



SLOVENSKI STANDARD
oSIST prEN ISO 3095:2023

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Nadomešča:
SIST EN ISO 3095:2013

Železniške naprave - Akustika - Merjenje hrupa, ki ga oddajajo tirna vozila (ISO/DIS 3095:2023)

Railway applications - Acoustics - Measurement of noise emitted by railbound vehicles (ISO/DIS 3095:2023)

Akustik - Bahnanwendungen - Messung der Geräuschemission von spurgebundenen Fahrzeugen (ISO/DIS 3095:2023)

Acoustique - Applications ferroviaires - Mesurage du bruit émis par les véhicules circulant sur rails (ISO/DIS 3095:2023)

Ta slovenski standard je istoveten z: prEN ISO 3095

ICS:

17.140.30	Emisija hrupa transportnih sredstev	Noise emitted by means of transport
45.060.01	Železniška vozila na splošno	Railway rolling stock in general

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Railway applications — Acoustics — Measurement of noise emitted by railbound vehicles

ICS: 45.020; 17.140.30

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Foreword

ISO (the International Organization for Standardization) is a worldwide federation of national standards bodies (ISO member bodies). The work of preparing International Standards is normally carried out through ISO technical committees. Each member body interested in a subject for which a technical committee has been established has the right to be represented on that committee. International organizations, governmental and non-governmental, in liaison with ISO, also take part in the work. ISO collaborates closely with the International Electrotechnical Commission (IEC) on all matters of electrotechnical standardization.

The procedures used to develop this document and those intended for its further maintenance are described in the ISO/IEC Directives, Part 1. In particular, the different approval criteria needed for the different types of ISO documents should be noted. This document was drafted in accordance with the editorial rules of the ISO/IEC Directives, Part 2 (see www.iso.org/directives).

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Any trade name used in this document is information given for the convenience of users and does not constitute an endorsement.

For an explanation of the voluntary nature of standards, the meaning of ISO specific terms and expressions related to conformity assessment, as well as information about ISO's adherence to the World Trade Organization (WTO) principles in the Technical Barriers to Trade (TBT), see www.iso.org/iso/foreword.html.

This document was prepared by Technical Committee ISO/TC 43, *Acoustics*, Subcommittee SC 1, *Noise*.

This fourth edition cancels and replaces the third edition (ISO 3095:2013), which has been technically revised.

The main changes compared to the previous edition are as follows:

- the alignment of measurement conditions with ISO 3381:2021
- an improvement of the tonality assessment
- the introduction of specific measurement conditions for hybrid vehicles
- a new informative [Annex C](#) providing guidance information on the track influence on pass-by test results
- an improved specification for additional noise measurements on bridges and other elevated structures in concrete bridge sections (see [Annex E](#))
- a new informative [Annex G](#) specifying the measurement method for parking noise

Any feedback or questions on this document should be directed to the user's national standards body. A complete listing of these bodies can be found at www.iso.org/members.html.

Introduction

Railway exterior noise is encountered both along open track and in and around depots, stops, stations and other holding locations. It includes a number of different physical sources such as rolling noise, impact noise, traction noise, aerodynamic noise, curving noise, braking noise, horn noise and noise from auxiliary equipment and other components. The noise for any given train type strongly depends on the rolling stock design, operating conditions and the track type and condition.

Rolling noise is one of the main sources which contain a significant and sometimes dominant noise contribution from the track. This International Standard is intended to characterize the noise emission from the unit, minimizing the influence of the track.

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Railway applications — Acoustics — Measurement of noise emitted by railbound vehicles

1 Scope

This document specifies measurement methods and conditions to obtain reproducible and comparable exterior noise emission levels and spectra for all kinds of vehicles operating on rails or other types of fixed track, hereinafter conventionally called “unit”.

This document is applicable to type testing of units.

It provides measurement procedures for vehicle exterior noise (in general, a vehicle type test is carried out using only a selected subset of these tests):

- when the vehicle is moving at constant speed;
- when the vehicle is accelerating or decelerating;
- when the vehicle is stationary in different operating conditions.

It does not include all the instructions to characterize the noise emission of the other infrastructure related sources (bridges, crossings, switching, impact noise, curving noise, etc.).

This document is not applicable to:

- the noise emission of track maintenance units while working;
- environmental impact assessment;
- noise immission assessment;
- guided buses;
- warning signal noise.

The results may be used, for example:

- to characterize the exterior noise emitted by units;
- to compare the noise emission of various units on a particular track section;
- to collect basic source data for units.

NOTE Additional guidance is provided in [Annex D](#) for measurements in the specific case of light rail vehicles.

2 Normative references

The following documents are referred to in the text in such a way that some or all of their content constitutes requirements 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.

IEC 60942, *Electroacoustics — Sound calibrators*

IEC 61260-1, *Electroacoustics — Octave-band and fractional-octave-band filters — Part 1: Specifications*

IEC 61672-1, *Electroacoustics — Sound level meters — Part 1: Specifications*

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IEC 62864-1, *Railway Applications — Rolling stock — Power supply with onboard energy storage system — Part 1: Series hybrid system*

EN 15461, *Railway applications — Noise emission — Characterization of the dynamic properties of track sections for pass by noise measurements*

EN 15610, *Railway applications — Acoustics — Rail and wheel roughness measurement related to rolling noise generation*

EN 17343, *Railway applications — General terms and definitions*

EN 60268-4, *Sound system equipment — Part 4: Microphones*

3 Terms and definitions

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

ISO and IEC maintain terminological databases for use in standardization at the following addresses:

- ISO Online browsing platform: available at <https://www.iso.org/obp>
- IEC Electropedia: available at <https://www.electropedia.org/>

3.1 General definitions

3.1.1 type test for noise emission of railbound units

one or more tests performed to prove that a product is capable of conforming to all relevant requirements of a specification

[SOURCE: ISO 12576-1:2001, 3.27, modified — for noise emission of railbound units has been added.]

3.1.2 environmental impact assessment test

measurement performed for collecting data to be used in a prediction method for environmental assessment

3.1.3 train

single self-propelled rail vehicle or a selfpropelled group of physically coupled rail vehicles

Note 1 to entry: The technical definition is given. The operational definition may require further conditions, e.g. driver, registration etc.

Note 2 to entry: A group of trailer vehicles moved by gravity alone is not considered a train.

EXAMPLE 1 Locomotive(s) coupled with trailers.

EXAMPLE 2 One multiple unit, or several multiple units coupled together.

EXAMPLE 3 Self-propelled OTM in running mode.

Note 3 to entry: Examples of trains are shown in [Figure 1](#).

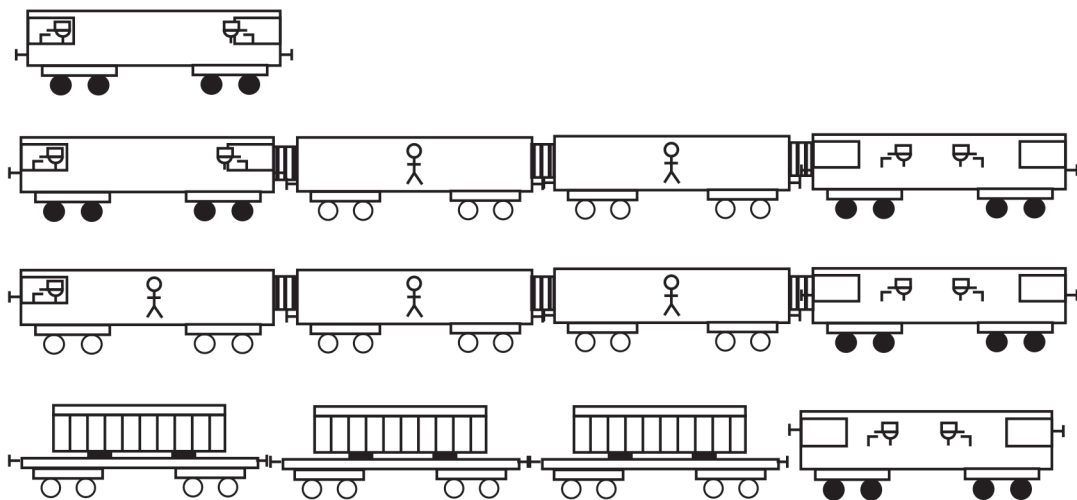


Figure 1 — Examples of trains

[SOURCE: EN 17343]

3.1.4 Coach

carriage
car
trailer to carry passengers

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Note 1 to entry: One or more coaches can be coupled together with a traction vehicle to form a train.

Note 2 to entry: In the operational sense also passenger vehicles within a train set may be called coaches.

Note 3 to entry: examples of coaches are shown in [Figure 2](#).

Note 4 to entry: The technical definition is given. The operational definition may require further conditions, e.g. driver, registration etc.



Figure 2 — Examples of coaches

[SOURCE: EN 17343]

3.1.5 hybrid vehicle

vehicle that can store energy in an onboard ESS (Energy Storage System) and is driven by using the stored energy as well as electric power from a generator or overhead lines

Note 1 to entry: Adapted from IEC 62864-1:2016.

Note 2 to entry: Dual-mode vehicles are not hybrid vehicles because they have no energy storage system on-board.

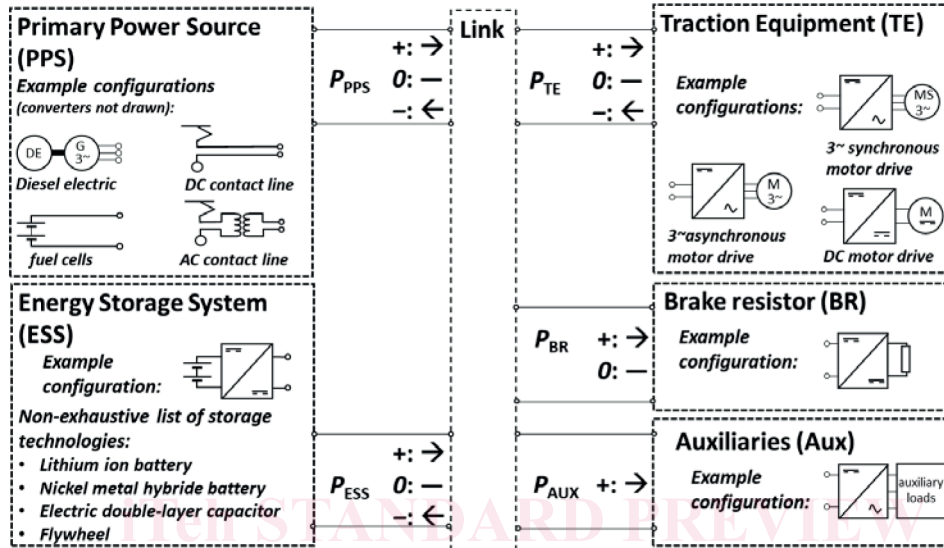
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3.1.6 series hybrid

system which drives a (electric) motor supplied via the power converter for combined operation of electric power from multiple power sources.

Note 1 to entry: Adapted from IEC 62864-1:2016

Note 2 to entry: the wheels are driven by the driving force from the (electric) motor only.



Key

- DE Diesel engine
- P_{PPS} Power of primary power source (PPS)
- P_{TE} Power of traction equipment (TE)
- P_{ESS} Power of energy storage system (ESS)
- P_{BR} Power of brake resistor (BR)
- P_{AUX} Power of auxiliaries (AUX)

Figure 3 — Block diagram of a series hybrid system

3.2 Definitions of track properties

3.2.1 acoustic roughness

$r(x)$
variation of the height of the running surface associated with rolling noise excitation, expressed as a function of distance x along the rail

[SOURCE: EN 15610:2019]

3.2.2 acoustic roughness spectrum

$\tilde{r}(\lambda)$
amplitude of the acoustic roughness expressed as a function of the wavelength λ

[SOURCE: EN 15610:2019]

3.2.3**decay rate on the track**

vibration amplitude decay rate of the vertical or transverse bending waves of the rail

Note 1 to entry: It is represented by a one-third octave band spectrum of the values of the decay rate, expressed in decibels per metre (dB/m) representing the attenuation as a function of the distance.

[SOURCE: EN 15461:2008 and Amd. 1:2010, 3.6, modified – "as a function of the distance along the rail" deleted]

3.2.4**acoustic track characteristics****ATC**

characteristics of the track that are defined in terms of acoustic rail roughness and track decay rates

[SOURCE: ISO 3381:2021]

3.2.5**test section**

specific section of track associated with a particular set of measurements

[SOURCE: EN 15610:2019]

3.2.6**reference track section**

portion of track on which the track decay rates and the acoustic roughness levels are controlled

3.3 Definitions of acoustic measurement quantities**3.3.1****sound pressure**

p

difference between an instantaneous total pressure and the corresponding static pressure

Note 1 to entry: Sound pressure is expressed in pascals (Pa).

[SOURCE: IEC 61672-1:2013]

3.3.2**sound pressure level**

L_p

ten times the logarithm to the base 10 of the ratio of the time-mean-square of a sound-signal to the square of the reference value

$$L_p = 10 \lg \frac{p_{RMS}^2}{p_0^2} \text{ dB}$$

where p_{RMS} is the root-mean-square pressure in the time domain and p_0 is the reference value

Note 1 to entry: Sound pressure level is expressed in decibels (dB).

Note 2 to entry: The reference value is 20 μ Pa.

[SOURCE: IEC 61672-1, modified — equation and definition of terms p_{RMS} and p_0 added]

3.3.3**AF-weighted sound pressure level history**

$L_{pAF}(t)$

A-weighted sound pressure level as a function of time with time weighting F (fast)