SLOVENSKI STANDARD
oSIST prEN IEC 62590-2-2:2024

01-oktober-2024

Železniške naprave - Elektronski elektroenergetski pretvornik za fiksne postroje - 2-2. del: Enosmerno napajanje - Krmiljeni konverter

Railway applications - Electronic power converters for fixed installations - Part 2-2: DC Applications - Controlled converters

Applications ferroviaires - Convertisseurs électroniques de puissance pour installations fixes - Partie 2-2 : Applications de traction en courant continu - Convertisseurs commandés

Ta slovenski standard je istoveten z: **prEN IEC 62590-2-2:2024**

ICS:

29.200	Usmerniki. Pretvorniki. Stabilizirano električno napajanje	Rectifiers. Convertors. Stabilized power supply
45.040	Materiali in deli za železniško tehniko	Materials and components for railway engineering

oSIST prEN IEC 62590-2-2:2024 **en**

9/3105/CDV

COMMITTEE DRAFT FOR VOTE (CDV)

PROJECT NUMBER: **IEC 62590-2-2 ED1**	
DATE OF CIRCULATION: **2024-08-09**	CLOSING DATE FOR VOTING: **2024-11-01**
SUPERSEDES DOCUMENTS: **9/2942/CD, 9/2983A/CC**	

IEC TC 9 : ELECTRICAL EQUIPMENT AND SYSTEMS FOR RAILWAYS

SECRETARIAT: France	SECRETARY: 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 2-2: DC Applications - Controlled converters

PROPOSED STABILITY DATE: 2027

NOTE FROM TC/SC OFFICERS:

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INTERNATIONAL ELECTROTECHNICAL COMMISSION

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RAILWAY APPLICATIONS –ELECTRONIC POWER CONVERTERS FOR FIXED INSTALLATIONS
Part 2-2: DC TRACTION APPLICATIONS – CONTROLLED CONVERTERS

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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
9/1387/FDIS	9/1411/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.

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

137 • reconfirmed,
138 • withdrawn,
139 • replaced by a revised edition, or
140 • amended.

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INTRODUCTION

Semiconductor converters for traction power supply differ from other electronic power 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.

Controlled rectifiers are supplying a DC traction network from a three-phase power network using controllable semiconductor valves. Inverters enable to recuperate power from a DC traction network into a three-phase power network. Reversible converters combine the functions of a rectifier and an inverter.

DC converters are self-commutated converters for connecting of the DC traction network with other DC networks or storage devices.

The series of IEC 62590 consists of the following parts:

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 2-2: DC TRACTION APPLICATIONS - CONTROLLED CONVERTERS

1 Scope

This document describes functions and working principles, specifies requirements, interfaces, and test methods for controlled converters for DC electric traction power supply systems:

- AC/DC converters
  - Rectifiers
  - Inverters
  - Combinations
- DC converters

Purpose of the converters can be a power connection to other power networks or energy storages.

Common characteristic of this equipment is the possibility to influence the power flow in the DC electric traction power supply system. The converters can be:

- Line commutated
- Self-commutated

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.

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

IEC 62590-1, *Railway applications – Fixed installations – Electronic power converters – Part 1: General requirements*

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

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

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 60071-1, *Insulation co-ordination - Part 1: Definitions, principles and rules*

3 Terms and definitions

For the purposes of this document, the terms and definitions given in 62590-1 and the following apply.

ISO and IEC maintain terminological 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 Semiconductor devices and combinations

3.1.1
rated current <of a controlled converter>
rated load <of a controlled converter>
I_{Nd}

value of a DC current a controlled converter is designed for, referring to the DC electric traction power supply system

Note 1 to entry: All rated values of the components are derived from this value

Note 2 to entry: A converter can have a rated continuous load and rated loads in conjunction with a duty classes.

3.1.2
rated DC power <of a controlled converter>
rated current multiplied with nominal DC voltage

Note 1 to entry: This value refers to DC electric traction power supply system side.

3.1.3
reversible converter
converter in which the direction of the power flow is reversible

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

3.2 Line commutated converters

3.2.1
trigger delay angle
time expressed in angular measure by which the trigger pulse is delayed with respect to the reference instant in the case of phase control

Note 1 to entry: With line, machine or load commutated converters the reference instant is the zero crossing instant of the commutating voltage. With AC controllers it is the zero crossing instant of the supply voltage. For AC controllers with inductive loads the trigger delay angle is the sum of the phase shift and the current delay angle.

[SOURCE: IEC 60050-551:1998, 551-16-33, modified – “the” removed]

3.2.2
commutation failure
failure to commutate the current from a conducting arm to the succeeding arm

[SOURCE: IEC 60050-551:1998, 551-16-59, modified – “a” removed]

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244 ## 3.3 Self-commutated converters

245 **3.3.1**
246 **switched valve device**
247 controllable valve device which can be turned on and off by a control signal

248 [SOURCE: IEC 60050-551:1998 551-14-08, modified – “a” removed, may replaced with can]

249 **3.3.2**
250 **free-wheeling diode**
251 diode parallel to a switched valve device in reverse direction fulfilling the purpose of a free-
252 wheeling arm

253 **3.3.3**
254 **boost converter**
255 direct DC converter providing an output voltage which is higher than the input voltage

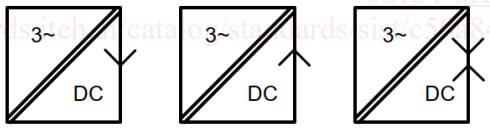
256 [SOURCE: IEC 60050-551:1998, 551-12-32]

257 **3.3.4**
258 **buck converter**
259 direct DC converter providing an output voltage which is lower than the input voltage

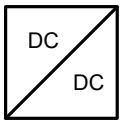
260 [SOURCE: IEC 60050-551:1998, 551-12-33]

261 ## 3.4 Symbols

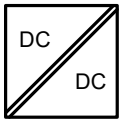
262 The following symbols are used in this document:



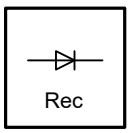
263 AC/DC converter with optional indication of power
264 flow direction



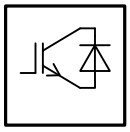
265 DC converter



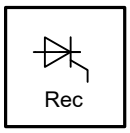
266 DC converter with isolation between 2 electrical circuits



267 diode rectifier (valve)assembly



268 IGBT converter(valve device) assembly



thyristor converter (valve) assembly

NOTE: The symbols for the DC converters are taken from IEC 60617 while the other symbols are adapted to the need of this document.

3.5 Principal letter symbols

U_a test voltage for power frequency withstand voltage test

U_{v0} no load transformer voltage, valve side

U_{dN} nominal DC voltage

3.6 Abbreviated Terms

ESS energy storage system, system that can take electrical energy from the DC power supply network, store the energy, and supply the energy back to the DC electric power supply network when necessary

ESU energy storage unit, device to which electrical energy is charged and from which electrical energy is discharged

ACTB apparatus to connect ESU to DC bus

IGBT insulated gate bipolar transistor

AC alternating current

3AC three phase AC

DC direct current

4 System Configurations

4.1 General

Main purpose of controlled electronic power converters for DC electric traction power supply systems is to influence the power flow. The power can flow from a 3AC power network to the DC electric traction system or vice versa. This can also be a bidirectional power flow to energy storages or other equipment using regenerated power.

This type of equipment has a control including processing of measured values.

4.2 Purpose of converters

4.2.1 AC/DC converters

4.2.1.1 General

The AC/DC converters connect a 3AC power network with a DC electric traction power supply system as shown in Figure 1. Requirements from both networks shall be considered.