

[SOURCE: IEC 60050-551:1998 551-16-01, modified – the word “the” between converter and transfer removed]

3.2.4
line-commutation
line-commutated
external commutation where the commutating voltage is supplied by the line

Note 1 to entry: The term line refers to the line to line voltage of the feeding 3AC power network.

[SOURCE: IEC 60050-551:1998 551-16-12, modified – note 1 to entry added, “an” at the beginning removed]

3.2.5
self-commutation
self-commutated
commutation where the commutating voltage is supplied by components within the converter or the electronic switch

[Source: IEC 60050-551: 1998 551-16-15, modified – “a” at the beginning removed]

3.3 Rated values

3.3.1
nominal voltage <for converter>
voltage by which a converter is designated

Note 1 to entry: Standardized values are given in IEC 60850

3.3.2
rated continuous current
***I*r**
value of current which a converter is capable of carrying continuously without damage, for specified service conditions

Note 1 to entry: The rated continuous current does not include overloads. If a specified overload is needed a derating is necessary and a duty class is applied.

3.3.3
rated current <for converter>
***I*N**
current value the converter and parts of it is designed for in conjunction with a duty class

Note 1 to entry: A converter and parts of it can have several pairs of rated current and duty class.

Note 2 to entry: The rated current for DC applications is always a mean value. The rated current for AC applications is always an RMS value.

3.3.4
duty class
tabled representation of current capability and test values for standard design converters in terms of current values and duration selected to represent a characteristic group of practical applications

Note 1 to entry: The current values are expressed in per unit of the rated current I_N.

3.3.5
load cycle
conventional representation of the current demand to a converter

Note 1 to entry: The current values are expressed in A or in per unit of the rated current.

Note 2 to entry: The load cycle shows the repetitive variation of the loads with time and, hence, the overloads and underloads the converter is expected to carry.

[SOURCE: IEC 60050-811:2017, 811-28-38, modified, Note 1 to entry is modified, Note 2 to entry modified]