



SLOVENSKI STANDARD SIST EN 50215:2009

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Railway applications - Rolling stock - Testing of rolling stock on completion of construction and before entry into service

Bahnanwendungen - Prüfung von Bahnfahrzeugen nach Fertigstellung und vor Indienststellung

Applications ferroviaires - Matériel roulant - Essais sur matériel roulant après achèvement et avant mise en service

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ICS:

29.280	Ò\^ dã } æ\^ } æ] !^ { æ	Electric traction equipment
45.060.01	Železniška vozila na splošno	Railway rolling stock in general

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EUROPEAN STANDARD
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English version

**Railway applications -
Rolling stock -
Testing of rolling stock
on completion of construction and before entry into service**

Applications ferroviaires -
Matériel roulant -
Essais sur matériel roulant
après achèvement
et avant mise en service

Bahnanwendungen -
Bahnfahrzeuge -
Prüfung von Bahnfahrzeugen
nach Fertigstellung
und vor Indienststellung

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This European Standard was approved by CENELEC on 2009-07-01. 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 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.

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

CENELEC

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

Central Secretariat: Avenue Marnix 17, B - 1000 Brussels

Foreword

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

The text of the draft was submitted to the Unique Acceptance Procedure and was approved by CENELEC as EN 50215 on 2009-07-01.

This European Standard supersedes EN 50215:1999.

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) 2010-07-01
- latest date by which the national standards conflicting with the EN have to be withdrawn (dow) 2012-07-01

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1 Scope

This European Standard specifies general criteria to demonstrate by testing that newly constructed complete railway vehicles conform with standards or other normative documents.

This standard is intended to be used as technical instructions for the processing of tests which may be needed for demonstration of certain technical requirements where they are relevant.

This standard is not intended to be used as a list of approval requirements without consideration of aforementioned technical requirements.

This standard, as a whole or in part, applies to all railway vehicles except special purpose vehicles such as track-laying machines, ballast cleaners and personnel carriers. The extent of application of the standard for particular vehicles will be specifically mentioned in the contract.

NOTE 1 The parts of the standard which are applicable will depend on the type of vehicle (e.g. passenger, freight, powered, trailer, etc.).

NOTE 2 The scope of this standard excludes railbound and road/rail vehicles for construction and maintenance of railway infrastructure.

NOTE 3 This standard does not deal with tests carried out on components or equipment before fitting to the vehicle.

In so far as this standard is applicable it may be used for the following:

- generator sets mounted on a vehicle provided for auxiliary purposes;
- the electrical transmission used on trolley buses or similar vehicles;
- control and auxiliary equipment of vehicles with non-electrical propulsion systems;
- vehicles guided, supported or electrically propelled by systems which do not use the adhesion between wheel and rail.

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.

EN 12663:2000, *Railway applications - Structural requirements of railway vehicle bodies*

EN 13129-2:2004, *Railway applications - Air conditioning for main line rolling stock - Part 2: Type tests*

EN 13272:2001, *Railway applications - Electrical lighting for rolling stock in public transport systems*

EN 13452-2:2003, *Railway applications - Braking - Mass transit brake systems - Part 2: Methods of test*

EN 13775-1:2003, *Railway applications - Measuring of new and modified freight wagons - Part 1: Measuring principles*

EN 13775-2:2003, *Railway applications - Measuring of new and modified freight wagons - Part 2: Freight wagons with bogies*

EN 13775-3:2003, *Railway applications - Measuring of new and modified freight wagons - Part 3: Freight wagons with 2 wheelsets*

EN 13775-4:2004, *Railway applications - Measuring of new and modified freight wagons - Part 4: Bogies with 2 wheelsets*

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EN 13775-5:2003, *Railway applications - Measuring of new and modified freight wagons - Part 5: Bogies with 3 wheelsets*

EN 13775-6:2004, *Railway applications - Measuring of new and modified freight wagons - Part 6: Multiple and articulated freight wagons*

EN 14067-4:2005, *Railway applications - Aerodynamics - Part 4: Requirements and test procedures for aerodynamics on open track*

EN 14067-5:2006, *Railway applications - Aerodynamics - Part 5: Requirements and test procedures for aerodynamics in tunnels*

EN 14363:2005, *Railway applications - Testing for the acceptance of running characteristics of railway vehicles - testing of running behaviour and stationary tests*

EN 14531-1:2005, *Railway applications - Braking - Methods for calculation of stopping distances, slowing distances and immobilisation braking - Part 1: General algorithms*

EN 14750-2:2006, *Railway applications - Air conditioning for urban and suburban rolling stock - Part 2: Type tests*

EN 14752:2005, *Railway applications - Bodyside entrance systems*

EN 14813-2:2006, *Railway applications - Air conditioning for driving cabs - Part 2: Type tests*

EN 15806 ¹⁾, *Railway application - Braking - Static brake testing*

EN 50121-3-1:2006, *Railway applications - Electromagnetic compatibility - Part 3-1: Rolling stock - Train and complete vehicle*

EN 50121-3-2:2006, *Railway applications - Electromagnetic compatibility - Part 3-2: Rolling stock - Apparatus*

EN 50126-1:1999, *Railway applications - The specification and demonstration of Reliability, Availability, Maintainability and Safety (RAMS) - Part 1: Basic requirements and generic process*

EN 50153:2002, *Railway applications - Rolling stock - Protective provisions relating to electrical hazards*

EN 50155:2007, *Railway applications - Electronic equipment used on rolling stock*

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

EN 50206-1:1998, *Railway applications - Rolling stock - Pantographs: Characteristics and tests - Part 1: Pantographs for main line vehicles*

EN 50206-2:1999, *Railway applications - Rolling stock - Pantographs: Characteristics and tests - Part 2: Pantographs for metros and light rail vehicles*

EN 50238:2003, *Railway applications - Compatibility between rolling stock and train detection systems*

EN 50317:2002 (+ A1:2004 + A2:2007), *Railway applications - Current collection systems - Requirements for and validation of measurements of the dynamic interaction between pantograph and overhead contact line*

EN 50343:2003, *Railway applications - Rolling stock - Rules for installation of cabling*

EN 50388:2005, *Railway applications - Power supply and rolling stock - Technical criteria for the coordination between power supply (substation) and rolling stock to achieve interoperability*

EN 60077-1:2002, *Railway applications - Electric equipment for rolling stock - Part 1: General service conditions and general rules (IEC 60077-1:1999, mod.)*

¹⁾ At draft stage.

- EN 60077-2:2002, *Railway applications - Electric equipment for rolling stock - Part 2: Electrotechnical components - General rules* (IEC 60077-2:1999, mod.)
- EN 60077-3:2003, *Railway applications - Electric equipment for rolling stock - Part 3: Electrotechnical components - Rules for d.c. circuit-breakers* (IEC 60077-3:2001)
- EN 60077-4:2003, *Railway applications - Electric equipment for rolling stock - Part 4: Electrotechnical components - Rules for AC circuit-breakers* (IEC 60077-4:2003)
- EN 60077-5:2003, *Railway applications - Electrotechnical equipment for rolling stock - Part 5: Electrotechnical components - Rules for HV fuses* (IEC 60077-5:2003)
- EN 60310:2004, *Railway applications - Traction transformers and inductors on board rolling stock* (IEC 60310:2004)
- EN 60322:2001, *Railway applications - Electric equipment for rolling stock - Rules for power resistors of open construction* (IEC 60322:2001)
- EN 60349-1:2000 (+ A1:2002), *Electric traction - Rotating electrical machines for rail and road vehicles - Part 1: Machines other than electronic convertor-fed alternating current motors* (IEC 60349-1:1999 + A1:2002)
- EN 60349-2:2001, *Railway applications - Rotating electrical machines for rail and road vehicles - Part 2: Electronic converter-fed alternating current motors* (IEC 60349-2:1993, mod.)
- EN 60529:1991 (+ A1:2000), *Degrees of protection provided by enclosures (IP Code)* (IEC 60529:1989 + A1:1999)
- EN 61287-1:2006, *Railway applications - Power converters installed on board rolling stock - Part 1: Characteristics and test methods* (IEC 61287-1:2005)
- EN 61377-1:2006, *Railway applications - Rolling stock - Part 1: Combined testing of inverter-fed alternating current motors and their control system* (IEC 61377-1:2006)
- EN 61377-2:2002, *Railway applications - Rolling stock - Combined testing - Part 2: Chopper-fed direct current traction motors and their control* (IEC 61377-2:2002)
- EN 61377-3:2002, *Railway applications - Rolling stock - Part 3: Combined testing of alternating current motors, fed by an indirect convertor, and their control system* (IEC 61377-3:2002)
- EN ISO 3095:2005, *Railway applications - Acoustics - Measurement of noise emitted by railbound vehicles* (ISO 3095:2005)
- EN ISO 3381:2005, *Railway applications - Acoustics - Measurement of noise inside railbound vehicles* (ISO 3381:2005)

3 Terms and definitions

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

3.1

manufacturer

organisation which has the technical responsibility for the supply of the vehicle system

NOTE There may be more than one manufacturer where the contract for the vehicle is split in two or more parts.

3.2

manufacturer's works

location where the assembly of the vehicles is completed and where static tests are generally performed

3.3**purchaser**

organisation which orders and will own the vehicle

NOTE The purchaser may have the responsibility for direct negotiations with the manufacturer, unless that responsibility is delegated to the user, a main contractor or a consultant.

3.4**supplier**

organisation which has the responsibility for the supply of individual items of equipment or groups of equipment to the manufacturer

3.5**supplier's works**

location where individual items of equipment or groups of equipment are manufactured

3.6**contract**

all the component parts of the technical specifications agreed between manufacturer and purchaser, consisting of purchaser's technical specifications, manufacturer's technical responses, minutes of meetings, and any other formal contract documents

3.7**user**

organisation which will use the vehicle

NOTE The user will be a train operator and may be the purchaser, or another party who is using the vehicle on behalf of the purchaser through, for example, a leasing arrangement.

3.8**infrastructure controller**

organisation which controls the railway infrastructure, including, for example, track, signalling, communications and structures

3.9**type test**

a test of one or more devices, system or complete vehicle to show that the design meets the required specifications and the relevant standards

3.10**routine test**

a test to which each vehicle is subjected to during or after manufacture to ascertain whether it complies with the specified criteria

3.11**safety-related**

carries responsibility for safety

3.12**voluntary test**

any additional test (either type or routine) added to the Test Plan by agreement between the manufacturer and the purchaser

3.13**validation documentation**

documented evidence that a product, process or service is in conformance with specified requirements or other normative documents

3.14**test plan**

the plan of the tests to be undertaken by the manufacturer as presented within its Quality Plan, including all supporting information on the conduct of the tests

NOTE In the context of this standard, the Test Plan includes all subordinate test specifications.

3.15

Quality Plan

document specifying which procedures and associated resources shall be applied by whom and when to a specific project, product, process or contract

[ISO 9000:2000]

3.16

Approval Authority

any body other than the purchaser with the legal right to require tests to be performed on vehicles within the scope of this standard and to whom compliance verification must be demonstrated

NOTE These bodies may be different in each country and may include national or international regulatory bodies, national safety authorities, infrastructure controllers, and Notified Bodies.

4 Requirements

4.1 General

The manufacturer shall exercise control over all activities affecting the quality of the products to ensure that the requirements of the standards or other normative documents to which the declaration refers are met.

For this purpose the manufacturer shall have at his disposal all necessary means for carrying out this control at all levels (for example raw materials, supplies, production, finished products or packing). Information shall be available on the manufacturer's quality system and the results of tests as appropriate.

The manufacturer shall establish and maintain a quality system. This shall include auditable procedures covering the final inspection and test operations, including workmanship standards, test specifications, test records, calibration of test instruments and equipment, document control, control of non-conforming products and personnel training.

NOTE It is recommended that manufacturers operate a quality system in accordance with EN ISO 9001.

The Quality Plan for the design, production, inspection and testing of the product shall include a Test Plan defining how the manufacturer will demonstrate conformance to the specified requirements.

The contract shall define the various tests to be undertaken on completed vehicles and before entry into service to assure the purchaser that:

- the vehicles comply with the technical requirements of the contract (type tests, 3.9, see also 5.3.1);
- every vehicle conforms to the design standard proved in the type tests (routine tests, 3.10, see also 5.3.2).

All component type and routine tests shall be successfully completed according to the relevant standards and specifications, except as permitted by 6.1, before the tests within the scope of this standard are commenced. The tests covered by this standard are to demonstrate correct interfacing with the functions of the vehicle.

This standard does not cover the following types of testing:

- endurance and reliability;
- development;
- investigative (except for guidance only);
- system test, such as subassembly or system combined test.

4.2 Third party test facilities

If it is intended to use third party test facilities this shall be declared and agreed at the time of contract with details of the third party, its test facilities and accreditation included in the Test Plan (see 4.3).

This shall of necessity apply to:

- static tests necessitating the vehicle to be moved to a specialized test centre not belonging to either the manufacturer or the purchaser;
- dynamic tests on another system not belonging to either the manufacturer or the user.

It is recommended that third party test facilities are accredited to EN ISO/IEC 17025.

NOTE The purchaser or the approval authority of the country concerned may require tests to be carried out by an accredited test facility independent of the manufacturer.

4.3 Test Plan

The various tests to be undertaken by the manufacturer shall be presented by the manufacturer within its Quality Plan as a Test Plan which shall detail the following:

- a) the test programme;
- b) the component and equipment type tests to be completed before undertaking each vehicle test;
- c) the test facilities to be used, including, as appropriate, their accreditation and competence details, and their level of independence from the manufacturer;
- d) the test methods;
- e) the vehicle loading conditions for each test;
- f) the environmental conditions for each test;
- g) the limits and tolerances of any test measuring methods;
- h) the success criteria for each test;
- i) the Corrective Action process;
- j) the validation documentation.

Where the contract requires validation of certain tests or documents by the purchaser, these shall be identified in the Test Plan.

Where the contract requires safety to be demonstrated by a series of tests derived from a Safety or Risk Assessment performed in accordance with EN 50126-1, or as required by an external Approval Authority then these tests shall be included in the test programme and identified as such in the Test Plan. The term “safety-related” is used (see definition 3.12, derived from EN 50129) in this standard to identify those tests which might be in this category. The final decision on whether a test is safety-related rests with those who determine the contribution made by the test to the responsibility for safety.

The auditable process used to derive the information for the Test Plan shall ensure that the list of tests produced to support the validation documentation is comprehensive.

The configuration (type numbers, serial numbers, modification status) of key components, including revisions of software, shall be recorded as a “quality” record

On successful completion of each test the validation documentation shall be prepared by the manufacturer.

5 Categories of tests

5.1 General

The Test Plan shall present the tests to be carried out in the following categories:

- a) preliminary adjustment tests (see 5.2);
- b) acceptance tests, which include:
 - type tests, see 5.3.1;
 - routine tests, see 5.3.2;
- c) investigation tests (see 5.4).

The tests may be simplified or omitted by agreement between purchaser and manufacturer:

- i) if the vehicles concerned are demonstrated to be identical to vehicles previously constructed and for which experience is available, or if the vehicles are equipped with motors or other important components stipulated by the purchaser;
- ii) if it can be shown by documentary proof that equivalent tests have been performed under representative conditions.

5.2 Preliminary adjustment tests

Before submitting the vehicle to the acceptance tests, the manufacturer may require to carry out preliminary adjustment tests which cannot be made in manufacturer's works and which may involve test runs on the user's lines with or without load. In this event, at least the minimum amount of testing required for safe running (see 6.2) shall be completed to the satisfaction of the user and the infrastructure controller.

The maximum total distance of the trial runs to obtain necessary adjustments should be agreed in the contract and shall take into account the type of vehicle, more especially its maximum speed and the new devices which are incorporated. Failing a specified value in the contract, a maximum run not exceeding 5 000 km should be adopted for vehicles which are to be subjected to the type tests.

Test runs may only be undertaken under the supervision and with the participation of a qualified agent appointed by the user. The user shall also appoint the driver of the vehicle.

5.3 Acceptance tests

5.3.1 Type tests

These tests shall be performed over an agreed duration to demonstrate that the vehicle design complies with the performance requirements specified in the contract. They are listed in Tables A.1 and A.2 and described in Clauses 8 and 9.

The tests shall be undertaken on the first vehicles built to the design unless otherwise agreed at the time of contract and included in the Test Plan.

If the type tests are performed on a prototype or pre-production vehicle, then the manufacturer shall agree with the purchaser those additional tests which are necessary on the first production built vehicle to be included in the Test Plan.

The tests shall be performed under the appropriate test conditions as explained in Clause 6.

Voluntary type tests may be required only if they are specified in the Test Plan.

5.3.2 Routine tests

These tests shall be carried out on each vehicle to be delivered. They are listed in Tables A.1 and A.2 and described in Clauses 8 and 9 (see Clause 6).

Specific parameters used in the type test should be selected as the test criteria for compliance of each vehicle. The routine tests shall include sufficient measurements and checks to confirm compliance with the selected test criteria.

The tests shall be performed under the appropriate test conditions as explained in Clause 6.

The results obtained in the routine tests shall, taking into account acceptable tolerances, not be less satisfactory than those obtained for the type tests.

In cases where observations made during the corresponding type tests make it unnecessary for the routine test to be repeated in its entirety, a limited range or sample of routine tests, or a simplified form of those tests stated in the summary tables, or declarations of conformity may be accepted by agreement in the contract.

Any necessary additional routine tests shall be agreed in the contract and included in the Test Plan.

5.3.3 Tests required by Approval Authority

Tests required by Approval Authorities and those tests demonstrating safety (see 4.3) shall be clearly identified in the Test Plan. Tests regarded as in this category are shown in Tables A.1 and A.2.

5.4 Investigation tests

Investigation tests are special tests of an optional character and are carried out in order to obtain additional information. They shall be carried out only if they are specified in the contract.

These tests may be arranged by agreement between purchaser and manufacturer. In each particular case, the purchaser and manufacturer shall agree on the operating method and the programme for these tests.

The results of investigation tests shall not be used as a reason for refusing to accept the vehicle.

6 Test conditions

6.1 General

Tests shall be performed under the prevailing ambient conditions unless otherwise specified.

The Test Plan shall take account of the nature and site of each test and should cover:

- a) type and routine test programmes, especially in those cases where this standard allows the parties a freedom of choice;
- b) static tests (see 6.2);
- c) dynamic tests (see 6.3);
- d) methods for testing for environmental conditions, e.g. snow, rain, dust, temperature, etc. where these conditions are seasonal;
- e) factory tests on components which, due to shortage of suitable test facilities at the supplier's works, are required to be carried out on the completed vehicle either statically or dynamically.

6.2 Static tests

These tests should normally take place at the manufacturer's works and are described in Clause 8.

These tests shall include checks that the vehicle is sufficiently safe to undertake the dynamic tests.

The test facilities shall be appropriate and sufficient to ensure the tests are performed consistently; otherwise, the manufacturer shall inform the purchaser of any limitations of their test facilities with respect to these tests.

Where tests are performed at a third-party facility (see 4.2) which involves transportation of the vehicle to or from that facility, sufficient tests shall be undertaken by the manufacturer to ensure that the transportation can be completed safely.

6.3 Dynamic tests

The tests are normally undertaken on the lines over which the vehicle is intended to operate or, if not available, over lines with similar characteristics as specified in the contract, and are described in Clause 9.

The purchaser shall arrange access to the lines as appropriate and the necessary crew under the conditions specified in the contract.

Operation of the test trains shall comply with all regulations of the infrastructure controller.

The purchaser shall provide all the necessary facilities for any preparation for dynamic tests (including preliminary test running) under the conditions specified in the contract.

Where it is necessary to undertake the dynamic tests on the track of another infrastructure controller, the selected route, its characteristics and conditions of operation shall be agreed at the time of contract.

It is permitted to perform some or all of the dynamic tests at a dedicated facility by agreement.

NOTE 1 Attention is drawn to the need to ensure that the responsibilities of all parties involved in performing the dynamic tests are clearly defined.

NOTE 2 Attention is also drawn to the need to complete all the necessary preliminaries such as the relevant parts of the Reliability, Availability and Maintenance Case and the Safety Case before undertaking the dynamic tests.

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7 Validation documentation

The validation documentation shall contain sufficient information to identify the vehicle and all its major components and enable these to be traced through the test records. As a minimum the following shall be provided:

- a) the name and address of the organisation which produced the documentation;
- b) the name and address of the manufacturer;
- c) the identification of the vehicle and its major components by name, type, model number and any relevant supplementary information such as lot number, batch or serial number and modification level;
- d) the standards or normative documents referenced in the contract or Test Plan in a clear and concise way;
- e) all supplementary information such as grade or category of the vehicle components;
- f) the date of the documentation;
- g) the signature and title or an equivalent marking of the authorised signatory.