

English version

**Railway applications -
Onboard auxiliary power converter systems**

Applications ferroviaires -
Convertisseur auxiliaire pour les véhicules
ferroviaires

Bahnanwendungen -
Hilfsbetriebeumrichtersystem
für Schienenfahrzeuge

This Technical Specification was approved by CENELEC on 2010-03-26.

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CENELEC

European Committee for Electrotechnical Standardization
Comité Européen de Normalisation Electrotechnique
Europäisches Komitee für Elektrotechnische Normung

Management Centre: Avenue Marnix 17, B - 1000 Brussels

Foreword

This Technical Specification was prepared by SC 9XB, Electromechanical material on board rolling stock, of Technical Committee CENELEC TC 9X, Electrical and electronic applications for railways.

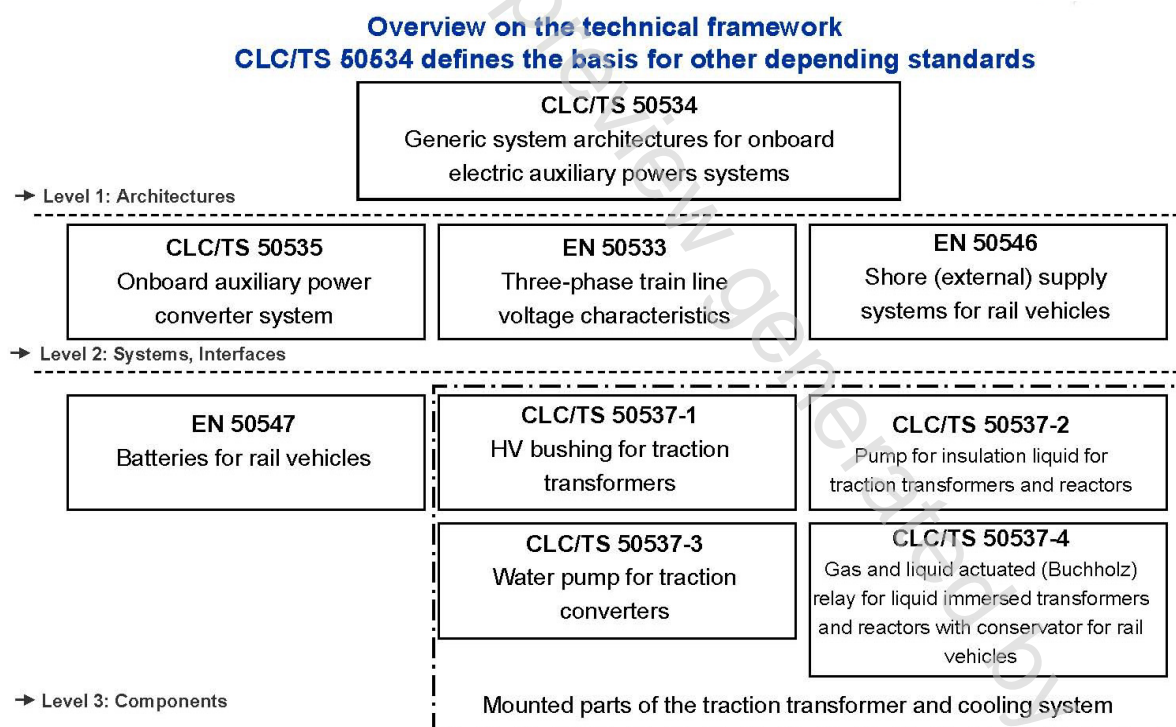
It was circulated for voting in accordance with the Internal Regulations, Part 2, Subclause 11.3.3.3 and was accepted as a CENELEC Technical Specification on 2010-03-26.

Attention is drawn to the possibility that some of the elements of this document may be the subject of patent rights. CEN and CENELEC shall not be held responsible for identifying any or all such patent rights.

The following date was fixed:

- latest date by which the existence of the CLC/TS
has to be announced at national level (doa) 2010-06-26

This standardization project was derived from the EU-funded Research project MODTRAIN (MODPOWER). It is part of a series of standards, referring to each other. The hierarchy of the standards is intended to be as follows:



Annexes defined to be normative belong to the content of this Technical Specification; annexes defined as informative are used only for information.

Annex A is normative and Annexes B, C and D are informative.

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Introduction

This Technical Specification defines characteristics and interfaces for electric onboard auxiliary power converter systems. This includes auxiliary power converters and battery chargers. The following European Standards and Technical Specifications refer to the defined target energy supply system in this present Technical Specification:

CLC/TS 50534	Railway applications – Generic system architectures for onboard electric auxiliary power systems <i>(Characteristics and interface of generic system architectures for onboard electric auxiliary power systems)</i>
EN 50533 ¹⁾	Railway applications – Three-phase train line voltage characteristics <i>(Characteristics of the voltage system used for auxiliary power supply)</i>
EN 50546 ²⁾	Railway applications – Shore (external) supply system for rail vehicles <i>(Interface description of the shore supply including protection functions)</i>
EN 50547 ²⁾	Railway applications – Batteries for rail vehicles <i>(Standardized batteries for rail vehicles and charging characteristics)</i>
CLC/TS 50537 (series)	Railway applications – Mounted parts of the traction transformer and cooling system <i>(Standardized products used in conjunction with traction transformers and traction cooling systems)</i>

CLC/TS 50535 has to be understood as a basic document of a set of hierarchically structured specifications as illustrated in the foreword. This set of European Standards and Technical Specifications defines a consistent technical framework beginning on an architectural level, followed by standards belonging to important system interfaces and concluding this hierarchy with Technical Specifications on component level. The diagram in the foreword points up these different system integration levels and shows the dependencies between the documents.

One main objective of this standardisation initiative is to simplify the cooperation between concerned railway stakeholders in charge of operating onboard auxiliary power systems, designing systems able to cope with the operational requirements and stakeholders manufacturing auxiliary power system components, which provide the requested services.

¹⁾ At draft stage.

²⁾ Under development.

1 Scope

This Technical Specification defines the classification of the electric onboard auxiliary power converter system and defines its basic characteristics and interfaces. The onboard auxiliary power converter system consists of the auxiliary converter and the battery charger function.

This Technical Specification applies to locomotive hauled passenger trains and electric multiple units with distributed power as well as trains with concentrated power heads. Relevant train configuration and concerned energy supply subsystems are defined in CLC/TS 50534. This Technical Specification provides a technical base for implementation of onboard auxiliary power systems on different trains.

The objective of this specification is to define the required interfaces and characteristics of the onboard auxiliary power converter system in order to enable further standardisation:

- interface between onboard auxiliary power converter system and onboard traction power system;
- interface of the onboard auxiliary power supply system to the low voltage grid and to a shore supply (stationary workshop supply or external supply);
- interfaces of the auxiliary converter and the battery charger;
- characteristics of the onboard auxiliary power converter system.

The electrical operational behaviour is defined by requirements. Requirements for the type tests as well as the routine test are referred.

2 Normative references

The following referenced documents are indispensable for the application 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.

TS 45545 (series)	2009 ³⁾	<i>Railway applications – Fire protection on railway vehicles</i>
CLC/TS 50534		<i>Railway applications – Generic system architectures for onboard electric auxiliary power systems</i>
EN 12663	2000	<i>Railway applications – Structural requirements of railway vehicle bodies</i>
EN 50121-3-2	2000 ⁴⁾	<i>Railway applications – Electromagnetic compatibility – Part 3-2: Rolling stock – Apparatus</i>
EN 50125-1	1999	<i>Railway applications – Environmental conditions for equipment – Part 1: Equipment on board rolling stock</i>
EN 50163 + A1	2004 2007	<i>Railway applications – Supply voltages of traction systems</i>
EN 50238		<i>Railway applications – Compatibility between rolling stock and train detection systems</i>

³⁾ Part 5 is of CENELEC origin – Other parts are from CEN.

⁴⁾ Superseded by EN 50121-3-2:2006, *Railway applications – Electromagnetic compatibility – Part 3-2: Rolling stock – Apparatus*.

EN 50272-2	2001	<i>Safety requirements for secondary batteries and battery installations – Part 2: Stationary batteries</i>
EN 50388		<i>Railway applications – Power supply and rolling stock – Technical criteria for the coordination between power supply (substation) and rolling stock to achieve interoperability</i>
EN 50533	5)	<i>Railway applications – Three-phase train line voltage characteristics</i>
EN 50547	6)	<i>Railway applications – Batteries for rail vehicles</i>
EN 60077-1	2002	<i>Railway applications – Electric equipment for rolling stock – Part 1: General service conditions and general rules (IEC 60077-1:1999, mod.)</i>
EN 60529		<i>Degrees of protection provided by enclosures (IP Code) (IEC 60529)</i>
EN 60721-3-5		<i>Classification of environmental conditions – Part 3: Classification of groups of environmental parameters and their severities – Section 5: Ground vehicle installations (IEC 60721-3-5)</i>
EN 61287-1	2006	<i>Railway applications – Power converters installed on board rolling stock – Part 1: Characteristics and test methods (IEC 61287-1:2005)</i>
EN 61373	1999	<i>Railway applications – Rolling stock equipment – Shock and vibration tests (IEC 61373)</i>
IEC 60038	2002 ⁷⁾	<i>IEC standard voltages</i>

3 Terms, definitions and abbreviations

3.1 Terms and definitions

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

3.1.1

customer

buyer of the train, where the auxiliary power converter system is integrated

3.1.2

operator

responsible party for providing the transportation service

3.1.3

system integrator

responsible party for integrating the auxiliary power converter products or units into the overall system. This includes electrical and mechanical integration aspects

3.1.4

manufacturer

the manufacturer designs and manufactures the on-board auxiliary power converter products

⁵⁾ At draft stage.

⁶⁾ Under development.

⁷⁾ IEC 60038:2002 (Ed. 6.2) combines IEC 60038:1983 (Ed. 6) + A1:1994 + A2:1997. It is superseded by IEC 60038:2009 (Ed. 7), *IEC standard voltages*.

3.1.5

system architectures

system architectures describe basic designs of systems consisting of several subsystems and functions. The description is precise in concern of essential interfaces and functions. The internal design of the subsystems itself is not part of the architecture description

3.1.6

Train Control and Monitoring System (TCMS)

overriding control and monitoring system on the train

3.1.7

active front-end converters

converters with turn-off semiconductor, which can actively control their current waveforms and their power factor

3.1.8

onboard Auxiliary Power Converter System (APCS)

onboard subsystem, which transforms converts electric energy for traction auxiliary loads and comfort loads

3.1.9

Auxiliary Converter Unit (ACU)

part of the onboard auxiliary power converter system and includes multiple power conversion functionality to supply the auxiliary converter intermediate circuit voltage (Aux DC-Link) and the 3 AC train lines

3.1.10

auxiliary converter intermediate circuit voltage

DC Link Auxiliary (DCLA)

intermediate circuit voltage in a voltage range of typically 600 V to 800 V used in auxiliary converters e.g. with 3 AC FF output

3.1.11

auxiliary power interface on coaches for international rulement

RIC interface

defines the input voltage for auxiliary converter on coaches for international rulement. The voltage and frequencies for RIC are defined in Annex B

3.1.12

auxiliary winding interface on main traction transformer (TRAF)

TRAF interface derived from the auxiliary winding on the main traction transformer

3.1.13

traction converter intermediate circuit voltage

DC Link Traction (DCLT)

intermediate circuit voltage of the traction converter

3.1.14

power train line

electric energy distribution facility (e.g. bus bars, cables) used for the distribution of auxiliary power in a train and coaches

3.1.15

3 AC FF train line voltage systems

voltage systems applied in conjunction with 3 AC power train lines using fixed frequency and consequently fixed voltage amplitude (3 AC 400 V 50 Hz or 3 AC 480 V 60 Hz in accordance with IEC 60038)