

SLOVENSKI STANDARD
SIST EN 14813-2:2007+A1:2010
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Železniške naprave - Klimatske naprave v voznih kabinah - 2. del: Preskusi tipa

Railway applications - Air conditioning for driving cabs - Part 2: Type tests

Bahnanwendungen - Luftbehandlung in Führerräumen - Teil 2: Typprüfungen

Applications ferroviaires - Conditionnement de l'air pour cabines de conduite - Partie 2:
Essais de type

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EUROPEAN STANDARD
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Railway applications - Air conditioning for driving cabs - Part 2: Type tests

Applications ferroviaires - Conditionnement de l'air pour
cabines de conduite - Partie 2: Essais de type

Bahnanwendungen - Luftbehandlung in Führerräumen -
Teil 2: Typprüfungen

This European Standard was approved by CEN on 26 June 2006 and includes Amendment 1 approved by CEN on 28 September 2010.

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EN 14813-2:2006+A1:2010 (E)

Foreword

This document (EN 14813-2:2006+A1:2010) has been prepared by Technical Committee CEN/TC 256 "Railway applications", the secretariat of which is held by DIN.

This European Standard shall be given the status of a national standard, either by publication of an identical text or by endorsement, at the latest by May 2011, and conflicting national standards shall be withdrawn at the latest by May 2011.

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

This document includes Amendment 1, approved by CEN on 2010-09-28.

This document supersedes EN 14813-2:2006.

The start and finish of text introduced or altered by amendment is indicated in the text by tags \square_{A1} \square_{A1} .

\square_{A1} This document has been prepared under a mandate given to CEN/CENELEC/ETSI by the European Commission and the European Free Trade Association, and supports essential requirements of EU Directive 2008/57/EC.

For relationship with EU Directive 2008/57/EC, see informative Annex ZA, which is an integral part of this document. \square_{A1}

This series of European Standard includes the following parts:

- EN 14813-1, *Railway applications — Air conditioning for driving cabs — Part 1: Comfort parameters*
- EN 14813-2, *Railway applications — Air conditioning for driving cabs — Part 2: Type tests*

In the context of this series, there are two further series on air conditioning in rolling stock:

- EN 13129-1, *Railway applications — Air conditioning for main line rolling stock — Part 1: Comfort parameters*
- EN 13129-2, *Railway applications — Air conditioning for main line rolling stock — Part 2: Type tests*
- EN 14750-1 *Railway applications — Air conditioning for urban and suburban rolling stock — Part 1: Comfort parameters*
- EN 14750-2 *Railway applications — Air conditioning for urban and suburban rolling stock — Part 2: Type tests*

According to the CEN/CENELEC Internal Regulations, the national standards organizations of the following countries are bound to implement this European Standard: Austria, Belgium, Bulgaria, Croatia, Cyprus, Czech Republic, Denmark, Estonia, Finland, France, Germany, Greece, Hungary, Iceland, Ireland, Italy, Latvia, Lithuania, Luxembourg, Malta, Netherlands, Norway, Poland, Portugal, Romania, Slovakia, Slovenia, Spain, Sweden, Switzerland and United Kingdom.

Introduction

The object of this European Standard is to establish programmes and test methods to verify the air conditioning installations as described in EN 14813-1.

If necessary, the revised requirements due to operating constraints of the vehicle will be detailed in the contractual specification. This European Standard applies if there is no particular clause in the contractual specification.

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EN 14813-2:2006+A1:2010 (E)**1 Scope**

This European Standard is applicable to railway vehicle driving cabs which are air-conditioned or heated/ventilated. These include:

- locomotives;
- mainline, suburban or regional vehicles;
- urban vehicles such as metros and trams.

This European Standard does not consider the special operational requirements of shunt locomotives.

This European Standard specifies the comfort parameter measurement methods for driving cabs.

The comfort parameters and their tolerances cited in this European Standard are defined in EN 14813-1.

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 14813-1:2006, *Railway applications — Air conditioning for driving cabs — Part 1: Comfort parameters*

EN ISO 3381, *Railway applications — Acoustics — Measurement of noise inside railbound vehicles (ISO 3381:2005)*

EN ISO 7726:2001, *Ergonomics of the thermal environment — Instruments for measuring physical quantities (ISO 7726:1998)*

CIE 85, *Solar spectral irradiance*¹⁾

3 Terms and definitions

For the purposes of this document, the terms and definitions given in EN 14813-1:2006 apply.

4 Test classification

Two levels of testing are detailed in this European Standard.

TL1 is a simplified level that gives principle information about the functionality of the system. It does not aim to verify the comfort parameters and performance of the system. It can be done in a workshop or at a yard. TL2 is a full level test to verify the comfort parameters and the performance of the system. This test shall be performed in a climatic chamber or in an appropriate environment.

The operator shall detail in his contractual specification the test classification.

¹⁾ To be purchased from: International Commission of Illumination, CIE Central Bureau, Kegelgasse 27, A-1030 Wien.

In the absence of any detail, the full level of testing (TL2) shall apply. If not stated otherwise, the following test requirements apply to both TL1 and TL2.

5 Preliminary verifications

It is advised that preliminary tests are carried out to verify the electrical and electronic assemblies, the functional logic of the control system, the air tightness of the air distribution system, the water tightness of the car, the thermal capacity of the air conditioning equipment and so on. These verifications should be conducted before proceeding to the comfort test.

6 Comfort tests

6.1 Air movement tests²⁾

6.1.1 General remarks

The tests shall be carried out under the following conditions:

- vehicle stationary and protected from rain;
- altitude < 1 000 m above sea level;
- exterior air speed between 0 km/h and 5 km/h;
- exterior temperature between + 15 °C and + 30 °C.

In the case of different altitude and exterior temperature, correction shall be made.

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6.1.2 Air flow rates

The flow rates of outside air (fresh air) shall be measured in accordance with 10.5.

6.1.3 Pressure differentials (visualisation)

If appropriate, this can be shown up by the movement of smoke between the two relative areas.

The visualisation shall be made for driving cabs to verify that the air conditioning installation is well designed by preventing the transfer of smoke to a non-smoking area.

6.2 Measurement of air speeds

These tests shall be carried out during the climatic tests without the simulation of the thermal and volumetric effects of occupation (the necessary heating elements, humidification and ventilation equipment can affect the measurement inside the comfort envelope). Measuring points shall be according to Annex D.

6.3 Thermal comfort

It is recommended for a detail analysis of thermal comfort to use thermal mannequins.

²⁾ This is applicable for TL1 and TL2.

EN 14813-2:2006+A1:2010 (E)**7 Climatic tests****7.1 General remarks**

Annex A defines the test programme for level TL1. These tests are only carried out on a stationary vehicle at air speed as defined in Annex A.

Annex B defines a minimum schedule of tests for level TL2 which enables the verification of comfort parameters defined in EN 14813-1. The order of the tests is not obligatory but shall be compatible with the physical conditions of the test and the means of measurement.

Throughout the tests, all the values at the measuring points defined in Clause 11 shall be recorded continuously, as well as the energy consumption and the power absorbed by the air conditioning installation itself, and the whole of the vehicle.

Should other requirement such as for example the doors, the power supply, the lighting etc., need to be tested, these tests shall not interfere in any way with the tests on the air conditioning equipment installed.

7.2 Preheating test**7.2.1 Test level TL1**

The test conditions for preheating are defined in Annex A.

Before the start of the preheating test, the interior temperatures of the air and the interior surfaces shall be within ± 2 K of the exterior air temperature for at least 15 min.

It is anticipated that the temperature stabilisation process may take up to 8 h.

7.2.2 Test level TL2

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The test conditions for preheating are defined in Annex B.

Before the start of the preheating test, the interior temperatures of the air and the interior surfaces shall be within ± 1 K of the exterior air temperature for at least 15 min.

7.3 Precooling test**7.3.1 Test level TL1**

The test conditions for precooling are defined in Annex A.

Before the start of the precooling test, the interior temperatures of the air and the interior surfaces shall be within ± 2 K of the exterior air temperature for at least 15 min.

At this time, before starting the precooling test, the artificial sunlight equipment or equivalent heating power shall be switched on for 2 h, corresponding to the values given in Annex D of EN 14813-1:2006, with doors and windows closed.

7.3.2 Test level TL2

The test conditions for precooling are defined in Annex B.

Before the start of the precooling test, the interior temperatures of the air and the interior surfaces shall be within ± 1 K of the exterior air temperature for at least 15 min.

At this time, before starting the precooling test, the artificial sunlight equipment or equivalent heating power shall be switched on for 2 h, corresponding to the values given in Annex D of EN 14813-1:2006, with all doors and windows closed.

7.4 Regulation test

The test conditions are defined in Annex A and Annex B.

Starting from stabilised operation (see EN 14813-1:2006, 3.34), after a changing of a parameter (interior or exterior), wait 60 min or three similar consecutive control cycles, then the results obtained shall be in accordance with the requirements defined in EN 14813-1.

8 Tests at extreme exterior operating conditions

The operation of the air conditioning equipment, when installed on the vehicle, shall be checked at the extreme operating temperatures defined in EN 14813-1:2006, 6.3.

For TL1, these tests may be carried out on the air conditioning equipment only.

9 Complementary tests

9.1 Determination of the coefficient k

9.1.1 Purpose of the test

The coefficient k characterises the thermal quality of a driving cab (efficiency of the insulation). The test shall be carried out only at TL2. The test conditions are defined in Annex B.

9.1.2 Definition

The global coefficient k is defined by the following equation:

$$k = \frac{P}{A_e \times (T_{im} - T_{em})}$$

where

- the surface A_e is the developed exterior surface of the assembly including walls, ceiling, floor and ends of the structure for all or part of the driving cab under consideration. This shall include windows, doors and openings;
- P is the thermal power released inside the driving cab, necessary to maintain constantly the difference in absolute value between the interior temperature (T_{im}) measured at 0,8 m above the seat reference point according to Annex D, and the mean exterior temperature (T_{em}).

9.1.3 Procedure

The openings for fresh air and exhaust air are sealed, but not insulated.

The air conditioning installation is isolated. The vehicle is without power (except for the batteries). The doors and the windows are closed.

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It is necessary to provide a heating installation independent of that of the cab, controllable to a low output and distributed in the driving cab. The uniformity of the temperatures inside the vehicle shall be achieved by fans. The power consumption of the heaters and the fans shall be recorded separately.

All the measured data shall be recorded at least once per minute.

The value of the temperature difference $|T_{im}-T_{em}|$ shall be $25\text{ K} \pm 5\text{ K}$. It is recommended to carry out this test with $T_{em} = +5\text{ °C} \pm 2\text{ K}$.

The output of the heating system and of the ventilation is maintained constant; the determination of the coefficient k is possible after stabilisation of the temperatures:

- values of T_{em} and $|T_{im}-T_{em}|$ shall be determined and averaged over a period of 30 min. The variation of these values, over a minimum period of 3 h shall be less than 0,1 K;
- range of temperatures relating to different points of measurement (interior and exterior) shall be less than 2 K.

The coefficient k is calculated using the measurements taken during the last hour of stabilisation of temperatures.

9.2 Thermography

The thermographic test is recommended for evaluation of the thermal quality of the vehicle.

9.3 Noise emission

The measurement of noise shall be carried out with the air conditioning installation functioning in the same modes than at the extreme summer temperature of the zone considered in EN 14813-1:2006, Annex D and Annex E, and in accordance with EN ISO 3381.

9.4 Vibration generation

The measurement of vibration shall be carried out on a stationary vehicle with the air conditioning installation functioning at a level which corresponds to the requirements of the contractual specification.

10 Methods of measurement – Measuring instruments**10.1 General remark**

Continuous recording should be carried out, taking as a base a minimum of sampling rates of one measurement per minute for all the values recorded.

10.2 Temperatures**10.2.1 Air temperature**

The measuring devices shall be class S according to EN ISO 7726:2001, Table 2, and have a maximum drift of $\pm 0,25\text{ K}$ over the duration of recording.

10.2.2 Surface temperatures

In respect of the walls, and in order to measure the real temperature of the relevant surface, precautions shall be taken to protect against external influences such as radiation, convection and transmission of heat.