SLOVENSKI STANDARD
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Železniške naprave - Voznikova kabina - 5. del: Zunanja vidljivost tramvajskih vozil

Railway applications - Driver's cabs - Part 5: External visibility for tram vehicles

Bahnanwendungen - Führerraum - Teil 5: Sichtbedingungen nach außen bei Straßenbahnfahrzeugen

Applications ferroviaires - Cabines de conduite - Partie 5 : Visibilité extérieure depuis la cabine de tramways

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ICS:

45.060.10	Vlečna vozila	Tractive stock
45.140	Oprema za podzemne vlake, tramvaje in lahka tirna vozila	Metro, tram and light rail equipment

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Railway applications - Driver's cabs - Part 5: External visibility for tram vehicles

Applications ferroviaires - Cabines de conduite - Partie 5 : Visibilité extérieure depuis la cabine de tramways

Bahnanwendungen - Führerraum - Teil 5: Sichtbedingungen nach außen bei Straßenbahnfahrzeugen

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

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European foreword

This document (prEN 16186-5:2019) has been prepared by Technical Committee CEN/TC 256 “Railway applications”, the secretariat of which is held by DIN.

This document is currently submitted to the CEN Enquiry.

This document has been prepared under a mandate given to CEN by the European Commission and the European Free Trade Association.

EN 16186 *Railway applications — Driver's cab* consists of the following parts:

— *Part 1: Anthropometric data and visibility*;

— *Part 2: Integration of displays, controls and indicators*;

— *Part 3: Design of displays*;

— *Part 4: Layout and access*;

— *Part 5: External visibility for tram vehicles*;

— *Part 6: Working environment in tram vehicles* [1];

— *Part 7: Design of displays for tram vehicles* [2];

— *Part 8: Tram vehicle layout and access* [3].

1 Under development.

2 Under development.

3 Under development.

1 Scope

This document defines the external front and rear visibility conditions for cabs of tram vehicles and the associated assessment method.

The requirements of this document apply to vehicles operating on tram networks.

This document does not apply to refurbishment of existing vehicles.

This document does not apply to driver's auxiliary cabs.

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 15152:2019, *Railway applications – Windscreens for rail vehicles*

ISO 20176, *Road vehicles – H-point machine (HPM-II) – Specifications and procedure for H-point determination*

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 http://www.iso.org/obp

3.1
windscreen
windscreen used by a driver in service to observe the track and signals

Note 1 to entry: For the purpose of this document, “windscreen” refers to driver's windscreen.

[SOURCE: EN 15152:2019, 3.1, modified — "Glazing" is replaced with "windscreen" at the start of the definition, the wording was altered and the current Note 1 to entry was added.]

3.2
sagittal plane
XZ plane passing in the middle of the dummy

3.3
side windscreen
additional glazing positioned at the side of a windscreen that is predominately positioned transversely to the running direction

[SOURCE: EN 15152:2019, 3.2.2]

3.4
tram network
urban rail network with its own right of way or shared with road traffic

Note 1 to entry: Typically line of sight operation.

Note 2 to entry: A tram network could be linked to other rail networks.

3.5
tram vehicle
rail vehicle operated within line of sight and designed to run on a tram network

Note 1 to entry: An assembly of one or more coupled tram vehicles is usually called a tram.

3.6
primary vision area
area of the windscreen through which track and signals are visible from the driving position

Note 1 to entry: Defined as “vision area A” by EN 16186-1:2014+A1:2018, 3.1.3.

[SOURCE: EN 15152:2019, 3.3, modified — The current Note 1 to entry was added.]

3.7
secondary vision area
area of the windscreen outside the primary vision area, through which the driver may also look from the driving position

Note 1 to entry: Defined as “vision area B” by EN 16186-1:2014+A1:2018, 3.1.4.

[SOURCE: EN 15152:2019, 3.4, modified — The current Note 1 to entry was added.]

3.8
driver dummies
models referring to the min and max anthropometric data

Note 1 to entry: The anthropometric data are provided in Clause 4 of this document.

4 Driver's anthropometric data

4.1 General

This clause defines the anthropometric data on which the requirements for cab forward visibility are based.

The background on these anthropometric data are provided in CEN/TR 16823.

4.2 Data

Figure 1 and Figure 2 give the body size measures. The associated distance between the eyes is given in Table 1.

Dimensions in millimetres

	Min.	Max.
a[a]	1 580	1 940
b[a]	1 480	1 815
c	820	985
d	710	860
e	545	665
f[a]	510	635
g[a]	405	510
h	120	180
i	440	525
[a] Includes 30 mm allowance for shoes.		

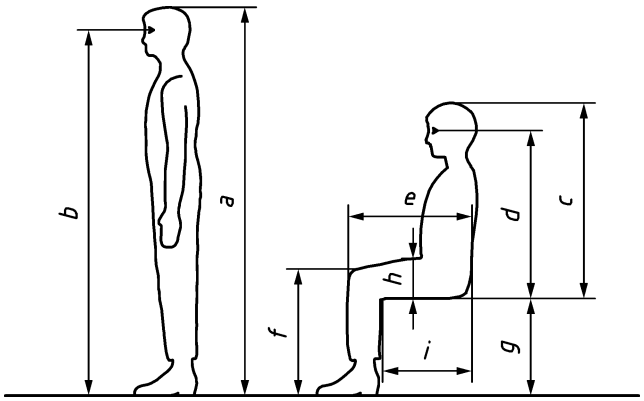
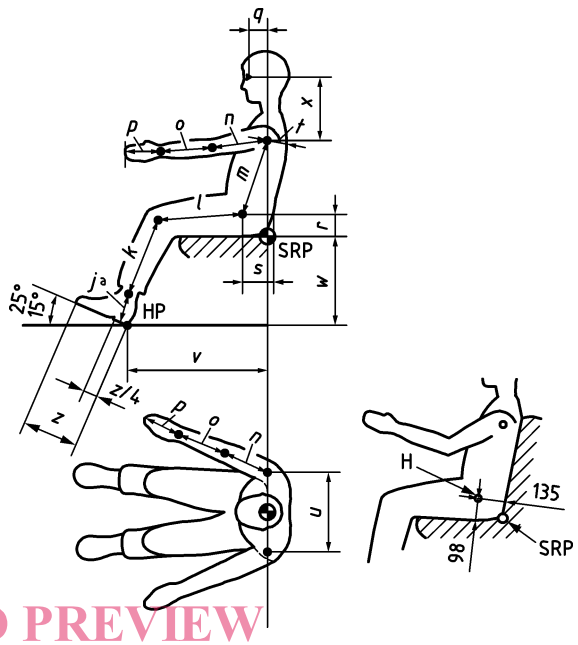


Figure 1 — Principal body size measures

Dimensions in millimetres

	Min.	Max.
j [a]	107	126
k	353	457
l	377	473
m	411	498
n	257	312
o	223	266
p	170	221
q	78	90
r	75	101
s	105	121
t	104	131
u	295	387
v	450 to 550	600 to 700
w	390 to 405	470 to 510
x	232	261
z	220	290

[a] Includes 30 mm allowance for shoes.



Key

H source for hip point: ISO 20176
HP heel point (lowest rear point of the heel)
SRP seat reference point
z/4 non-flexible part of the shoe pad

Figure 2 — Additional body size measures

Table 1 — Distance between eyes

	Min	Max
	53 mm	70 mm
The minimum dimensions shall be used together with the minimum requirements listed in Figure 2. The maximum dimensions shall be used together with the maximum requirements listed in Figure 2.		

5 Forward visibility

5.1 General

For the seated driving position the forward visibility requirements of 5.2.1 shall be ensured (see also Annex A and Annex B).

The horizontal distance from the driver's eye to the windscreen in seated position shall be a minimum of 500 mm and an absolute maximum of 1 715 mm. It is recommended to have a maximum of 1 500 mm.

The sightlines as defined in 5.2.1 shall not be infringed by any permanent equipment of the rolling stock, whether inside or outside the cab.

All visibility criteria shall be applied using both dummies defined in 4.2.

The visibility criteria do not apply to driver instructor locations.

5.2 Forward visibility requirements

5.2.1 Objectives

A good outside field of vision enables the driver to anticipate hazardous situations, taking into account the exterior environment when the tram vehicle is moving. A good close outside field of vision enables the driver to manage the restart of the tram vehicle in relation to the exterior environment. The cab design shall:

— enable all drivers to see the track (free from obstacles, track elements in the correct position);

— enable all drivers to see and recognize the signals intended for them in an adequate sighting distance;

— enable all drivers to anticipate and detect hazard by:

  - having a large field of vision taking account of the technical constraints and the physiological entry data (use of the binocular field of vision);
  - limiting the hidden areas;

— enable all drivers to detect a hazard by limiting the hidden areas: e.g. detection of a pedestrian of 6 years of age or over when the tram vehicle starts moving in area used by pedestrians (in particular stations).

These objectives are met if the requirements listed below are fulfilled.

5.2.2 General

The visibility for the driver from the normal seated position respecting the comfort articular angles, with the hand on the master controller, is covered by the following assessment based on standard reference points of the two driver dummies, on a vehicle in design mass under normal payload conditions on a straight and level track.

Assessment for visibility shall at least be done with one eye point. It can be done with two eyes if needed to fulfil the criteria.

5.2.3 Visibility of external signals

The reference points shall be:

— high reference point: positioned at a height of 6,30 m above the top of rail at a distance of 10 m from the front plane of the buffer or automatic coupler or the most external leading point of the vehicle and positioned laterally right and left from the straight track axis at a distance of 3,50 m; and

— low reference point: positioned at top of rail level at a distance of 15 m from the front plane of the buffer or automatic coupler or the most external leading point of the vehicle and positioned laterally right and left from the straight track axis at a distance of 3,15 m.

The demonstration of forward visibility shall be done based on a drawing with theoretical lines of sight for both driver dummies.

It is recommended that the minimum longitudinal distance at which low reference points are visible should be reduced.

With this assessment all effects like track curvature, track geometry and vehicle conditions are completely covered, i.e. no additional requirements resulting from those effects shall apply.

The windscreen shall enable upwards visibility of 25° in relation to the horizontal level at eye height in the sagittal plane for the 2 dummies (see Figure 3).

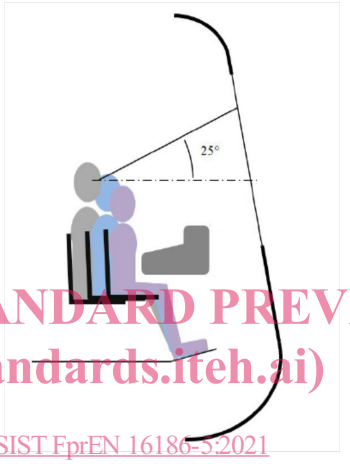


Figure 3 — Upward visibility

5.2.4 Close outside visibility

The close outside visibility for the driver from the normal seated position, with his hand on the master controller, is covered by the following assessment based on a vehicle in design mass under normal payload conditions on a straight and level track.

In case of close-up obstacles, the driver shall have a direct line of sight to the complete area in front of the vehicle. This requirement is assumed to be fulfilled when a cylinder of 1,1m in height and 300 mm in diameter, with its centre placed on the top of rail 650 mm away from the foremost surface of the tram, within a minimum angle of 165° centred on the eye point axis shall always be detected by the driver (see Figure 4).