

© Copyright SEK Svensk Elstandard. Reproduction in any form without permission is prohibited.

Järnvägstillämpningar – Specifikation och verifiering av rullande materiels energiförbrukning

Railway Applications –

Rolling Stock –

Specification and verification of energy consumption

Som svensk standard gäller europastandarden EN 50591:2019. Den svenska standarden innehåller den officiella engelska språkversionen av EN 50591:2019.

Nationellt förord

Tidigare fastställd svensk standard SEK TS 50591, utgåva 1, 2016, gäller ej fr o m 2022-08-02.

Standarder underlättar utvecklingen och höjer elsäkerheten

Det finns många fördelar med att ha gemensamma tekniska regler för bl a mätning, säkerhet och provning och för utförande, skötsel och dokumentation av elprodukter och elanläggningar.

Genom att utforma sådana standarder blir säkerhetsfordringar tydliga och utvecklingskostnaderna rimliga samtidigt som marknadens acceptans för produkten eller tjänsten ökar.

Många standarder inom elområdet beskriver tekniska lösningar och metoder som åstadkommer den elsäkerhet som föreskrivs av svenska myndigheter och av EU.

SEK är Sveriges röst i standardiseringsarbetet inom elområdet

SEK Svensk Elstandard svarar för standardiseringen inom elområdet i Sverige och samordnar svensk medverkan i internationell och europeisk standardisering. SEK är en ideell organisation med frivilligt deltagande från svenska myndigheter, företag och organisationer som vill medverka till och påverka utformningen av tekniska regler inom elektrotekniken.

SEK samordnar svenska intressenters medverkan i SEKs tekniska kommittéer och stödjer svenska experters medverkan i internationella och europeiska projekt.

Stora delar av arbetet sker internationellt

Utformningen av standarder sker i allt väsentligt i internationellt och europeiskt samarbete. SEK är svensk nationalkommitté av International Electrotechnical Commission (IEC) och Comité Européen de Normalisation Electrotechnique (CENELEC).

Standardiseringsarbetet inom SEK är organiserat i referensgrupper bestående av ett antal tekniska kommittéer som speglar hur arbetet inom IEC och CENELEC är organiserat.

Arbetet i de tekniska kommittéerna är öppet för alla svenska organisationer, företag, institutioner, myndigheter och statliga verk. Den årliga avgiften för deltagandet och intäkter från försäljning finansierar SEKs standardiseringsverksamhet och medlemsavgift till IEC och CENELEC.

Var med och påverka!

Den som deltar i SEKs tekniska kommittéarbete har möjlighet att påverka framtida standarder och får tidig tillgång till information och dokumentation om utvecklingen inom sitt teknikområde. Arbetet och kontakterna med kollegor, kunder och konkurrenter kan gynnsamt påverka enskilda företags affärsutveckling och bidrar till deltagarnas egen kompetensutveckling.

Du som vill dra nytta av dessa möjligheter är välkommen att kontakta SEKs kansli för mer information.

SEK Svensk Elstandard

Box 1284
164 29 Kista
Tel 08-444 14 00
www.elstandard.se

English Version

Railway Applications - Rolling Stock - Specification and verification of energy consumption

Applications ferroviaires - Spécification et vérification de la consommation d'énergie pour le matériel roulant ferroviaire

Bahnanwendungen - Fahrzeuge - Spezifikation und Überprüfung des Energieverbrauchs

This European Standard was approved by CENELEC on 2018-12-14. 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, France, Germany, Greece, Hungary, Iceland, Ireland, Italy, Latvia, Lithuania, Luxembourg, Malta, the Netherlands, Norway, Poland, Portugal, Republic of North Macedonia, Romania, Serbia, 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: Rue de la Science 23, B-1040 Brussels

Contents	Page
European foreword.....	5
1 Scope	6
2 Normative references	6
3 Terms, definitions and abbreviations	6
3.1 Terms and definitions	6
3.2 Abbreviations.....	9
4 General.....	9
5 Traction and Auxiliaries (with commercial operation, without HVAC).....	11
5.1 General	11
5.2 Operational requirements.....	11
5.2.1 General.....	11
5.2.2 Train data.....	11
5.2.3 Infrastructure conditions	12
5.2.4 Timetable and driving style	13
5.2.5 Energy supply network characteristics.....	14
5.2.6 Environmental conditions.....	15
5.3 Simulation requirements	15
5.3.1 General.....	15
5.3.2 Timetable	15
5.3.3 Annual energy consumption	15
5.3.4 Documentation.....	15
5.4 Verification	16
5.4.1 General.....	16
5.4.2 Infrastructure conditions	16
5.4.3 Timetable	16
5.4.4 Measurement equipment	17
5.4.5 Test rules	17
5.4.6 Documentation.....	18
5.5 Post processing of test results.....	18
5.5.1 General.....	18
5.5.2 Train data.....	18
5.5.3 Time and driving style	19
5.5.4 Environmental conditions.....	19
5.5.5 Energy supply network characteristics.....	19
6 Traction and Auxiliaries (without commercial operation and in parking mode, without HVAC).....	19
6.1 General	19
6.2 Operational requirements.....	20
6.2.1 General.....	20
6.2.2 Load conditions	20
6.2.3 Auxiliary management.....	20
6.2.4 Comfort functions.....	20
6.2.5 Energy supply network characteristics.....	20
6.2.6 Environmental conditions.....	20
6.3 Simulation requirements	21
6.3.1 General.....	21
6.3.2 Thermal stability	21
6.3.3 Auxiliary conversion losses caused by HVAC supply.....	21

6.3.4	Energy storage systems	21
6.3.5	Annual energy consumption	21
6.3.6	Documentation.....	21
6.4	Verification	21
6.4.1	General.....	21
6.4.2	Comfort functions.....	21
6.4.3	Test preparation.....	22
6.4.4	Environmental conditions.....	22
6.4.5	Measurement equipment	22
6.4.6	Test duration	22
6.4.7	Documentation.....	22
6.5	Post-processing of test results.....	22
7	HVAC.....	22
7.1	General	22
7.2	Methods.....	23
7.2.1	General.....	23
7.2.2	Method I [with climatic chamber / EN 13129:2016].....	23
7.2.3	Method II [without climatic chamber]	23
7.3	Operational requirements.....	23
7.3.1	In-service with commercial operation mode.....	23
7.3.2	In-service without commercial operation mode	25
7.3.3	Parking mode	26
7.3.4	Total annual consumption	26
7.4	Simulation requirements	26
7.4.1	General.....	26
7.4.2	Documentation.....	27
7.5	Verification	27
7.5.1	General.....	27
7.5.2	Measurement equipment	27
7.5.3	Test rules	27
7.5.4	Documentation.....	28
7.6	Post-processing	28
Annex A	(normative) Definition of standard parameters.....	29
A.1	General	29
A.2	Infrastructure characteristics.....	29
A.3	Electric traction system characteristics	30
A.4	In-service with commercial operation mode	31
A.5	In-service without commercial operation mode and in parking mode	32
A.6	Fuel characteristics.....	33
Annex B	(normative) Definition of standard values for service profiles.....	34
B.1	General	34
B.2	Suburban passenger traffic.....	34
B.3	Regional passenger traffic	35
B.4	Intercity passenger traffic.....	37
B.5	High-speed passenger traffic.....	38
B.6	Freight mainline.....	40
B.7	Metro passenger traffic.....	43
Annex C	(normative) Operational Hours of HVAC	45
Annex D	(informative) Application Guide	47
D.1	Objectives for use in procurement projects	47
D.2	Application in Procurement Process	47

Annex ZZ (informative) Relationship between this European standard and the essential requirements of EU Directive 2016/797/EU [2016 OJ L138] aimed to be covered.....	49
Bibliography.....	52

European foreword

This document (EN 50591:2019) has been prepared by CLC/SC 9XB "Electrical, electronic and electromechanical material on board rolling stock, including associated software" with contribution of UNIFE-UIC TECREC 100_001.

The following dates are fixed:

- latest date by which the existence of this document (doa) 2019-11-02 has to be announced at national level
- latest date by which this document has to be (dop) 2020-02-02 implemented at national level by publication of an identical national standard or by endorsement
- latest date by which the national standards (dow) 2022-08-02 conflicting with this document have to be withdrawn

This document supersedes CLC/TS 50591:2013.

The main changes in this edition compared to CLC/TS 50591:2013 are the adoption of existing CLC/TS 50591 enquiry comments, the harmonization with results from the European Lighthouse Project Roll2Rail and the inclusion of an HVAC energy quantification method. Since separate methods for traction and HVAC energy quantification are described, the document structure had to be revised.

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

This document has been prepared under a mandate given to CENELEC by the European Commission and the European Free Trade Association, and supports essential requirements of EU Directive(s).

For the relationship with EU Directive(s) see informative Annex ZZ, which is an integral part of this document.

1 Scope

The purpose of this document is to support rolling stock procurement, especially life cycle cost (LCC) assessment.

This document is applicable to the specification and verification of energy consumption of railway rolling stock. It establishes a criterion for the energy consumption of rolling stock to calculate the total net energy consumed, either at current collector or from the fuel tank, over a predefined service profile, to ensure that the results are directly comparable or representative of the real operation of the train. For this purpose, this document considers the energy consumed and regenerated by the rolling stock. The determination methods covered are the simulation and the measurement.

This document provides the framework that gives guidance on the generation of comparable energy performance values for trains and locomotives on a common basis and thereby supports benchmarking and improvement of the energy efficiency of rail vehicles.

This document does not cover the comparison of energy consumption with other modes of transportation, or even for comparison between diesel and electric traction, covering only the energy consumption of the railway rolling stock itself.

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.

EN 13129:2016, *Railway applications – Air conditioning for main line rolling stock – Comfort parameters and type tests*

EN 15663:2017+A1:2018, *Railway applications – Vehicle reference masses*

EN 50163:2004, *Railway applications – Supply voltages of traction systems*

EN 50388:2012, *Railway Applications – Power supply and rolling stock – Technical criteria for the coordination between power supply (substation) and rolling stock to achieve interoperability*

EN 50463-1:2017, *Railway applications – Energy measurement on board trains – Part 1: General*

EN 50463-2:2017, *Railway applications – Energy measurement on board trains – Part 2: Energy measuring*

UIC leaflet 552, *Electrical power supply for trains – Standard technical characteristics of the train line* (10th edition, June 2005)