SLOVENSKI STANDARD
SIST EN 16186-5:2021

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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

SIST EN 16186-5:2021 **en,fr,de**

EUROPEAN STANDARD

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English Version

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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COMITÉ EUROPÉEN DE NORMALISATION
EUROPÄISCHES KOMITEE FÜR NORMUNG

CEN-CENELEC Management Centre: Rue de la Science 23, B-1040 Brussels

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European foreword

This document (EN 16186-5:2021) 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of an identical text or by endorsement, at the latest by Februrary 2022, and conflicting national standards shall be withdrawn at the latest by Februrary 2022.

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.

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: Integration of displays, controls and indicators for tram vehicles*[1];

— *Part 7: Design of displays for tram vehicles*[1];

— *Part 8: Tram vehicle layout and access*[1].

NOTE Part 1 to 4 above-mentioned standard are only applicable for heavy rail vehicles.

Any feedback and questions on this document should be directed to the users' national standards body. A complete listing of these bodies can be found on the CEN website.

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.

[1] Under development.

1 Scope

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

This document applies to vehicles operating on tram networks.

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

This document is not intended to be applied for tram train.

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 trains*

EN 15227, *Railway applications - Crashworthiness requirements for rail vehicles*

EN 15663, *Railway applications - Vehicle reference masses*

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
auxiliary desk
<tram vehicle>
additional control desk with limited functionality generally located in the passenger area

3.2
windscreen
glazing in front of a driver through which the track ahead can be observed

[SOURCE: EN 15152:2019, 3.2, modified — “or passengers” is removed.]

3.3
sagittal plane
XZ plane passing in the middle of the dummy

Note 1 to entry: The XZ directions are defined in EN 15227.

3.4
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]

3.5
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 can be linked to other rail networks.

3.6
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.

3.7
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.]

3.8
secondary vision area
area of the windscreen outside the primary vision area, through which the driver can 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. “May” has been replaced with “can”]

3.9
driver dummies
models referring to the min and max anthropometric data

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

4 Driver's anthropometric data

4.1 General

This Clause defines the anthropometric data on which the requirements in this document 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.

Dimensions in millimetres

Measure	Min.	Max.
a[a]	1 580	1 940
b[a]	1 480	1 815
d	710	860
e	545	665
g[a]	405	510
h	120	180
i	440	525
j [a]	107	126
k	353	457
l	377	473
m	403	498
n	257	312
o	223	266
p	170	221
t	104	131
x	232	261
[a] Includes 30 mm allowance for shoes.		

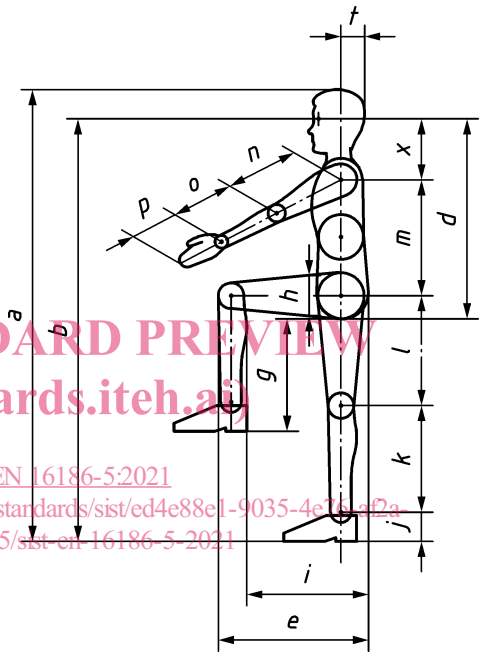
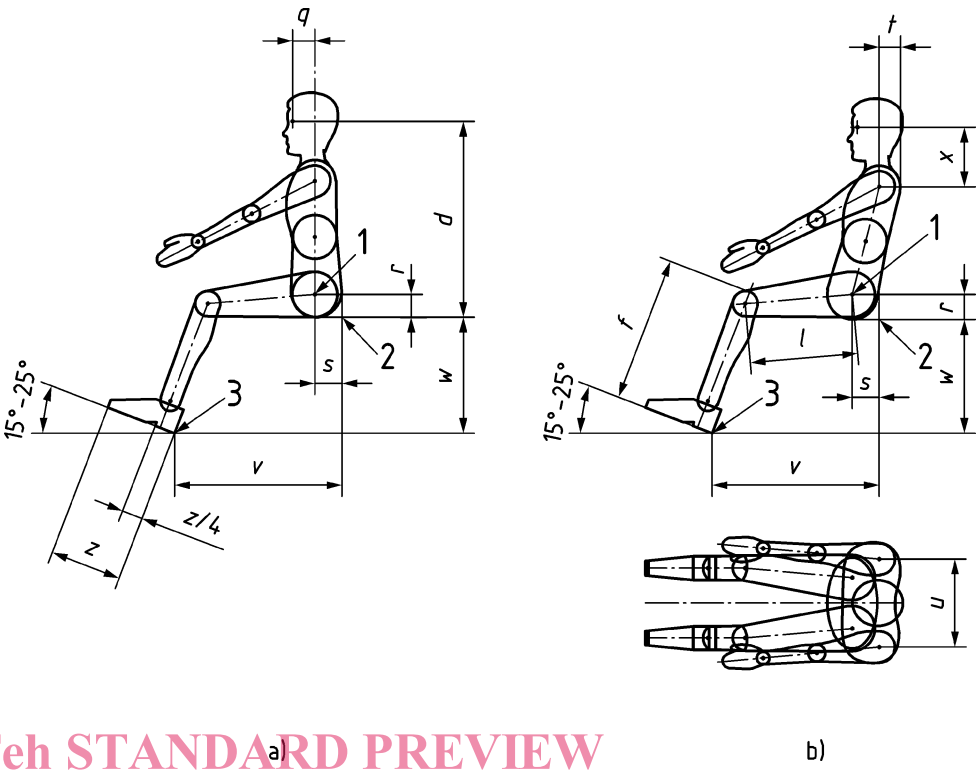


Figure 1 — Principal body size measures

Dimensions in millimetres

	Min.	Max.
d	see Figure 1	
f [a]	510	635
l	see Figure 1	
q	78	90
r	75	101
s	105	121
t	see Figure 1	
u	295	387
v	450 to 550	600 to 700
w	390 to 405	470 to 510
x	see Figure 1	
z	220	290

[a] Includes 30 mm allowance for shoes.



Key

a) sitting upright
b) sitting inclined
1 hip point
2 seat reference point
3 heel point (lowest rear point of the heel)
z/4 non-flexible part of the shoe pad

Figure 2 — Additional body size measures

The minimum distance between the eyes is 53 mm and the maximum distance between the eyes is 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, Figure B.1).

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.

The sightlines as defined in 5.2 shall not be infringed by any permanent equipment of the rolling stock (except for the wiper), 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. The cab design shall enable all drivers:

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

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

— to anticipate and detect hazard by having a large field of vision taking account of the technical constraints and the physiological data (use of the binocular field of vision);

— 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, as defined in EN 16186-8[4], with the hand on the master controller, is covered by the following assessment. The assessment is based on standard reference points of the two driver dummies, on a vehicle in design mass under normal design payload conditions according to EN 15663 on a straight and level track.

Visibility to the outside shall be possible within a minimum angle of 165 °, symmetrical to the sagittal plane (see Figure 5). The forward viewing field is verified on a horizontal level at eye level.

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.

NOTE It is not necessary to do the assessment for the complete range of the different comfort angles.

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;

— 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 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 two dummies (see Figure 3).

Figure 3 — Upward visibility

5.2.4 Close outside visibility

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 1 100 mm 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 is always be detected by the driver. The detection shall be possible within the forward field of view (as defined in 5.2.2).

The criteria are fulfilled, if at least the top surface of the cylinder can be seen by the driver.

If a direct line of sight is technically impossible for external side visibility, an indirect line of sight is allowed.