



# SLOVENSKI STANDARD

## SIST EN 13129:2016

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SIST EN 13129-1:2004

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**Železniške naprave - Klimatske naprave za železniška vozila za dolge proge -  
Parametri za določevanje udobja in tipski preskus**

Railway applications - Air conditioning for main line rolling stock - Comfort parameters and type tests

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Bahnanwendungen - Luftbehandlung in Schienenfahrzeugen des Fernverkehrs -  
Behaglichkeitsparameter und Typprüfung

SIST EN 13129:2016

Applications ferroviaires - Conditionnement de l'air pour matériel roulant grandes lignes -  
Paramètres de bien-être et essais de type

**Ta slovenski standard je istoveten z: EN 13129:2016**

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**ICS:**

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45.060.01	Železniška vozila na splošno	Railway rolling stock in general

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EUROPEAN STANDARD

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## Railway applications - Air conditioning for main line rolling stock - Comfort parameters and type tests

Applications ferroviaires - Conditionnement de l'air  
pour matériel roulant grandes lignes - Paramètres de  
bien-être et essais de type

Bahnanwendungen - Luftbehandlung in  
Schienenfahrzeugen des Fernverkehrs -  
Behaglichkeitsparameter und Typprüfung

This European Standard was approved by CEN on 19 May 2016.

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## European foreword

This document (EN 13129:2016) 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of an identical text or by endorsement, at the latest by February 2017, and conflicting national standards shall be withdrawn at the latest by February 2017.

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

This document supersedes EN 13129-1:2002 and EN 13129-2:2004.

This document has been prepared under a mandate given to CEN 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.

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, Former Yugoslav Republic of Macedonia, France, Germany, Greece, Hungary, Iceland, Ireland, Italy, Latvia, Lithuania, Luxembourg, Malta, Netherlands, Norway, Poland, Portugal, Romania, Slovakia, Slovenia, Spain, Sweden, Switzerland, Turkey and the United Kingdom.

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**EN 13129:2016 (E)****1 Scope**

This European Standard establishes comfort parameters of air conditioning for passenger compartments or saloons of railway vehicles (single level or double-decker). These comfort parameters apply in a similar way to the areas reserved for train staff.

The European Standard also specifies conditions, performance values and the comfort parameter measurement methods for compartments or saloons.

This European Standard is applicable to main line rail vehicles. It does not apply to suburban vehicles, metros, tramways and driver's cabs.

**2 Normative references**

The following documents, in whole or in part, are normatively referenced in this document and are indispensable for its application. For dated references, only the cited edition applies. For undated references, the latest edition of the referenced document (including any amendments) applies.

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

**3 Terms and definitions**

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

**3.1****comfort**

agreeable sensation perceived by a person concerning his or her climatic environment

**3.2****air conditioning installation**

equipment intended for ventilation and/or heating and/or cooling and/or filtration

**3.3****forced air ventilation**

air circulation generated by a mechanical action

**3.4****natural ventilation**

air circulation generated without mechanical action

**3.5****preheating**

process which enables the interior temperatures to be raised without the presence of passengers

**3.6****precooling**

process which enables the interior temperatures to be lowered without the presence of passengers

**3.7****heating**

process which enables the interior temperatures to be raised or maintained



**3.8****cooling**

process which enables the interior temperatures to be lowered or maintained

**3.9****dehumidification**

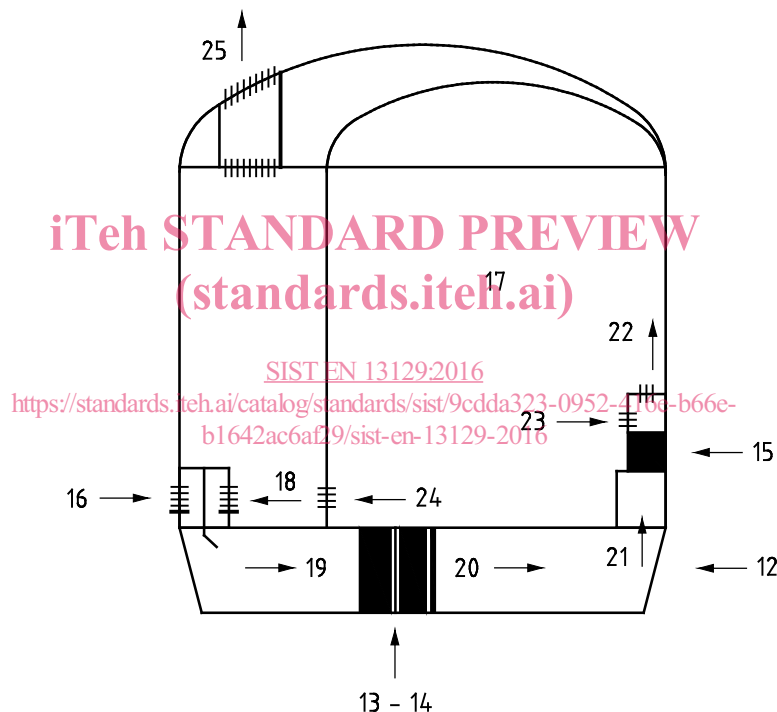
process which reduces the absolute humidity of the interior air

**3.10****air conditioning device**

device which includes ventilation, heating, cooling and/or dehumidification

**3.11****heating and ventilation device**

device which includes ventilation and heating



NOTE The numbers correspond to the following definitions.

**Figure 1 — Diagram explaining certain railway terms**

Note 1 to entry: This representation is only given as an example and does not prejudice the design of the installation.

**3.12****air handling unit**

group of components designed to move, filter and/or mix, heat and/or cool the air

Note 1 to entry: See Figure 1, No 12.

**3.13****cooling unit**

system that carries out the cooling function in a centralized and/or decentralized manner

Note 1 to entry: See Figure 1, No 13.

**EN 13129:2016 (E)****3.14****principal heating unit**

system that carries out the heating function in a centralized and/or decentralized manner with the use of heating elements

Note 1 to entry: It is possible that the heating elements are either associated with forced air ventilation or not.

Note 2 to entry: See Figure 1, No 14.

**3.15****auxiliary heating unit**

de-centralized heating element(s) for adding heat locally

Note 1 to entry: See Figure 1, No 15.

**3.16****fresh air**

air taken from outside the vehicle

Note 1 to entry: See Figure 1, No 16.

**3.17****room air**

air contained in a specified space

Note 1 to entry: See Figure 1, No 17.

**3.18****recirculated or return air**

air taken from the interior of a specified space and re-used

Note 1 to entry: See Figure 1, No 18.

**3.19****mixed air**

combination of fresh air and recirculated air

Note 1 to entry: See Figure 1, No 19.

**3.20****treated or conditioned air**

air that has been filtered

Note 1 to entry: It is possible that the air can have had energy exchanged as it passed through the air handling unit.

Note 2 to entry: See Figure 1, No 20.

**3.21****primary air**

quantity of treated air entering the ducts

Note 1 to entry: See Figure 1, No 21.

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**3.22****supply air**

treated air supplied to a specified space

Note 1 to entry: The treated can be combined with some induced air.

Note 2 to entry: See Figure 1, No 22.

**3.23****induced air**

room air that is taken and re-used locally without additional conditioning

Note 1 to entry: See Figure 1, No 23.

**3.24****transfer air**

air leaving a specified area

Note 1 to entry: See Figure 1, No 24.

**3.25****exhaust air**

air rejected outside the vehicle

Note 1 to entry: See Figure 1, No 25.

**3.26****interior temperature setting**

$T_{ic}$

target temperature to be achieved by the room air

**3.27****mean interior temperature**

$T_{im}$

arithmetic mean of the interior air temperatures measured 1,1 m above the floor unless specified differently

Note 1 to entry: Refer to normative Annex E.

**3.28****mean exterior temperature**

$T_{em}$

arithmetic mean of the exterior air temperatures measured at minimum 0,1 m away from car body

Note 1 to entry: Refer to 17.2.

**3.29****control settling time**

$t_{cs}$

maximum allowed time for achieving stabilized condition after a change of  $T_{ic}$

**3.30****system reaction time**

$t_{rs}$

maximum allowed time for achieving stabilized conditions after a parameter change

EXAMPLE  $T_{em}$ , wind speed, solar load, occupation.

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## EN 13129:2016 (E)

## 3.31

**comfort envelope**

compartment or saloon areas normally occupied by passengers, including bar areas and aisles

## 3.32

**comfort zone**

subset of the comfort envelope such as compartments or other areas

## 3.33

**horizontal range of the extreme interior air temperatures**

absolute difference of the extreme interior air temperatures measured at 1,1 m from the floor

Note 1 to entry: Refer to normative Annex E.

## 3.34

**vertical range of the extreme interior air temperatures**

absolute difference of the extreme interior air temperatures in vertical direction at different heights

Note 1 to entry: Refer to normative Annex F and normative Annex G.

## 3.35

**local annexe**

place where passengers stay temporarily

EXAMPLE Side corridors, vestibules, wash rooms, WCs, nursery, gangways.

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## 3.36

**catering service area**

space or compartment reserved for staff specializing in the preparation and/or sale of food

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## 3.37

**heat transfer coefficient*****k***

ratio between the density of the heat flow rate per unit of surface area and the prevailing difference in temperature  $T_{im}$  and  $T_{em}$  across the relevant walls of the vehicle

Note 1 to entry: The coefficient  $k$  takes account of the efficiency of the insulation of the exterior walls and the effect of the infiltration of air caused by the non-airtightness of the vehicle in motion (doors, windows, various openings) and is applicable to all or part of the vehicle.

Note 2 to entry: This value is expressed in  $W/(m^2 K)$ .

## 3.38

**total solar energy transmittance****solar factor*****g***

ratio between the overall energy flow transmitted to the interior of the vehicle through the window, and the incident solar radiation

## 3.39

**equivalent solar load**

total heat received by  $1 m^2$  surface perpendicular to the radiation emitted by a luminous source (solar equivalent)

Note 1 to entry: According to normative Annex D the simulation of solar exposure is performed with the luminous source inclined at an angle of  $30^\circ$  to the horizontal.

**3.40****heat emission per person**

heat emitted by a seated person normally dressed differentiated into latent ( $q_{lat}$ ) and sensible heat emission ( $q_{sens}$ )

Note 1 to entry: For values refer to normative Annex J.

**3.41****stabilized operation**

operation after  $t_{cs}$  or  $t_{rs}$

Note 1 to entry: Refer to 9.3.2 and 9.3.3.

**3.42****stabilized condition**

stabilized condition is achieved when the difference between the maximum and the minimum values of  $T_{im}$  is less than or equal to the defined limits

Note 1 to entry: Refer to 9.3.4.

**3.43****stand by operation**

mode under which a predetermined interior temperature range is maintained during non-operational activity of the vehicle

**3.44****maximum passenger load**

passenger load corresponding to all seats occupied, including tip-up seats and wheelchair areas in the comfort areas

**3.45****single result**

$X_{ijk}$

value measured in a single measuring point k or the value calculated over all single measuring points from a group k related to one specific  $T_{im}$ , in a single test i, for a single comfort parameter j, considered without regarding measuring tolerances

Note 1 to entry: Refer to Clause 15 for measuring tolerances.

**3.46****quality limit**

**q1**

target quality limit that if fulfilled results in 100% fulfilment

**3.47****quality limit**

**q2**

quality limit required to be fulfilled

**3.48****weighting factor**

$w_{ijk}$

factor to assign importance to different measuring points and parameters

**EN 13129:2016 (E)****3.49****single conformity level**

$Y_{ijk}$   
conformity level for one comfort parameter  $j$ , in one specific test  $i$ , at one measuring point  $k$  or group of measuring points  $k$ , in relation to the corresponding quality limits  $q_1$  and  $q_2$

**3.50****specific conformity level**

$Y_{ij,s}$   
weighted arithmetic mean of all single conformity levels  $Y_{ijk}$  in one zone  $s$  for one comfort parameter  $j$ , in one specific test  $i$

**3.51****conformity level  $CL_i$  of a single test**

weighted arithmetic mean of all relevant specific conformity levels  $Y_{ij,s}$  for one test  $i$

**3.52****conformity level  $CL_{SS}$ ,  $CL_{int}$  and  $CL_{TDP}$** 

arithmetic mean of all relevant conformity levels  $CL_i$  for the steady-state tests, intermediate tests and typical daily profiles

**3.53****overall conformity level**

$CL$   
sum of the weighted conformity levels

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Note 1 to entry: The overall conformity level ( $CL$ ) calculation is defined in normative Annex B.

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**3.54****degraded mode**

operation of the air conditioning installation with defined limitations in performance

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**3.55****technical specification**

document, describing specific parameters and/or product requirements as an addition to the requirements of this standard

**3.56****climatic zone**

climatic conditions used to size the air conditioning installation

Note 1 to entry: Refer to Subclauses 7.1.1 and 7.1.2 for the definition of design and the extreme conditions.

**4 Compliance with the standard**

The measured parameters considered for the evaluation of the overall conformity level are those specified in 9.3 and 10.1.1 to 10.1.4. The calculation method is specified in normative Annex B.

The overall conformity level is determined as follows:

- Level A:  $97 \% \leq CL \leq 100 \%$ ;
- Level B:  $93 \% \leq CL < 97 \%$ ;
- Level C:  $85 \% \leq CL < 93 \%$ ;

- Below 85 % or if at minimum one parameter fails the q2 limit, the standard is not conformed to.

The minimum overall conformity level to be applied should be defined in the technical specification. In the absence of such a definition, level C shall be reached at least.

## 5 Comfort parameters

During normal passenger service, comfort is assessed:

- a) on the basis of the following interior climate parameters:
  - i) air temperature,
  - ii) air speed,
  - iii) relative humidity,
  - iv) surface temperatures.
- b) as a function of thermal exchange between the interior climate and a seated person dressed normally in accordance with Figure J.1.
- c) as a function of the exterior climatic conditions which have an indirect effect.

The assessment shall be performed in accordance with normative Annex B and shall be based on the following 7 comfort parameters: **(standards.iteh.ai)**

- 1) range of  $T_{im}$  with respect to  $T_{ic}$ ,
- 2) horizontal range of the extreme air interior temperatures,
- 3) vertical range of the extreme interior air temperatures for seated and standing passengers,
- 4) surface temperatures,
- 5) humidity,
- 6) air speed,
- 7) quality of regulation.

## 6 Quality limits

Each individual country shall be allocated to climatic zones for winter and summer.

NOTE 1 In case any information regarding the classification is requested in technical specification see informative Annex A.

The evaluation of the comfort parameters shall be done by quality limits q1 and q2.

The quality limits q1 and q2 of the extended range shall also be applied to all intermediate test conditions independently of exterior temperature.

NOTE 2 These quality limits are defined depending on exterior temperature in a normal and an extended range.