SVENSK STANDARD SS-EN 62864-1

Fastställd	Utgåva	Sida	Ansvarig kommitté
2017-05-17	1	1 (1+61)	SEK TK 9

Järnvägstillämpningar – Rullande materiel – Kraftförsörjning med energilagringssystem ombord – Del 1: Seriehybridsystem

Railway applications – Rolling stock – Power supply with onboard energy storage system – Part 1: Series hybrid system

Som svensk standard gäller europastandarden EN 62864-1:2016. Den svenska standarden innehåller den officiella engelska språkversionen av EN 62864-1:2016.

Nationellt förord

Europastandarden EN 62864-1:2016

består av:

– **europastandardens ikraftsättningsdokument,** utarbetat inom CENELEC

– **IEC 62864-1, First edition, 2016 - Railway applications - Rolling stock - Power supply with onboard energy storage system - Part 1: Series hybrid system**

utarbetad inom International Electrotechnical Commission, IEC.

ICS 45.060.00

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EUROPEAN STANDARD

NORME EUROPÉENNE

EUROPÄISCHE NORM

EN 62864-1

November 2016

ICS 45.060

English Version

Railway applications - Rolling stock - Power supply with onboard energy storage system - Part 1: Series hybrid system (IEC 62864-1:2016)

Applications ferroviaires - Matériel roulant - Alimentation équipée d'un système embarqué de stockage de l'énergie - Partie 1: Système hybride série (IEC 62864-1:2016)

Bahnanwendungen - Schienenfahrzeuge - Stromversorgung durch Energiespeichersysteme auf Schienenfahrzeugen - Teil 1: Serienhybridsystem (IEC 62864-1:2016)

This European Standard was approved by CENELEC on 2016-07-20. CENELEC members are bound to comply with the CEN/CENELEC Internal Regulations which stipulate the conditions for giving this European Standard the status of a national standard without any alteration.

Up-to-date lists and bibliographical references concerning such national standards may be obtained on application to the CEN-CENELEC Management Centre or to any CENELEC member.

This European Standard exists in three official versions (English, French, German). A version in any other language made by translation under the responsibility of a CENELEC member into its own language and notified to the CEN-CENELEC Management Centre has the same status as the official versions.

CENELEC members are the national electrotechnical committees of Austria, Belgium, Bulgaria, Croatia, Cyprus, the Czech Republic, Denmark, Estonia, Finland, Former Yugoslav Republic of Macedonia, France, Germany, Greece, Hungary, Iceland, Ireland, Italy, Latvia, Lithuania, Luxembourg, Malta, the Netherlands, Norway, Poland, Portugal, Romania, Slovakia, Slovenia, Spain, Sweden, Switzerland, Turkey and the United Kingdom.

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

CEN-CENELEC Management Centre: Avenue Marnix 17, B-1000 Brussels

Ref. No. EN 62864-1:2016 E

SEK Svensk Elstandard

European foreword

The text of document 9/2154/FDIS, future edition 1 of IEC 62864-1, prepared by IEC/TC 9 "Electrical equipment and systems for railways" was submitted to the IEC-CENELEC parallel vote and approved by CENELEC as EN 62864-1:2016.

The following dates are fixed:

• latest date by which the document has to be implemented at national level by publication of an identical national standard or by endorsement	(dop)	2017-05-04
• latest date by which the national standards conflicting with the document have to be withdrawn	(dow)	2019-11-04

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

Endorsement notice

The text of the International Standard IEC 62864-1:2016 was approved by CENELEC as a European Standard without any modification.

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

IEC 60076-10	NOTE	Harmonized as EN 60076-10.
IEC 60077-1	NOTE	Harmonized as EN 60077-1.
IEC 60216-5	NOTE	Harmonized as EN 60216-5.
IEC 60254-1:2005	NOTE	Harmonized as EN 60254-1:2005 (not modified).
IEC 60254-2:2008	NOTE	Harmonized as EN 60254-2:2008 (not modified).
IEC 60310	NOTE	Harmonized as EN 60310.
IEC 60721-3-5	NOTE	Harmonized as EN 60721-3-5.
IEC 62619	NOTE	Harmonized as EN 62619 [1)].
IEC 62620	NOTE	Harmonized as EN 62620.
IEC 62928	NOTE	Harmonized as EN 62928 [1)].

[1)] At draft stage.

Annex ZA
(normative)

Normative references to international publications with their corresponding European publications

The following documents, in whole or in part, are normatively referenced in this document and are indispensable for its application. For dated references, only the edition cited applies. For undated references, the latest edition of the referenced document (including any amendments) applies.

NOTE 1 When 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

Publication	Year	Title	EN/HD	Year
IEC 60050-811	-	International Electrotechnical Vocabulary (IEV) - Chapter 811: Electric traction	-	-
IEC 60349-2	-	Electric traction - Rotating electrical machines for rail and road vehicles - Part 2: Electronic converter-fed alternating current motors	EN 60349-2	-
IEC 60349-4	-	Electric traction - Rotating electrical machines for rail and road vehicles - Part 4: Permanent magnet synchronous electrical machines connected to an electronic converter	EN 60349-4	-
IEC 60529	-	Degrees of protection provided by enclosures (IP Code)	EN 60529	-
IEC 61133	2016	Railway applications - Rolling stock - Testing of rolling stock on completion of construction and before entry into service	-	-
IEC 61287-1	-	Railway applications - Power converters installed on board rolling stock - Part 1: Characteristics and test methods	EN 61287-1	-
IEC 61373	-	Railway applications - Rolling stock equipment - Shock and vibration tests	EN 61373	-
IEC 61377	2016	Railway applications - Rolling stock - Combined test method for traction systems	EN 61377	2016
IEC 61881-3	-	Railway applications - Rolling stock equipment - Capacitors for power electronics - Part 3: Electric double-layer capacitors	EN 61881-3	-
IEC 61991	-	Railway applications - Rolling stock - Protective provisions against electrical hazards	-	-
IEC 62262	-	Degrees of protection provided by enclosures for electrical equipment against external mechanical impacts (IK code)	EN 62262	-
IEC 62498-1	2010	Railway applications - Environmental conditions for equipment - Part 1: Equipment on board rolling stock	-	-

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INTERNATIONAL ELECTROTECHNICAL COMMISSION

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RAILWAY APPLICATIONS – ROLLING STOCK – POWER SUPPLY WITH ONBOARD ENERGY STORAGE SYSTEM –

Part 1: Series hybrid system

FOREWORD

1) The International Electrotechnical Commission (IEC) is a worldwide organization for standardization comprising all national electrotechnical committees (IEC National Committees). The object of IEC is to promote international co-operation on all questions concerning standardization in the electrical and electronic fields. To this end and in addition to other activities, IEC publishes International Standards, Technical Specifications, Technical Reports, Publicly Available Specifications (PAS) and Guides (hereafter referred to as "IEC Publication(s)"). Their preparation is entrusted to technical committees; any IEC National Committee interested in the subject dealt with may participate in this preparatory work. International, governmental and non-governmental organizations liaising with the IEC also participate in this preparation. IEC collaborates closely with the International Organization for Standardization (ISO) in accordance with conditions determined by agreement between the two organizations.
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International Standard IEC 62864-1 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
9/2154/FDIS	9/2176/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.

A list of all parts in the IEC 62864 series, published under the general title *Railway applications – Rolling stock – Power supply with onboard energy storage system*, can be found on the IEC website.

The committee has decided that the contents of this publication will remain unchanged until the stability date indicated on the IEC website 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.

INTRODUCTION

There is an increasing need for efficient use of energy due to the decrease in fossil fuel based energy sources as well as the need to reduce emissions (e.g. CO_2, NO_x, PM, etc.) that contribute to global climate change. The railway system, which is essentially an energy-efficient transportation system, should also meet these requirements. In addition to saving energy, it is necessary to achieve a reduction in peak power, voltage stabilization and the ability to run without collecting power in scenic reserve areas, and the running capability to safely reach the next station in the event of electrical power failure onboard or at power supply system. To address these issues, hybrid systems are appearing in railway vehicles. These hybrid system vehicles are equipped with an energy storage system that allows effective use of regenerative energy. A hybrid system should be required to improve energy efficiency by actively controlling the power flow among the engine or power supply system, auxiliary power supply, traction and braking system, the energy storage system, etc.

The purpose of introducing hybrid systems includes:

- reducing energy consumption;
- improving vehicle performance;
- providing the ability to run with energy stored onboard; and
- improving environmental characteristics.

The aim of this standard is to establish the basic system configuration for series hybrid systems (electrically connected) and the tests to verify effective use of energy, as well as to provide railway operators and manufacturers with guidelines for manufacturing and evaluating hybrid systems.

The hierarchy of relevant standards related to hybrid systems are summarized in Figure 1. The standards listed in Figure 1 are not exhaustive.

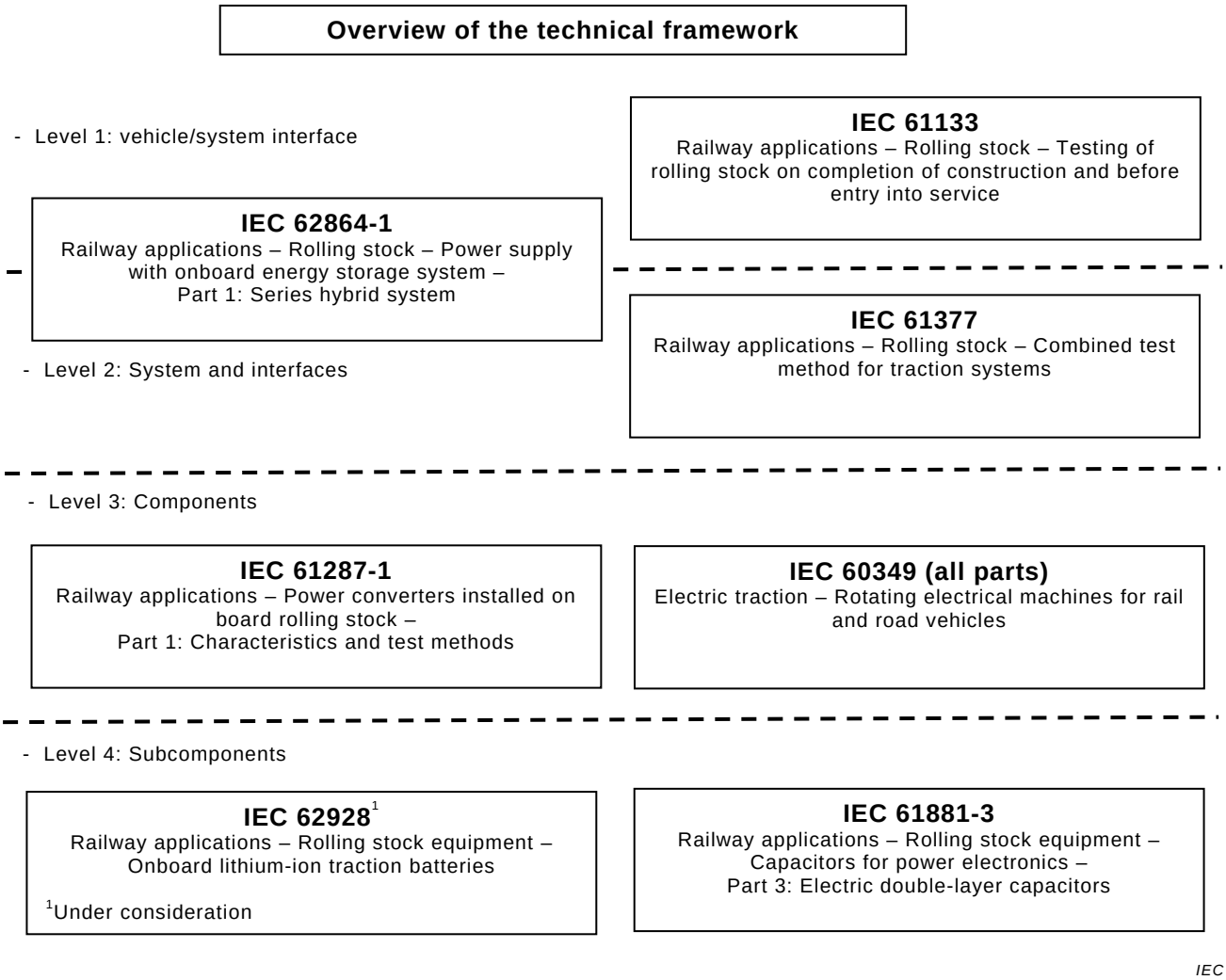

Figure 1 – Hierarchy of standards related to IEC 62864-1

In this standard, the hybrid system has the following four levels of hierarchy:

a) vehicle/system interface (level 1);
b) systems and interfaces (level 2);
c) components (level 3); and
d) subcomponents (level 4).

Detailed descriptions of the levels are described in 7.1.

E.g. subcomponent (level 4) is a cell, module etc. (for a battery, a subcomponent is defined in IEC 62620).

RAILWAY APPLICATIONS – ROLLING STOCK – POWER SUPPLY WITH ONBOARD ENERGY STORAGE SYSTEM –

Part 1: Series hybrid system

1 Scope

This part of IEC 62864 applies to series hybrid systems (electrically connected) with onboard energy storage (hereinafter referred as hybrid system).

A hybrid system has two (or more) power sources including energy storage system (ESS) on board to achieve the following features by combining converter and motors and performing energy management control:

- improving energy and fuel efficiency, improving acceleration characteristics, increasing running distance and uninterrupted running in the event of the loss of the primary power source (PPS), by using an ESS in addition to the primary power source under conditions where the power and capacity of the power source including regenerative power are limited, thus alleviating those limitations;
- reducing fuel consumption, reducing emissions (e.g. CO_2, NO_x, PM, etc.);
- reducing environmental impact (e.g. visible obstruction, noise, etc.).

By extension, systems that have only onboard ESS, without other PPSs, is also considered in this standard.

This standard intends to specify the following basic requirements, characteristics, functions and test methods for hybrid systems:

- energy management to control the power flow among primary power source, energy storage system and power converters;
- energy consumption, energy efficiency and regenerated energy;
- vehicle characteristics achieved by energy storage system;
- test methods of combined test; and
- test methods of completed vehicles based on factory (stationary) and field (running) tests.

NOTE Converter in this standard means combined equipment consisting of one or more converters (e.g. rectifier, inverter, chopper, etc.).

The interfaces between the following power sources are covered:

- external electric power supply system;
- onboard ESSs (including pure onboard energy storage);
- fuel cell, diesel electric generator; and
- other power sources.

As for the combination of inverters and motors, this standard applies to asynchronous motors or synchronous motors that are powered via voltage-source inverters.

Power source systems and combination of inverters and motors are not limited to the listed above, but this standard can also be applied to future systems.

This part of IEC 62864 covers electrically connected systems (series hybrid), and not systems that mechanically transmit the driving force (parallel hybrid).

2 Normative references

The following documents, in whole or in part, are normatively referenced in this document and are indispensable for its application. For dated references, only the edition cited applies. For undated references, the latest edition of the referenced document (including any amendments) applies.

IEC 60050-811*, International Electrotechnical Vocabulary (IEV) – Chapter 811: Electric traction*

IEC 60349-2*, Electric traction – Rotating electrical machines for rail and road vehicles – Part 2: Electronic converter-fed alternating current motors*

IEC 60349-4*, Electric traction – Rotating electrical machines for rail and road vehicles – Part 4: Permanent magnet synchronous electrical machines connected to an electronic converter*

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

IEC 61133:2016, *Railway applications – Rolling stock – Testing of rolling stock on completion of construction and before entry into* service

IEC 61287-1, *Railway applications – Power converters installed on board rolling stock – Part 1: Characteristics and test methods*

IEC 61373, *Railway applications – Rolling stock equipment – Shock and vibration tests*

IEC 61377:2016, *Railway applications – Rolling stock – Combined test method for traction systems*

IEC 61881-3, *Railway applications – Rolling stock equipment – Capacitors for power electronics – Part 3: Electric double-layer capacitors*

IEC 61991, *Railway applications – Rolling stock – Protective provisions against electrical hazards*

IEC 62262, *Degrees of protection provided by enclosures for electrical equipment against external mechanical impacts (IK code)*

IEC 62498-1:2010, *Railway applications – Environmental conditions for equipment – Part 1: Equipment on board rolling stock*