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Železniške naprave - Vetrobranska stekla za vlake (vključno z dopolnilom A1)

Railway applications - Windscreens for trains

Bahnanwendungen - Frontscheiben für Schienenfahrzeuge

Applications ferroviaires - Vitres frontales pour véhicules ferroviaires

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Schienenfahrzeuge

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EN 15152:2019+A1:2023 (E)**European foreword**

This document (EN 15152:2019+A1:2023) 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of an identical text or by endorsement, at the latest by June 2024, and conflicting national standards shall be withdrawn at the latest by June 2024.

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 **A1** EN 15152:2019 **A1**.

This document includes Amendment 1 approved by CEN on 27 November 2023.

The start and finish of text introduced or altered by amendment is indicated in the text by tags **A1** **A1**.

In comparison with the previous edition, the following technical modifications have been made:

Clause/subclause/table/figure	Change
Whole document and scope	Introduction of urban rail requirements, requirements for high speed trains and for certain types of OTMs
2 Normative references	The normative references have been updated
3 Terms and definitions	Creation of new definitions for different types of windscreen and glazing (e.g lateral windscreens, passenger windscreens, etc)
3 Terms and definitions	A1 New definitions for hotspots, heavy rail systems and urban rail systems A1
4.1.1 Windscreen classifications	New sub clause for the classification of windscreens into different types: driver's windscreens, lateral windscreen, passenger windscreen
4.2 Optical areas	New definitions of different optical areas based on the types of windscreens
4.3 Windscreen test requirements	All the test requirements as well as test prescriptions have been moved to the corresponding sub clauses
4.4 Marking	Former 4.3.3 has been moved and modified
4.5 Service requirements	New sub clause for in service requirements for windscreens
4.6 Storage and handling	New sub clause for storage and handling requirements for windscreens
5 Visual and optical requirements	New clause created for visual and optical requirements in order to separate them from functional requirements
5.1.2 Visual inspection procedure for appearance defects	New sub clause with precise instructions for the inspection of windscreens
5.1.3 Definition and classification of defects	New criteria for defining defects and their tolerances
5.1.4 Defect acceptance criteria	The notion of negligible, minor and major defects has been replaced by the number of acceptable defects on a given

Clause/subclause/table/figure	Change
	surface of the windscreen
5.2 Optical characteristics	New sub clause assembling all the optical requirements as well as the related measurement methods. Different requirements for urban rail have been introduced
6 Mechanical characteristics	New clause assembling all the mechanical requirements for windscreens. The clause has been editorially rearranged with regards to the previous version
6.1.1 Impact test requirements	Separate new requirements for the testing of high speed trains. Temperature ranges for the test have been introduced. The notion of testing at different angles (e.g 90° or at installation angle) has been introduced
6.1.4 Impact test procedure	The test procedure is now described in detail. Notably The notion of testing at different angles (e.g 90° or at installation angle) has been introduced
6.2 Residual visibility	New requirement and associated test
6.4 Resistance to repeated impact from small particles (gravelling)	Editorial rearrangement of the sub clause and introduction of more precise test methods
6.5 Bullet resistance	New requirement and associated test
7 Performance in service	New clause assembling several requirements for heating systems, for the resistance against ageing, the accelerated weathering test, thermal cycling, etc. All the sub clauses have been editorial reworked and more precise test methods have been introduced
Annex A – Determination of windscreen angles	New annex introduced to help the user determine the type of the windscreen (e.g driver's windscreen, lateral windscreen, etc)
Annex B – Transmittance calculation for inclined windscreens	New annex explaining the calculation method for light transmittance of windscreens at installation angle
Annex C – Windscreen test sample mounting	New annex giving precise instructions for the installation of test samples. The set up applies to impact and gravelling tests
Annex D – Impact test projectile	New, more precise criteria for the impact test projectile, based on actual examples
Annex E – Gravelling test projectile	New annex for the precise description of the gravelling test projectile
Annex F – Test samples	New annex with precise requirements for test samples used in different tests throughout the document
Annex G – Summary of testing requirements	Editorial rearrangement of the annex in order to take into account all the changes made to the document
Annex ZA – Relationship between this European Standard and the Essential Requirements of EU Directive 2008/57/EC aimed to be covered	New Annex ZA

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.

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For relationship with EU Directive 2008/57/EC, see informative Annex ZA, which is an integral part of this document.

A1) 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. **A1**

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, Türkiye and the United Kingdom.

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1 Scope

A1 This document specifies the functional requirements for rail vehicle windscreens, including type testing, routine testing, and inspection methods for high speed rail, heavy rail, and urban rail vehicles, including metro and tram applications. **A1**

This document is also applicable for tram vehicles.

For on-track machines (OTMs) when in transport mode (self-propelled or hauled) the requirements of this standard are applicable. OTMs in working configuration are outside the scope of this document.

Determination of the size, shape, orientation and position of windscreens is outside the scope of this document. These data form part of the windscreen technical specification.

This document applies to windscreens made of laminated glass, which is the most commonly used material but also to other materials, subject to the performance requirements being satisfied.

This document does not specify requirements for the interfaces between the windscreen and the vehicle. Accordingly this document does not address issues relating to: installation, structural integrity and crashworthiness.

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 755-2:2016, *Aluminium and aluminium alloys - Extruded rod/bar, tube and profiles - Part 2: Mechanical properties*

EN 1063:1999, *Glass in building - Security glazing - Testing and classification of resistance against bullet attack*

EN 2155-9, *Aerospace series - Test method for transparent materials for aircraft glazing - Part 9 : Determination of haze*

<https://standards.iteh.ai/> EN 45545-2, *Railway applications — Fire protection on railway vehicles — Part 2: Requirements for fire behaviour of materials and components* 2024

EN 50155, *Railway applications — Rolling stock — Electronic equipment*

EN ISO 4892-3, *Plastics - Methods of exposure to laboratory light sources - Part 3: Fluorescent UV lamps (ISO 4892-3)*

EN ISO 11664-1 (CIE S 014-1), *Colorimetry — Part 1: CIE standard colorimetric observers (ISO 11664-1)*

EN ISO 11664-2 (CIE, S 014-2), *Colorimetry — Part 2: CIE standard illuminants (ISO 11664-2)*

EN ISO 11664-3 (CIE, S 014-3), *Colorimetry — Part 3: CIE tristimulus values (ISO 11664-3)*

ISO 48, *Rubber, vulcanized or thermoplastic — Determination of hardness (hardness between 10 IRHD and 100 IRHD)*

ISO 3537, *Road vehicles — Safety glazing materials — Mechanical tests*

ISO 3538:1997, *Road vehicles — Safety glazing materials — Test methods for optical properties*

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ISO 6362-2:2014, *Wrought aluminium and aluminium alloys — Extruded rods/bars, tubes and profiles — Part 2: Mechanical properties*

CIE 15:2004, *Colorimetry, 3rd Edition*¹

CIE 38:1977, *Radiometric and photometric characteristics of materials and their measurement*¹

CIE S 004, *Colours of Light Signals*¹

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>

Note 1 to entry: Figure 1 shows examples of the different types of windscreen, bodyside windows and external glazing.

3.1**glazing**

glass or equivalent transparent material

3.2**windscreen**

glazing in front of a driver or passengers through which the track ahead can be observed

3.2.1**driver's windscreen**

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

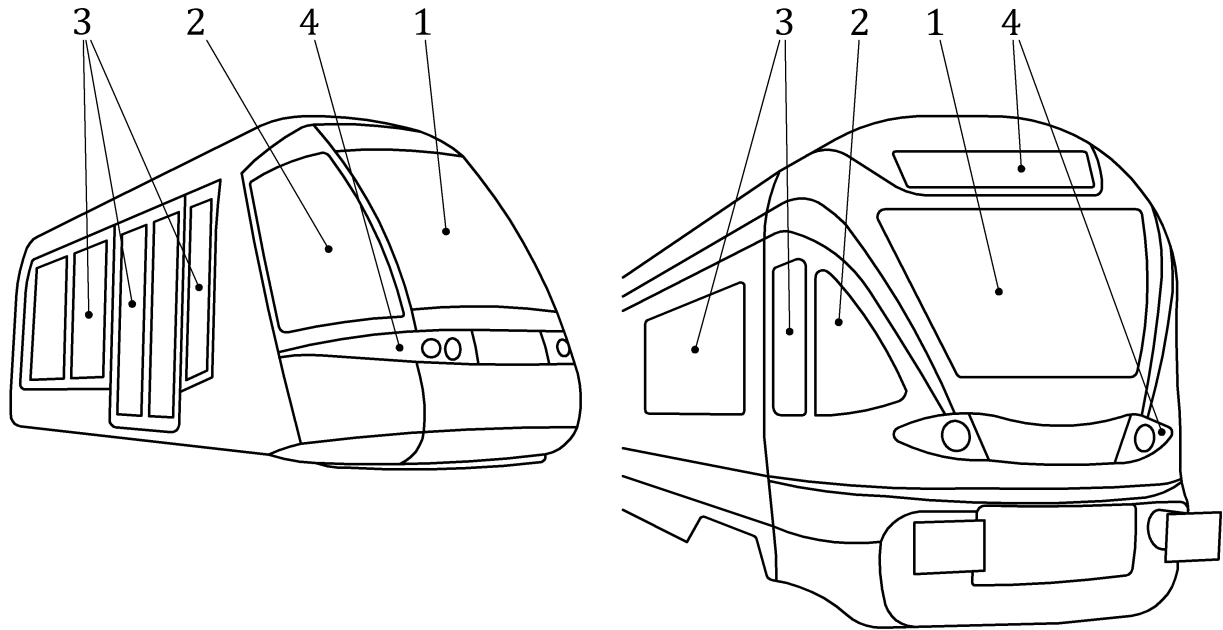
3.2.2**side windscreen**

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

3.2.3**passenger windscreen**

windscreen primarily for passenger use in the leading ends of rail vehicles

¹ Can be obtained from: International Commission of Illumination, CIE Central Bureau, Kegelgasse 27, A-1030 Wien.

a) \square_{A1} urban rail \square_{A1}

b) heavy rail

Key

- 1 driver's windscreen (3.2.1)
- 2 side windscreen (3.2.2)
- 3 bodyside window
- 4 external glazing (for example covers for lights, information displays)

Figure 1 — Windscreen, window and glazing definitions**3.3****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.

3.4**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.

3.5**peripheral area**

area of the windscreen outside the secondary vision area

Note 1 to entry: The peripheral area includes any screen-printed areas.

3.6**secondary image separation**

angular separation between the primary and the brightest secondary images (due to internal reflection) of a distant light source or object when viewed through glazing

EN 15152:2019+A1:2023 (E)**3.7****ultra-violet radiation****UV**

electromagnetic radiation of a wavelength shorter than that of visible light

Note 1 to entry: For the purposes of this document, wavelength is between 200 nm and 380 nm.

3.8**spall**

small glass particles which detach from the face of a window pane when it is subjected to impact on the opposite side

Note 1 to entry: Spalling in this document describes the detachment of spall from the inside face of a windscreen or window, when the outer face is subjected to impact.

3.9**hot-spot**

highly localised area where the temperature deviates significantly from the area surrounding it

A1 3.10**heavy rail system**

conventional rail system intended for intra and inter-regional and/or international transportation

Note 1 to entry: The heavy rail system comprises the heavy rail network, related rolling stock and the associated operation.

Note 2 to entry: Typically, a heavy rail system has standard or broad gauge tracks and infrastructure which are designed for an axle load of at least 17 t. The vehicles comply with a structural design category L, P-I, P-II or F-I according to EN 12663-1:2010+A1:2014 and a crashworthiness design category C-I according to EN 15227:2020.

Note 3 to entry: The heavy rail system is typically intended for passenger and freight transport.

[SOURCE: EN 17343:2020, 3.1.3]

3.11**urban rail system**

rail system intended for local, urban and suburban transportation

Note 1 to entry: The urban rail system comprises the urban rail network, related rolling stock and the associated operation.

Note 2 to entry: The urban rail system covers the transport in urban centres like towns, cities or conurbations and between such centres and surrounding areas.

Note 3 to entry: The urban rail system is predominantly intended for passenger transport.

[SOURCE: EN 17343:2020, 3.1.4]

3.12**metro system**

urban rail system operated by using a command / control system segregated from road traffic or any other rail system

Note 1 to entry: The metro system comprises the metro network, related rolling stock, and the associated operation.

Note 2 to entry: Typically, a metro system has tracks and infrastructure, which are designed for an axle load less than 17 t. The vehicles comply with a structural design category P-III according to EN 12663-1:2010+A1:2014 and a crashworthiness design category C-II according to EN 15227:2020.

Note 3 to entry: The metro system may include underground, elevated or surface sections.

Note 4 to entry: Exceptionally, metro systems may have level crossings and/or share tracks with other rail systems.

[SOURCE: EN 17343:2020, 3.1.4.1]

3.13

tram system

urban rail system operated on separate infrastructure or infrastructure shared with road traffic, or both

Note 1 to entry: The tram system comprises the tram network, related rolling stock, and the associated operation.


Note 2 to entry: Typically, a tram system has tracks and infrastructure, which are designed for an axle load less than 13 t. The vehicles comply with a structural design category P-IV or P-V according to EN 12663-1:2010+A1:2014 and a crashworthiness design category C-IV according to EN 15227:2020.

Note 3 to entry: Sections of the route may be signal controlled.

Note 4 to entry: A tram network can be linked to other rail networks.

Note 5 to entry: For tram systems having sections segregated from road traffic the term light rail system (LRS) may be used.

Note 6 to entry: Road traffic includes road users like cars, pedestrians, cyclists, wheelchair users, etc.

[SOURCE: EN 17343:2020, 3.1.4.2] 

3.14

technical specification

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

3.15

inspector

person with evidence of training, professional knowledge, skill and experience to enable the required inspection(s) to be performed

3.16

seat reference point

SRP

reference point at the back pan of a new seat design with a horizontal distance of 135 mm and vertical distance of 98 mm from the H point according to ISO 20176:2011

Note 1 to entry: See Figure 2 of EN 16186-1:2014+A1:2018.

[SOURCE, EN 16186-1:2014+A1:2018, 3.1.6, modified]

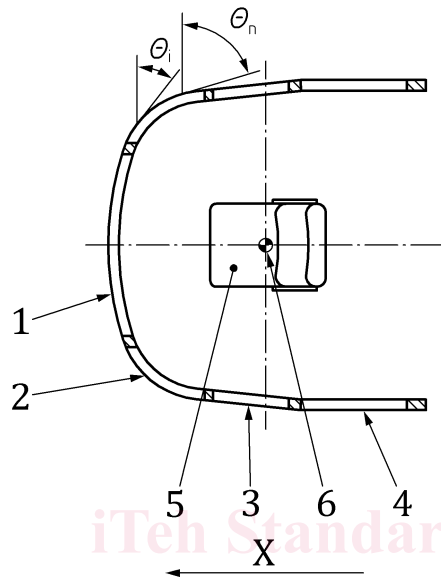
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4 Functional requirements

4.1 General

4.1.1 Windscreen classification

Windscreens are positioned to allow observation of the track and signals ahead of a vehicle. Additional side windscreens or windows may be provided to the side of the windscreen or windscreens (see Figure 2).



Key

- | | |
|----------------------|---|
| 1 | windscreen |
| 2 | side windscreen |
| 3 | side windscreen (cab window forward of seat reference point, see 4.1.2) |
| 4 | bodyside window |
| 5 | driver's seat (or passenger seats, for example in automatic vehicles) |
| 6 | seat reference point (SRP) |
| θ_i, θ_n | plan view angles (for curved windscreens, values vary with position) |
| X | direction of travel |

Figure 2 — Windscreens and side windscreens

The classification of rail vehicle glazing (windscreens, side windscreens or bodyside windows) affects the characteristics required and primarily depends on the orientation relative to the track. For the determination of a windscreen's orientation, only the parts of the glazing which if removed would create an aperture in the structure of the vehicle and expose the occupants of a vehicle to the outside shall be considered. Glazing that covers lights, information displays or extends over the structure for aesthetic purposes is therefore excluded.

Except when the requirements for driver's cabs apply (see 4.1.2), where the projected forward facing area determined according to Annex A is less than or equal to 0,065 m², the glazing shall be considered to be a bodyside window and therefore outside the scope of this document.