SLOVENSKI STANDARD
SIST EN 50318:2003

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Ģelezniģke naprave ï Sistemi tokovnega odjema ï Veljavnost simuliranja medsebojnih dinamiļnih vplivov med tokovnim odjemnikom in kontaktnim vodnikom

Railway applications - Current collection systems - Validation of simulation of the dynamic interaction between pantograph and overhead contact line

Bahnanwendungen - Stromabnahmesysteme - Validierung von Simulationssystemen für das dynamische Zusammenwirken zwischen Stromabnehmer und Oberleitung

Applications ferroviaires - Systèmes de captage de courant - Validation des simulations de l'interaction dynamique entre le pantographe et la caténaire

Ta slovenski standard je istoveten z: **EN 50318:2002**

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29.280	Elektriļ na vleļ na oprema	Electric traction equipment

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English version

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Up-to-date lists and bibliographical references concerning such national standards may be obtained on application to the Central Secretariat 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 Central Secretariat has the same status as the official versions.

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

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Foreword

This European Standard was prepared by SC 9XC, Electric supply and earthing systems for public transport equipment and ancillary apparatus (fixed installations), of Technical Committee CENELEC TC 9X, Electrical and electronic applications for railways.

The text of the draft was submitted to the formal vote and was approved by CENELEC as EN 50318 on 2002-04-01.

The following dates were fixed:

- latest date by which the EN has to be implemented at national level by publication of an identical national standard or by endorsement (dop) 2003-04-01

- latest date by which the national standards conflicting with the EN have to be withdrawn (dow) 2005-04-01

Annexes designated "normative" are part of the body of the standard.
In this standard, annex A is normative

This European Standard has been prepared under a mandate given to CENELEC by the European Commission and supports the Interoperability Directive, 96/48/EC.

Contents

1 Scope

This European Standard specifies functional requirements for the validation of simulation methods to ensure mutual acceptance of

- input and output parameters;
- a standardized subset of test results for evaluation of simulation methods;
- comparison with measurements;
- comparison between simulation methods.

This standard applies to the current collection from an overhead contact line by pantographs mounted on railway vehicles. It does not apply to trolley bus systems.

2 Normative references

This European Standard incorporates, by dated or undated reference, provisions from other publications. These normative references are cited at the appropriate places in the text, and the publications are listed hereafter. For dated references, subsequent amendments to or revisions of any of these publications apply to this European Standard only when incorporated in it by amendment or revision. For undated references the latest edition of the publication referred to applies (including amendments).

EN 50206-1 Railway applications – Rolling stock – Pantographs: Characteristics and tests – Part 1: Pantographs for main line vehicles

EN 50317 Railway applications – Current collection systems – Requirements for and validation of measurements of the dynamic interaction between pantograph and overhead contact line

3 Definitions

For the purpose of this standard the following definitions apply:

3.1
contact point
point of mechanical contact between a contact strip and a contact wire

3.2
contact force
vertical force applied by the pantograph to the overhead contact line. The contact force is the sum of the forces of all contact points

3.3
static force
mean vertical force exerted upward by the collector head on the overhead contact line, and caused by the pantograph raising device, whilst the pantograph is raised and the vehicle is at standstill
[EN 50206-1]

3.4
aerodynamic force
vertical force applied to the pantograph as a result of air flow around the pantograph components

3.5
mean value of contact force
***F*M**
arithmetic mean of contact force

3.6
standard deviation of contact force
σ
square root of the sum of the square errors divided by the number of output values minus 1

3.7
statistical minimum of contact force
value of contact force represented by $F_M - 3\,\sigma$

3.8
statistical maximum of contact force
value of contact force represented by $F_M + 3\,\sigma$

3.9
minimum of contact force
minimum contact force while the pantograph passes over the analysis section

3.10
maximum of contact force
maximum contact force while the pantograph passes over the ananlysis section

3.11
loss of contact
condition when the contact force is zero

3.12
simulation method
any numerical method that uses a fixed set of input parameters describing a system (e.g. pantograph/overhead contact line system) to calculate a set of output values representative of the dynamic behaviour of this system

3.13
pantograph model
mathematical model describing the dynamic characteristics of the pantograph

3.14
mass–spring–damper–model
method representing a dynamic mechanical system (e.g. pantograph) as a series of discrete concentrated masses connected together by spring and damper elements

3.15
transfer function of a pantograph
ratio of an applied force to the response of the pantograph, depending on frequency. For example the apparent mass function, as ratio of an applied sinusoidal force to the corresponding acceleration

3.16
collector head
part of the pantograph supported by the frame, which includes contact strips, horns and may include a suspension

3.17
overhead contact line model
mathematical model in a two- or three-dimensional geometry describing the dynamic characteristics of an overhead contact line

3.18
wave propagation speed of the contact wire
speed of a transversal wave, which runs along the contact wire

3.19
maximum uplift at the support
maximum value of the vertical uplift at each support within the analysis section, while the pantograph passes

3.20
analysis section
subset of the total overhead contact line model length which consists of those parts over which the passage of the pantographs is not influenced by initial transients and end effects of the model

3.21
frequency range of interest
frequency range within which the dynamic performance of the overhead contact line – pantograph system is considered

4 Symbols

F_M mean value of contact force

σ standard deviation of contact force

5 General

The theoretical study of the dynamic interaction between pantograph and overhead contact line by computer simulation makes it possible, to obtain much information about the system and to minimise the costs of line tests.

Depending on the phenomena to be studied, the frequency range of interest shall be defined in advance and shall be consistent with the pantograph model, overhead contact line model and simulation method and with the measurement system.

The simulation method shall be assessed by the use of comparisons between the results of the simulation and line tests or by comparison with other validated simulation methods. A validation of the method shall be done in accordance with clause 10.

In order to be used with confidence the simulation method shall be evaluated. The evaluation for a simulation method shall be done with the two steps which are shown in Figure 1.

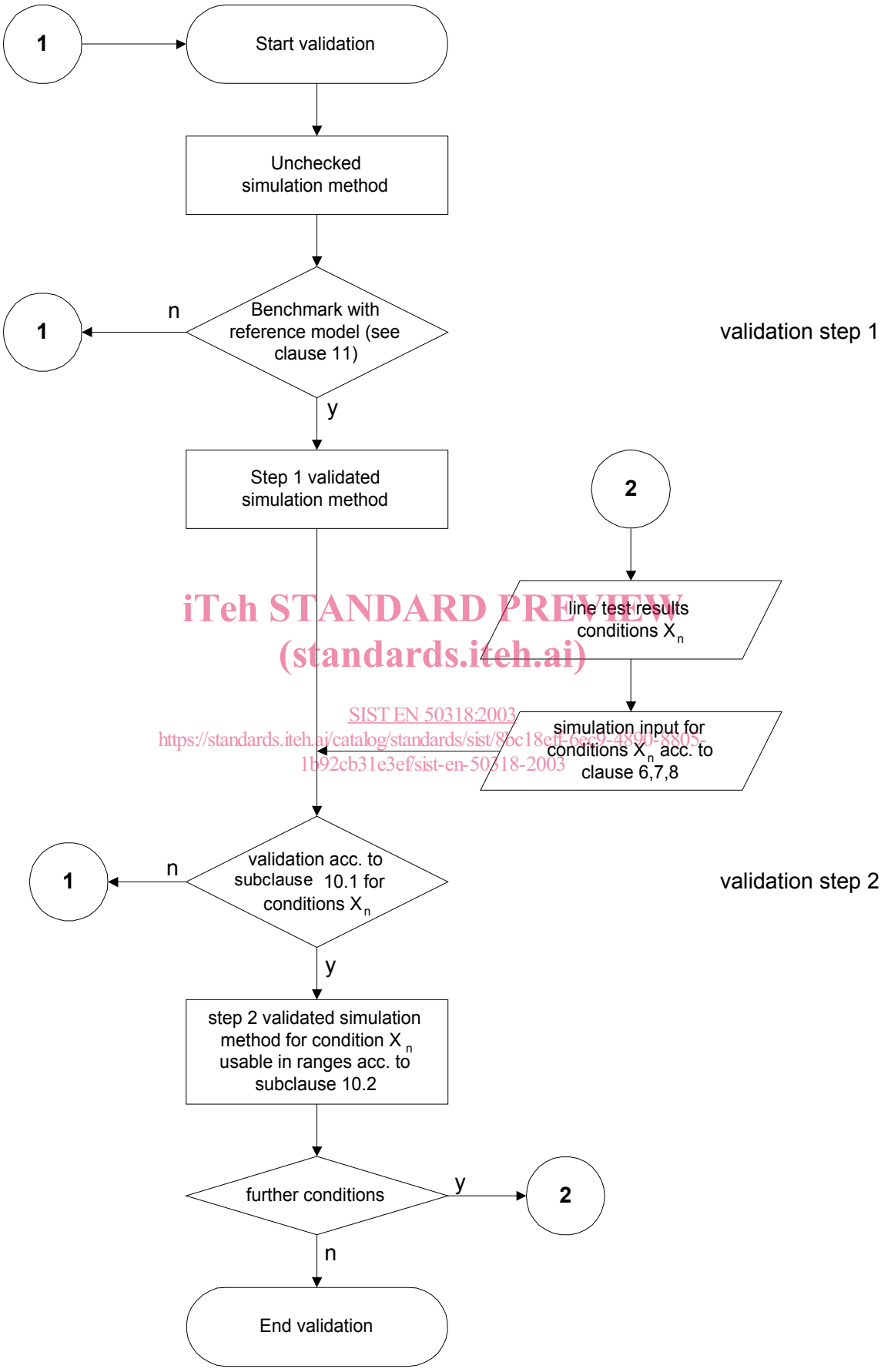

Figure 1 – Steps of evaluation