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Železniške naprave - Zunanje vidne in zvočne opozorilne naprave - 2. del: Opozorilne sirene za železniška vozila za višje osne pritiske

Railway applications - External visible and audible warning devices - Part 2: Warning horns for heavy rail

Bahnanwendungen - Optische und akustische Warneinrichtungen - Teil 2: Signalhörner für Eisenbahnfahrzeuge

Applications ferroviaires - Dispositifs externes d'avertissement optiques et acoustiques - Partie 2 : Avertisseurs sonores pour systèmes ferroviaire lourds

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Railway applications - External visible and audible warning devices - Part 2: Warning horns for heavy rail

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EUROPEAN COMMITTEE FOR STANDARDIZATION
COMITÉ EUROPÉEN DE NORMALISATION
EUROPÄISCHES KOMITEE FÜR NORMUNG

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European foreword

This document (EN 15153-2:2020) 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of an identical text or by endorsement, at the latest by July 2020, and conflicting national standards shall be withdrawn at the latest by July 2020.

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 15153-2:2013.

The main changes with respect to the previous edition are:

— a new frequency option (c) in 5.2.1;

— clarification of the test site requirements (Figure 1) in 6.1;

— addition of Annex A (list of contractual agreements);

— revision of Annex ZA.

This series of documents *Railway applications — External visible and audible warning devices* consists of the following parts:

— Part 1: *Head, marker and tail lamps for heavy rail;*

— Part 2: *Warning horns for heavy rail (this document);*

— Part 3: V*isible warning devices for urban rail;*

— Part 4: *Audible warning devices for urban rail.*

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 2016/797/EC.

For relationship with EU Directive 2016/797/EC, see informative Annex ZA, which is an integral part of this document.

According to the CEN-CENELEC Internal Regulations, the national standards organisations 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, Republic of North Macedonia, Romania, Serbia, Slovakia, Slovenia, Spain, Sweden, Switzerland, Turkey and the United Kingdom.

Introduction

This document was produced following the creation of EN 15153-4 for urban rail vehicles.

This document was re-named to make a clear distinction between heavy rail and urban rail.

Additionally, Annex ZA was updated for the current status of TSIs.

1 Scope

This document defines warning horn requirements that deliver the required audibility of approaching heavy rail vehicles. The requirements of this document do not apply to urban rail systems.

NOTE 1 The requirements for exterior audible warning devices for urban rail vehicles are found in EN 15153-4.

In the case of shunting heavy rail vehicle formations, the requirements of this document do not apply to the pushed vehicle(s).

For this purpose, the following requirements are included:

— functional and technical requirements of the warning horn as a component,

— functional and technical requirements of the integration of warning horns into the vehicle, and

— test requirements.

Operational requirements and maintenance requirements for warning horns are excluded.

NOTE 2 The requirements for the control of warning horns can be found in EN 16186-2.

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.

EN 16186-2:2017, *Railway applications — Driver's cab — Part 2: Integration of displays, controls and indicators*

EN 61672-1:2013, *Electroacoustics — Sound level meters — Part 1: Specifications (IEC 61672-1:2013)*

EN 61672-2:2013+A1:2017, *Electroacoustics — Sound level meters— Part 2: Pattern evaluation tests (IEC 61672-2:2013/A1:2017)*

EN IEC 60942:2018, *Electroacoustics — Sound calibrators (IEC 60942:2017)*

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:

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

3.1
warning horn
device or assembly capable of producing the specified audible warning tones

3.2
vehicle front
leading edge of the train in its operational condition

Note 1 to entry: This is the extreme front edge of any of the following - couplers, buffers, structures and vehicle profile.

3.3
C-weighted sound pressure level (time-equivalent)
$L_{pCeq,T}$
sound pressure level obtained using the frequency weighting C, given by the following formula:

$$L_{pCeq,T} = 10\lg\left(\frac{1}{T}\int_0^T \frac{p_C^2(t)}{p_0^2}dt\right)$$

where

$L_{pCeq,T}$ is the C-weighted equivalent continuous sound pressure level, in dB;

$p_{C(t)}$ is the C-weighted instantaneous sound pressure, in Pa;

T is the measurement time interval, in s;

p_0 is the reference sound pressure in Pa ; $p_0 = 2 \times 10^{-5}$ Pa

3.4
contractor
organization responsible for

— the design, manufacture or supply of the warning horn (may also be referred to as the ‘supplier’); and

— the purchase, installation or use of the warning horn (may also be referred to as the ‘customer’)

4 Symbols and abbreviations

For the purposes of this document, the following symbols and abbreviations apply.

Hz Hertz, the SI unit of frequency

5 Requirements

5.1 General

Trains shall be fitted with one or more warning horns on the leading vehicle.

All vehicle fronts shall be fitted with warning horn(s).

In the case of shunting locomotives only, the requirements of this document may be satisfied by a single omni-directional warning horn.

Consideration shall be given to the location of the warning horns, taking into account the possible exposure of staff to excessive noise.

NOTE The aim is to control the risk of accidental hearing damage when a horn is sounded at a time when a person is working close to the horn.

The limitation of noise exposure to persons inside the driver's cab are addressed by respecting the limit values for driver's cab noise exposure as given in TSI Noise. In order to minimize environmental impact, warning horns should be orientated along the longitudinal axis of the vehicle.

It is permissible for trains to be fitted with additional audible warning devices.

5.2 Acoustic requirements

5.2.1 Frequencies

The notes of the audible warning horns are intended to be recognizable as being from a train and not be similar to warning devices used in road transport, factories or other common warning devices. The warning horn frequencies shall be selected from the following options:

a) Two separately sounded warning horns. The fundamental frequencies of the warning horn notes shall be:

   — high note: 370 Hz ± 20 Hz;

   — low note: 311 Hz ± 20 Hz.

b) Two separately sounded warning horns. The fundamental frequencies of the warning horn notes shall be:

   — high note: 660 Hz ± 30 Hz;

   — low note: 370 Hz ± 20 Hz.

   It is permissible for these horns to be sounded simultaneously.

   NOTE 1 This is derived from TSI LOC and PAS.

c) One sounded warning horn. The fundamental frequency of the warning horn note shall be either:

— high note: 660 Hz ± 30 Hz; or

— low note: 370 Hz ± 20 Hz.

d) Two warning horns sounded simultaneously. The fundamental frequencies of the notes shall be:

— high note: 470 Hz ± 25 Hz;

— low note: 370 Hz ± 20 Hz.

e) Three warning horns sounded simultaneously. The fundamental frequencies of the notes shall be:

— high note: 622 Hz ± 30 Hz;

— middle note: 470 Hz ± 25 Hz;

— low note: 370 Hz ± 20 Hz.

Where a second sound is required additionally to the simultaneous sounds for cases d) and e), the second sound shall be produced by sounding only the note of 370 Hz ± 20 Hz.

In the case of trains intended for national use only, the deviation in Annex E is permissible.

NOTE 2 It is desirable for warning horns to provide a spectrum which is rich in harmonics, to optimize audibility for persons with partial hearing loss.

5.2.2 Sound pressure level

The C-weighted sound pressure level $L_{pCeq,T}$ produced by each horn sounded separately (or in a group if designed to sound simultaneously) shall be between 101 dB and 109 dB when measured and verified in accordance with the requirements defined in Clause 6.

In the case of trains intended for national use only, the deviation in Annex E is permissible.

5.3 Operation

The control of warning horns from the driver's cab shall be as specified in EN 16186-2.

5.4 Energy supply

Warning horns shall be operated using an energy source that is readily available on the vehicle carrying the horn. The horn shall meet the technical requirements of this document over the full range of energy levels encountered on the vehicle in its normal operational condition. Where agreed between contractors, the horn shall be operational over an extended range of energy levels.

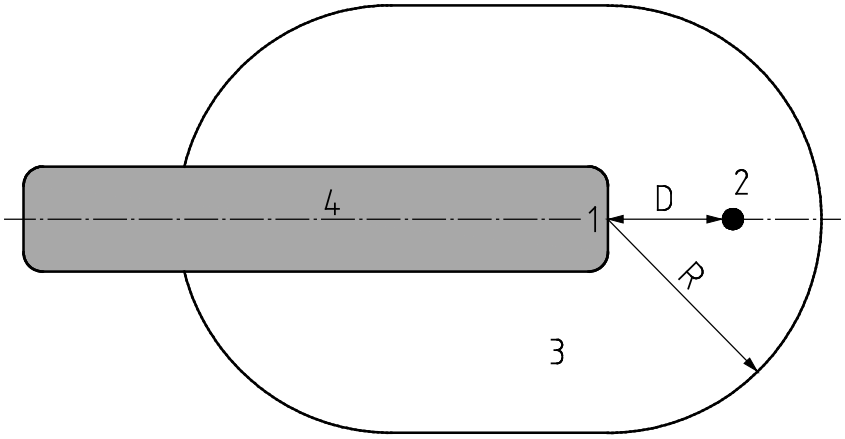
5.5 Impact protection

Warning horns and their control systems should be protected from impact and subsequent blockage by airborne objects such as debris, dust, snow, hail and birds. Where such protection features are used, the acoustic requirements shall apply with any protection features in place.

6 Test requirements

6.1 Environmental test conditions

Where tests on the train are conducted, acoustic measurements of warning horns shall be carried out with the horns mounted to rail vehicles in an open, flat site, as shown in Figure 1. Neither substantially acoustically reflective nor substantially acoustically absorbing surfaces are allowed in the test site. Measurements on ice, snow and frozen soil or frozen ballast shall not be undertaken.



Key

D = 25 m
R ≥ 2D

1 front of train
2 measurement position
3 open area
4 centre-line of train

Figure 1 — Open site for warning horn measurements

The weather conditions (ambient temperature, humidity, wind speed, wind direction and precipitation) shall be registered.

The $L_{pCeq,T}$ with T = 20 s of background noise at the measurement positions shall be at least 10 dB below the noise level obtained when measuring the noise from the horn in the presence of background noise. For frequency analysis, this difference shall be at least 10 dB in each frequency band of interest.

Where additional tests for the functionality of the horn under snow conditions are required, these shall be carried out according to the procedure described in Annex C.

6.2 Test equipment

Each component of the instrumentation system shall meet the requirements for a type 1 instrument, as specified in EN 61672-1:2013.

A suitable microphone windscreen shall always be used during the tests.

The calibration of the measuring system shall be verified before and after each series of measurements. The adjustment of the measurement equipment shall use a class 1 sound calibrator that meets the requirements set out in EN IEC 60942:2018 and shall include the calibration at least at one frequency in the range of frequencies of interest. The measurement results shall be rejected if the difference between the adjusted results before and after calibration is greater than 0,5 dB.