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

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

Bahnanwendungen – Leistungselektronische Stromrichter für ortsfeste Anlagen – Teil 2-2: Gleichstrom Anwendungen – Gesteuerte Stromumrichter

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

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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

SIST EN IEC 62590-2-2:2026

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EUROPEAN STANDARD
NORME EUROPÉENNE
EUROPÄISCHE NORM

EN IEC 62590-2-2

August 2026

ICS 29.280

English Version

**Railway applications - Electronic power converters for fixed installations - Part 2-2: DC Traction applications - Controlled converters
(IEC 62590-2-2:2026)**

Applications ferroviaires - Convertisseurs électroniques de puissance pour installations fixes - Partie 2-2: Applications de traction en courant continu - convertisseurs commandés
(IEC 62590-2-2:2026)

Bahnanwendungen - Leistungselektronische Stromrichter für ortsfeste Anlagen - Teil 2-2: Anwendungen der Gleichstrom-Zugförderung - Gesteuerte Stromumrichter
(IEC 62590-2-2:2026)

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EN IEC 62590-2-2:2026 (E)**European foreword**

The text of document 9/3312/FDIS, future edition 1 of IEC 62590-2-2, prepared by TC 9 "Electrical equipment and systems for railways" was submitted to the IEC-CENELEC parallel vote and approved by CENELEC as EN IEC 62590-2-2:2026.

The following dates are fixed:

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In the official version, for Bibliography, the following notes have to be added for the standard indicated:

IEC 60146-1-1:2024	NOTE Approved as EN IEC 60146-1-1:2024 (not modified)
IEC 60146-2	NOTE Approved as EN 60146-2
IEC 62590-2-1:2025	NOTE Approved as EN IEC 62590-2-1:2026 (not modified)
IEC 62924	NOTE Approved as EN 62924

Annex ZA

(normative)

Normative references to international publications with their corresponding European publications

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.

NOTE 1 Where an International Publication has been modified by common modifications, indicated by (mod), the relevant EN/HD applies.

NOTE 2 Up-to-date information on the latest versions of the European Standards listed in this annex is available here: www.cenelec.eu.

<u>Publication</u>	<u>Year</u>	<u>Title</u>	<u>EN/HD</u>	<u>Year</u>
IEC 60071-1	-	Insulation co-ordination - Part 1: Definitions, principles and rules	EN IEC 60071-1	-
IEC 60529	-	Degrees of protection provided by enclosures (IP Code)	EN 60529	-
IEC 62590-1	2025	Railway applications - Electronic power converters for fixed installations - Part 1: General requirements	EN IEC 62590-1	2025
IEC 62695	-	Railway applications - Fixed installations - Traction transformers	-	-
IEC 62236-5	-	Railway applications - Electromagnetic compatibility - Part 5: Emission and immunity of fixed power supply installations and apparatus	-	-

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IEC 62590-2-2

Edition 1.0 2026-06

INTERNATIONAL STANDARD

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

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INTERNATIONAL ELECTROTECHNICAL COMMISSION

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

FOREWORD

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IEC 62590-2-2 has been prepared by IEC technical committee 9: Electrical equipment and systems for railways. It is an International Standard.

This first edition partially cancels and replaces IEC 62589 and IEC 62590. This edition constitutes a technical revision.

The text of this International Standard is based on the following documents:

Draft	Report on voting
9/3312/FDIS	9/3328/RVD

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

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The language used for the development of this International Standard is English.

This document was drafted in accordance with ISO/IEC Directives, Part 2, and developed in accordance with ISO/IEC Directives, Part 1 and ISO/IEC Directives, IEC Supplement, available at www.iec.ch/members_experts/refdocs. The main document types developed by IEC are described in greater detail at www.iec.ch/publications.

A list of all parts in the IEC 62590 series, published under the general title *Railway applications - Electronic power converters for fixed installations*, can be found on the IEC website.

The committee has decided that the contents of this document will remain unchanged until the stability date indicated on the IEC website under webstore.iec.ch in the data related to the specific document. At this date, the document will be

- reconfirmed,
- withdrawn, or
- revised.

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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 particular characteristics of the load.

Controlled rectifiers supply a DC traction network from a three-phase power network using controllable semiconductor valves. Inverters allow the recuperation of 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 the DC traction network to other DC networks or storage devices.

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1 Scope

This part of IEC 62590 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.

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

The 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 the following electric traction systems:

- railway networks,
- metropolitan transport networks including metros, tramways, trolleybuses and fully automated transport systems, magnetic levitated transport systems, and 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 60071-1, *Insulation co-ordination - Part 1: Definitions, principles and rules*

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

IEC 62590-1:2025, *Railway applications - Electronic power converters for fixed installations - Part 1: General requirements*

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

IEC 62236-5, *Railway applications - Electromagnetic compatibility - Part 5: Emission and immunity of fixed power supply installations and apparatus*

3 Terms, definitions, symbols, and abbreviated terms

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

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

- IEC Electropedia: available at <https://www.electropedia.org/>
- ISO Online browsing platform: available at <https://www.iso.org/obp>

3.1 Terms and definitions

3.1.1 Semiconductor devices and combinations

3.1.1.1 rated current

I_{Nd}

<of a controlled converter> 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 current and rated currents in conjunction with a duty class.

3.1.1.2 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.

3.1.1.3 reversible converter

converter in which the direction of the power flow is reversible

[SOURCE IEC 60050-551:1998, 551-12-37, modified – Figure 1 has been omitted.]

3.1.2 Line-commutated converters

3.1.2.1 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 – In the definition, “the” has been deleted.]

3.1.2.2 commutation failure

failure to commute the current from a conducting arm to the succeeding arm

[SOURCE: IEC 60050-551:1998, 551-16-59, modified – In the definition, “a” has been deleted]

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3.1.3 Self-commutated converters**3.1.3.1****switched valve device**

controllable valve device which can be turned on and off by a control signal

[SOURCE: IEC 60050-551:1998, 551-14-08, modified – In the definition, “a” has been deleted, “may” has been replaced with “can”.]

3.1.3.2**free-wheeling diode**

diode parallel to a switched valve device in reverse direction fulfilling the purpose of a free-wheeling arm

3.1.3.3**buck converter**

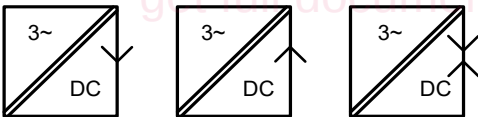
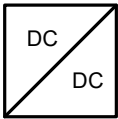
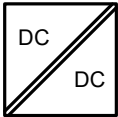
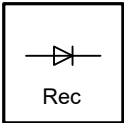
direct DC converter providing an output voltage which is lower than the input voltage

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

3.2 Graphical symbols

Table 1 lists all symbols used in this document. These symbols are based on symbols registered in IEC 60617.

Table 1 – Graphical symbols

Symbol	Explanation
	AC/DC converter with optional indication of power flow direction SOURCE: IEC 60617-S00213:2001-07; IEC 60617-S01402:2001-09; IEC 60617-S01403:2001-09 IEC 60617-S00099:2001-07; IEC 60617-S00100:2001-07; IEC 60617-S01407:2001-10.
	DC converter SOURCE: IEC 60617-S00213:2001-07; IEC 60617-S01402:2001-09.
	DC converter with isolation between 2 electrical circuits SOURCE: IEC 60617-S00213:2001-07; IEC 60617-S01402:2001-09; IEC 60617-S01407:2001-10
	diode rectifier (valve device) assembly SOURCE: IEC 60617-S00641:2001-07;