RAUDTEEALASED RAKENDUSED. PÜSIPAIGALDISED. ELEKTERVEOSEADMETE PROJEKTEERIMISEL KASUTATAVATE SIMULATSIOONIVAHENDITE HINDAMISNÕUDED

Railway applications - Fixed installations - Requirements for the validation of simulation tools used for the design of electric traction power supply systems

EESTI STANDARDIKESKUS
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NATIONAL FOREWORD

See Eesti standard EVS-EN 50641:2020 sisaldab Euroopa standardi EN 50641:2020 ingliskeelset teksti.	This Estonian standard EVS-EN 50641:2020 consists of the English text of the European standard EN 50641:2020.
Standard on jõustunud sellekohase teate avaldamisega EVS Teatajas.	This standard has been endorsed with a notification published in the official bulletin of the Estonian Centre for Standardisation.
Euroopa standardimisorganisatsioonid on teinud Euroopa standardi rahvuslikele liikmetele kättesaadavaks 10.01.2020.	Date of Availability of the European standard is 10.01.2020.
Standard on kättesaadav Eesti Standardikeskusest.	The standard is available from the Estonian Centre for Standardisation.

Tagasisidet standardi sisu kohta on võimalik edastada, kasutades EVS-i veebilehel asuvat tagasiside vormi või saates e-kirja meiliaadressile standardiosakond@evs.ee.

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EUROPEAN STANDARD

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English Version

Railway applications - Fixed installations - Requirements for the validation of simulation tools used for the design of electric traction power supply systems

Applications ferroviaires - Installations fixes - Exigences relatives à la validation des outils de simulation utilisés pour la conception des réseaux d'alimentation de traction

Bahnanwendungen - Ortsfeste Anlagen - Anforderungen für die Validierung von Simulationsprogrammen für die Auslegung von Bahnenergieversorgungssystemen

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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.

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European Committee for Electrotechnical Standardization
Comité Européen de Normalisation Electrotechnique
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European foreword

This document (EN 50641:2020) has been prepared by CLC/SC 9XC “Electric supply and earthing systems for public transport equipment and ancillary apparatus (Fixed installations)”, of Technical Committee CLC/TC 9X “Electrical and electronic applications for railways”.

The following dates are fixed:

• latest date by which this document has to be implemented at national level by publication of an identical national standard or by endorsement	(dop)	2020-11-04
• latest date by which the national standards conflicting with this document have to be withdrawn	(dow)	2022-11-04

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.

Experts representing approximately ten member states worked to draft a complete new document. The results and data are taken from the most well-known representative simulation softwares in Europe and related experts. This document provides a means of assessing simulation tools and provides assurance to anyone who depends upon their output. Future versions will include other cases such as urban traffic.

1 Scope

This document specifies requirements for the acceptance of simulation tools used for the assessment of design of electric traction power supply systems with respect to TSI Energy.

This document is applicable to the simulation of AC and DC electric traction power supply systems, in the frame of assessment required by Directive (EU) 2016/797. The methods and parameters defined in this document are only intended for use in the design of the electric traction power supply system, and hence this document solely considers validation of tools within the TSI energy subsystem for all envisaged railway networks.

This document does not deal with validation of simulation tools by measurement.

This document focuses on the core simulation functions comprising the equations and functions which calculate the mechanical movement of trains and also which calculate the load flow of the electrical traction power supply system. In doing so this document provides all requirements necessary to demonstrate that a simulation tool may be used for the purposes of TSI approval of electric traction power supply systems. Any simulation tool which meets the acceptance requirements of the test cases in this document can be used to determine TSI compatibility for all systems of the same voltage and frequency without any requirement for further validation as part of the TSI assessment process.

This document includes controls for the modification of simulation tools, in particular the limits of applicability of certification when tools are modified. These controls focus on determining whether the core functions of the simulation model are modified.

This document provides only the requirements for demonstration of the algorithms and calculations of core functions. The use of a certified simulation tool in accordance with this document does not, in itself, demonstrate good practice in electric traction power supply system design, neither does it guarantee that the simulation models and data for infrastructure or trains used in the tool are correct for a given application. The choice and application of any models and data, of individual system components, in a design is therefore subject to additional verification processes and not in the Scope of this document. Competent development of design models and full understanding of the limits of design tools remain requirements in any system design. This document does not reduce any element of the need for competent designers to lead the design process.

The test cases and data shown in Clause 6 in this document do not represent an existing network, but these data are used as theoretical/virtual network only for the purpose of verification of the core functionality.

NOTE A new test case will be drafted considering metro, tramways and trolleybuses using DC 600 V or DC 750 V. Until this test case is available, this document can also be applied to subway, tram and trolley bus systems. This test case will also integrate rail systems using DC 750 V.

Additionally, the application of this document ensures that the output data of different simulation tools are consistent when they are using the same set of input data listed in Clause 6.

This document only applies to the simulation of electric traction power supply systems characteristics at their nominal frequency for AC or DC systems. It does not consider harmonic studies, electrical safety studies (e.g. rail potential), short circuit or electromagnetic compatibility studies over a wide frequency spectrum. This document does not mandate the use of a particular simulation tool in order to validate the design of an electric traction power supply system.

This document does not consider complex models with active components such as static frequency convertors.

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 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*

3 Terms and definitions

For the purposes of this document, the terms and definitions given in EN 50163:2004, EN 50388:2012 and the following apply.

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

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

3.1
assessor
entity that carries out an assessment

[SOURCE IEC 60050-821:2017, 821-12-05]

3.2
electric traction system
electric traction power supply system
railway electric distribution network used to provide energy for rolling stock

[SOURCE: IEC 60050-811:2017, 811-36-21, modified – “electric traction power supply system” has been added as synonym and the Note 1 to entry has been removed.]

3.3
proposer
organization which proposes the simulation and validation

Note 1 to entry: This will normally be the software owner and or developer.

3.4
simulation accuracy
indicator dedicated to the characterization of the accuracy of the simulation output regarding a reference (measure or theoretical model) for a given case

3.5
simulation method
construction and solution of a numerical time-step or space-step model of train movement and electric traction power supply performance

3.6
simulation tool
software implementing a simulation method(s)