

**SLOVENSKI STANDARD
SIST EN 61373:2010**

01-december-2010

**Nadomešča:
SIST EN 61373:1999**

**Železniške naprave - Oprema voznih sredstev - Preskusi na udarce in vibracije
(IEC 61373:2010)**

Railway applications - Rolling stock equipment - Shock and vibration tests (IEC 61373:2010)

Applications ferroviaires - Matériel roulant - Essais de chocs et vibrations (CEI 61373:2010)

(standards.iteh.ai)

Applications ferroviaires - Matériel roulant - Essais de chocs et vibrations (IEC 61373:2010)

<https://standards.iteh.ai/catalog/standards/sist/6c9a4939-7e49-4ccd-83ef-bff77dbf1fdb/sist-en-61373-2010>

Ta slovenski standard je istoveten z: EN 61373:2010

ICS:

45.060.01 Železniška vozila na splošno Railway rolling stock in general

SIST EN 61373:2010

en

iTeh STANDARD PREVIEW
(standards.iteh.ai)

SIST EN 61373:2010

<https://standards.iteh.ai/catalog/standards/sist/6c9a4939-7e49-4ccd-83ef-bff77dbf1fbd/sist-en-61373-2010>

EUROPEAN STANDARD
NORME EUROPÉENNE
EUROPÄISCHE NORM

EN 61373

September 2010

ICS 45.060

Supersedes EN 61373:1999

English version

**Railway applications -
Rolling stock equipment -
Shock and vibration tests
(IEC 61373:2010)**

Applications ferroviaires -
Matériel roulant -
Essais de chocs et vibrations
(CEI 61373:2010)

Bahnanwendungen –
Betriebsmittel von Bahnfahrzeugen –
Prüfungen für Schwingen und Schocken
(IEC 61373:2010)

iTeh STANDARD PREVIEW

This European Standard was approved by CENELEC on 2010-09-01. 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, Croatia, 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

Management Centre: Avenue Marnix 17, B - 1000 Brussels

Foreword

The text of document 9/1386/FDIS, future edition 2 of IEC 61373, prepared by IEC TC 9, Electrical equipment and systems for railways, was submitted to the IEC-CENELEC parallel vote and was approved by CENELEC as EN 61373 on 2010-09-01.

This European Standard supersedes EN 61373:1999.

The main technical changes with regard to the EN 61373:1999 are as follows:

- change of the method to calculate the acceleration ratio which has to be applied to the functional ASD value to obtain the simulated long-life ASD value;
- addition of the notion of partially certified against this standard;
- suppression of Annex B of the EN 61373:1999 due to the new method to calculate the acceleration ratio;
- addition of guidance for calculating the functional RMS value from service data or the RMS value from ASD levels of Figures 2 to 5.

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

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) 2011-06-01
- latest date by which the national standards conflicting with the EN have to be withdrawn (dow) 2013-09-01

Annex ZA has been added by CENELEC.

Endorsement notice

The text of the International Standard IEC 61373:2010 was approved by CENELEC as a European Standard without any modification.

Annex ZA (normative)

Normative references to international publications with their corresponding European publications

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.

NOTE When an international publication has been modified by common modifications, indicated by (mod), the relevant EN/HD applies.

<u>Publication</u>	<u>Year</u>	<u>Title</u>	<u>EN/HD</u>	<u>Year</u>
IEC 60068-2-27	2008	Environmental testing - Part 2-27: Tests - Test Ea and guidance: Shock	EN 60068-2-27	2009
IEC 60068-2-47	2005	Environmental testing - Part 2-47: Tests - Mounting of specimens for vibration, impact and similar dynamic tests	EN 60068-2-47	2005
IEC 60068-2-64	2008	Environmental testing - Part 2-64: Tests - Test Fh: Vibration, broadband random and guidance	EN 60068-2-64	2008
ISO 3534-1	2006	Statistics - Vocabulary and symbols - Part 1: General statistical terms and terms used in probability	-	-

<https://standards.iteh.ai/catalog/standards/sist/6c9a4939-7e49-4ccd-83ef-bff77dbf1fbd/sist-en-61373-2010>

iTeh STANDARD PREVIEW
(standards.iteh.ai)

[SIST EN 61373:2010](#)

<https://standards.iteh.ai/catalog/standards/sist/6c9a4939-7e49-4ccd-83ef-bff77dbf1fbd/sist-en-61373-2010>



IEC 61373

Edition 2.0 2010-05

INTERNATIONAL STANDARD

NORME INTERNATIONALE



Railway applications – Rolling stock equipment – Shock and vibration tests

Applications ferroviaires – Matériel roulant – Essais de chocs et vibrations

SIST EN 61373:2010

<https://standards.iteh.ai/catalog/standards/sist/6c9a4939-7e49-4ccd-83ef-bff77dbf1fbd/sist-en-61373-2010>

INTERNATIONAL
ELECTROTECHNICAL
COMMISSION

COMMISSION
ELECTROTECHNIQUE
INTERNATIONALE

PRICE CODE
CODE PRIX



ICS 45.060

ISBN 978-2-88910-944-9

CONTENTS

FOREWORD.....	4
INTRODUCTION.....	6
1 Scope.....	7
2 Normative references.....	8
3 Terms and definitions.....	9
4 General.....	10
5 Order of testing.....	11
6 Reference information required by the test house.....	11
6.1 Method of mounting and orientation of equipment under test.....	11
6.2 Reference and check points.....	11
6.2.1 Fixing point.....	11
6.2.2 Check point.....	12
6.2.3 Reference point.....	12
6.2.4 Measuring point.....	12
6.3 Mechanical state and functioning during test.....	12
6.3.1 Mechanical state.....	12
6.3.2 Functional tests.....	13
6.3.3 Performance tests.....	13
6.4 Reproducibility for random vibration tests.....	13
6.4.1 Acceleration spectral density (ASD).....	13
6.4.2 Root mean square value (r.m.s.).....	13
6.4.3 Probability density function (PDF).....	13
6.4.4 Duration.....	13
6.5 Measuring tolerances.....	14
6.6 Recovery.....	14
7 Initial measurements and preconditioning.....	14
8 Functional random vibration test conditions.....	14
8.1 Test severity and frequency range.....	14
8.2 Duration of functional vibration tests.....	15
8.3 Functioning during test.....	15
9 Simulated long-life testing at increased random vibration levels.....	15
9.1 Test severity and frequency range.....	15
9.2 Duration of accelerated vibration tests.....	15
10 Shock testing conditions.....	16
10.1 Pulse shape and tolerance.....	16
10.2 Velocity changes.....	16
10.3 Mounting.....	16
10.4 Repetition rate.....	16
10.5 Test severity, pulse shape and direction.....	16
10.6 Number of shocks.....	17
10.7 Functioning during test.....	17
11 Transportation and handling.....	17
12 Final measurements.....	17
13 Acceptance criteria.....	17
14 Report.....	17

15	Test certificate	18
16	Disposal	18
	Annex A (informative) Explanation of service measurements, measuring positions, methods of recording service data, summary of service data, and method used to obtain random test levels from acquired service data	25
	Annex B (informative) Figure identifying general location of equipment on railway vehicles and their resulting test category	32
	Annex C (informative) Example of a type test certificate	33
	Annex D (informative) Guidance for calculating RMS values from ASD values or levels.....	34
	Figure 1 – Gaussian distribution	9
	Figure 2 – Category 1 – Class A – Body-mounted – ASD spectrum	19
	Figure 3 – Category 1 – Class B – Body-mounted – ASD spectrum	20
	Figure 4 – Category 2 – Bogie mounted – ASD spectrum.....	21
	Figure 5 – Category 3 – Axle mounted – ASD spectrum.....	22
	Figure 6 – Cumulative PDF tolerance bands	23
	Figure 7 – Shock test tolerance – Bands half sine pulse	24
	Figure A.1 – Standard measuring positions used for axle, bogie (frame) and body	25
	Figure A.2 – Typical fatigue strength curve.....	29
	Figure B.1 – General location of equipment on vehicles.....	32
	Figure D.1 – ASD spectrum.....	35
	Table 1 – Test severity and frequency range for functional random vibration tests.....	14
	Table 2 – Test severity and frequency range.....	15
	Table 3 – Test severity, pulse shape and direction.....	16
	Table A.1 – Environment data acquisition summary of the test parameters/conditions.....	26
	Table A.2 – Summary of the r.m.s. acceleration levels obtained from the questionnaire	28
	Table A.3 – Test levels obtained from service data using the method shown in Clause A.4	31

INTERNATIONAL ELECTROTECHNICAL COMMISSION

**RAILWAY APPLICATIONS –
ROLLING STOCK EQUIPMENT –
SHOCK AND VIBRATION TESTS**

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.
- 2) The formal decisions or agreements of IEC on technical matters express, as nearly as possible, an international consensus of opinion on the relevant subjects since each technical committee has representation from all interested IEC National Committees.
- 3) IEC Publications have the form of recommendations for international use and are accepted by IEC National Committees in that sense. While all reasonable efforts are made to ensure that the technical content of IEC Publications is accurate, IEC cannot be held responsible for the way in which they are used or for any misinterpretation by any end user.
- 4) In order to promote international uniformity, IEC National Committees undertake to apply IEC Publications transparently to the maximum extent possible in their national and regional publications. Any divergence between any IEC Publication and the corresponding national or regional publication shall be clearly indicated in the latter.
- 5) IEC itself does not provide any attestation of conformity. Independent certification bodies provide conformity assessment services and, in some areas, access to IEC marks of conformity. IEC is not responsible for any services carried out by independent certification bodies.
- 6) All users should ensure that they have the latest edition of this publication.
- 7) No liability shall attach to IEC or its directors, employees, servants or agents including individual experts and members of its technical committees and IEC National Committees for any personal injury, property damage or other damage of any nature whatsoever, whether direct or indirect, or for costs (including legal fees) and expenses arising out of the publication, use of, or reliance upon, this IEC Publication or any other IEC Publications.
- 8) Attention is drawn to the Normative references cited in this publication. Use of the referenced publications is indispensable for the correct application of this publication.
- 9) Attention is drawn to the possibility that some of the elements of this IEC Publication may be the subject of patent rights. IEC shall not be held responsible for identifying any or all such patent rights.

International Standard IEC 61373 has been prepared by IEC technical committee 9: Electrical equipment and systems for railways.

This second edition cancels and replaces the first edition, issued in 1999 and constitutes a technical revision.

The main technical changes with regard to the previous edition are as follows:

- change of the method to calculate the acceleration ratio which has to be applied to the functional ASD value to obtain the simulated long-life ASD value;
- addition of the notion of partially certified against this standard;
- suppression of Annex B of the first edition due to the new method to calculate the acceleration ratio;
- addition of guidance for calculating the functional RMS value from service data or the RMS value from ASD levels of Figures 2 to 5.

The text of this standard is based on the following documents:

FDIS	Report on voting
9/1386/FDIS	9/1397/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.

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

IMPORTANT – The 'colour inside' logo on the cover page of this publication indicates that it contains colours which are considered to be useful for the correct understanding of its contents. Users should therefore print this document using a colour printer.

iTeh STANDARD PREVIEW
(standards.iteh.ai)

[SIST EN 61373:2010](#)

<https://standards.iteh.ai/catalog/standards/sist/6c9a4939-7e49-4ccd-83ef-bff77dbf1fbd/sist-en-61373-2010>

INTRODUCTION

This standard covers the requirements for random vibration and shock testing items of pneumatic, electrical and electronic equipment/components (hereinafter only referred to as equipment) to be fitted on to railway vehicles. Random vibration is the only method to be used for equipment/component approval.

The tests contained within this standard are specifically aimed at demonstrating the ability of the equipment under test to withstand the type of environmental vibration conditions normally expected for railway vehicles. In order to achieve the best representation possible, the values quoted in this standard have been derived from actual service measurements submitted by various bodies from around the world.

This standard is not intended to cover self-induced vibrations as these will be specific to particular applications.

Engineering judgement and experience is required in the execution and interpretation of this standard.

This standard is suitable for design and validation purposes; however, it does not exclude the use of other development tools (such as sine sweep), which may be used to ensure a predetermined degree of mechanical and operational confidence. The test levels to be applied to the equipment under test are dictated only by its location on the train (i.e. axle, bogie or body-mounted).

iTeh STANDARD PREVIEW

It should be noted that these tests may be performed on prototypes in order to gain design information about the product performance under random vibration. However, for test certification purposes the tests have to be carried out on equipment taken from normal production.

<https://standards.iteh.ai/catalog/standards/sist/6c9a4939-7e49-4ccd-83ef-bff77dbf1fbd/sist-en-61373-2010>

RAILWAY APPLICATIONS – ROLLING STOCK EQUIPMENT – SHOCK AND VIBRATION TESTS

1 Scope

This International Standard specifies the requirements for testing items of equipment intended for use on railway vehicles which are subsequently subjected to vibrations and shock owing to the nature of railway operational environment. To gain assurance that the quality of the equipment is acceptable, it has to withstand tests of reasonable duration that simulate the service conditions seen throughout its expected life.

Simulated long-life testing can be achieved in a number of ways each having their associated advantages and disadvantages, the following being the most common:

- a) amplification: where the amplitudes are increased and the time base decreased;
- b) time compression: where the amplitude history is retained and the time base is decreased (increase of the frequency);
- c) decimation: where time slices of the historical data are removed when the amplitudes are below a specified threshold value.

The amplification method as stated in a) above, is used in this standard and together with the publications referred to in Clause 2, it defines the default test procedure to be followed when vibration testing items for use on railway vehicles. However, other standards exist and may be used with prior agreement between the manufacturer and the customer. In such cases test certification against this standard will not apply. Where service information is available tests can be performed using the method outlined in Annex A. If the levels are lower than those quoted in this standard, equipment is partially certified against this standard (only for service conditions giving functional test values lower than or equal to those specified in the test report).

Whilst this standard is primarily concerned with railway vehicles on fixed rail systems, its wider use is not precluded. For systems operating on pneumatic tyres, or other transportation systems such as trolleybuses, where the level of shock and vibration clearly differ from those obtained on fixed rail systems, the supplier and customer can agree on the test levels at the tender stage. It is recommended that the frequency spectra and the shock duration/amplitude be determined using the guidelines in Annex A. Equipment tested at levels lower than those quoted in this standard cannot be fully certified against the requirements of this standard.

An example of this is trolleybuses, whereby body-mounted trolleybus equipment could be tested in accordance with category 1 equipment referred to in the standard.

This standard applies to single axis testing. However multi-axis testing may be used with prior agreement between the manufacturer and the customer.

The test values quoted in this standard have been divided into three categories dependent only upon the equipment's location within the vehicle.

Category 1 Body mounted

Class A Cubicles, subassemblies, equipment and components mounted directly on or under the car body.