SLOVENSKI STANDARD
SIST EN 15152:2019

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Nadomešča:
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Železniške naprave - Vetrobranska stekla za vlake

Railway applications - Windscreens for trains

Bahnanwendungen - Frontscheiben für Schienenfahrzeuge

Applications ferroviaires - Vitres frontales pour trains

Ta slovenski standard je istoveten z: **EN 15152:2019**

ICS:

45.060.10	Vlečna vozila	Tractive stock

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Railway applications - Windscreens for trains

Applications ferroviaires - Vitres frontales pour véhicules ferroviaires

Bahnanwendungen - Frontscheiben für Schienenfahrzeuge

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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 15152:2019) 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of an identical text or by endorsement, at the latest by February 2020, and conflicting national standards shall be withdrawn at the latest by February 2020.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 15152:2007.

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	New definitions for hotspots, heavy rail and light rail
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 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

Clause/subclause/table/figure	Change
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.

For relationship with EU Directive 2008/57/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.

1 Scope

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

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*

EN 45545-2, *Railway applications — Fire protection on railway vehicles – Part 2: Requirements for fire behaviour of materials and components*

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*

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

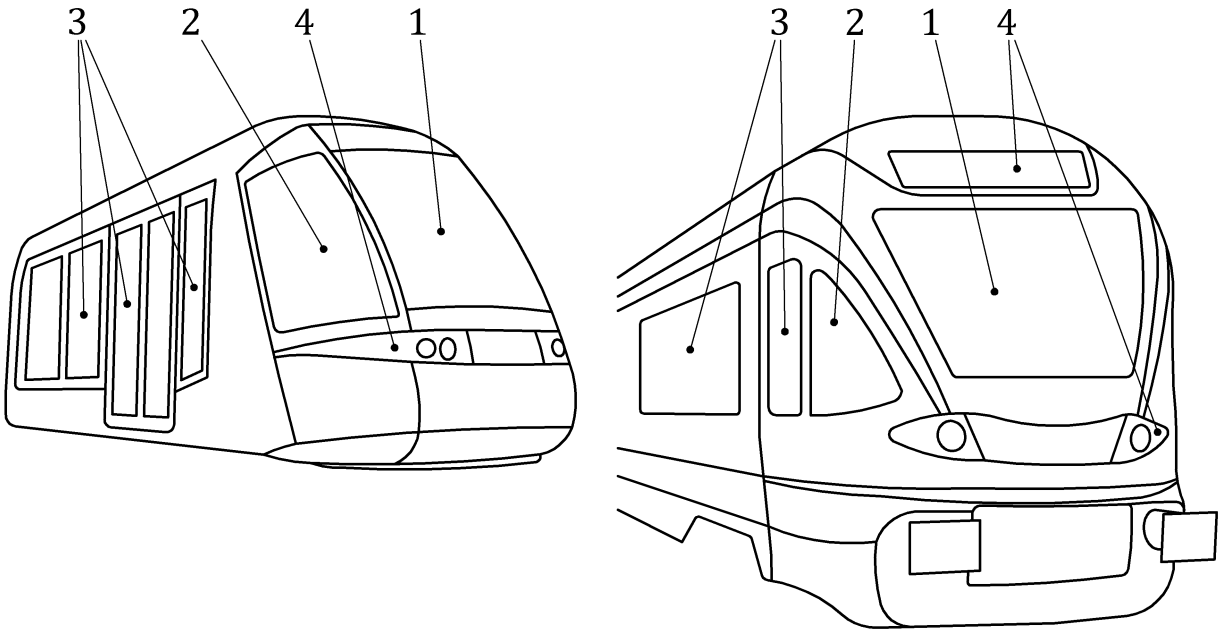
3.2
windscreen
glazing in front of a driver or passengers through which the track ahead can be observed

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) light rail **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

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

3.10
heavy rail
general purpose rail transport system for passengers and freight, for local, regional, long distance or international traffic, accessible to all types of rail vehicles, subject to operational requirements

Note 1 to entry: Heavy rail passenger vehicles are generally structural categories P-I or P-II (in accordance with EN 12663-1) and crashworthiness category C-I (in accordance with EN 15227).

Note 2 to entry: Does not include metro, light rail or tramway systems

3.11
light rail
urban and/or suburban rail transport system (excluding metros), typically only for passengers

Note 1 to entry: Light rail vehicles are generally structural categories P-III, P-IV or P-V (in accordance with EN 12663-1) and crashworthiness categories C-III or C-IV (in accordance with EN 15227).

Note 2 to entry: Light rail systems typically have their own right of way or share it with road traffic and usually do not exchange vehicles with long-distance passenger or freight traffic.

3.12
metro
high-capacity public transport system generally found in urban areas, operated on a dedicated railway infrastructure

Note 1 to entry: Metro vehicles are generally structural categories P-III or P-IV (in accordance with EN 12663-1) and crashworthiness category C-II (in accordance with EN 15227).

Note 2 to entry: Metro systems typically have their own right of way with no level crossings and no interface with road traffic and usually do not exchange vehicles with long-distance passenger or freight traffic.

3.13
tramway
rail system exclusively or predominately for passengers, which typically operates in areas accessible to the public and road traffic and where the speed of the vehicles is limited to enable the driver to stop within the distance they can see to be clear ahead

Note 1 to entry: Tramway vehicles are generally structural categories P-IV or P-V (in accordance with EN 12663-1) and crashworthiness category C-IV (in accordance with EN 15227).

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.

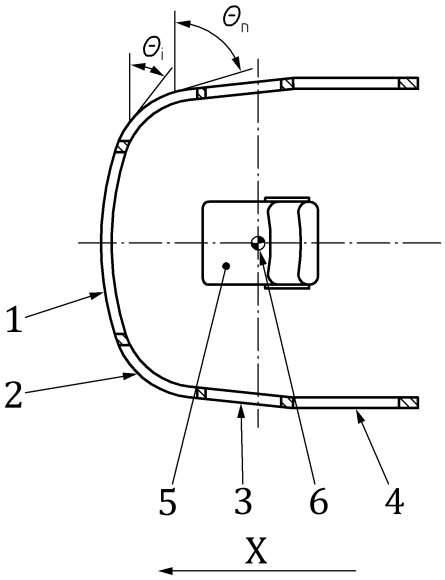
[SOURCE, EN 16186-1:2014+A1:2018, 3.1.6, modified]

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)
Θi, Θn	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.

For windscreens that can be considered to be forward facing (including those which are not required or intended for direct observation of the track and signals) the maximum and minimum plan view angles, Θ (See Figure 2), shall be determined according to Annex A.

For driver's windscreens, with a central driving position, the plan view angle, Θ may be assumed to be = 0°.

The maximum and minimum rake angles Φ shall be determined according to Annex A.

For curved windscreens the method set out in Annex A should be followed for the determination of plan view and rake angles.

The maximum and minimum installation angles Ψ shall be determined from the maximum and minimum plan view angles Θ and the maximum and minimum rake angles Φ using the relation $\cos(\Psi) = \cos(\Theta).\cos(\Phi)$.

The maximum and minimum windscreen plan view angles, rake angles and installation angles shall form part of the specification for manufacture and testing.

Where samples are used to determine optical properties, the maximum installation angle shall be used (see for example 5.2).

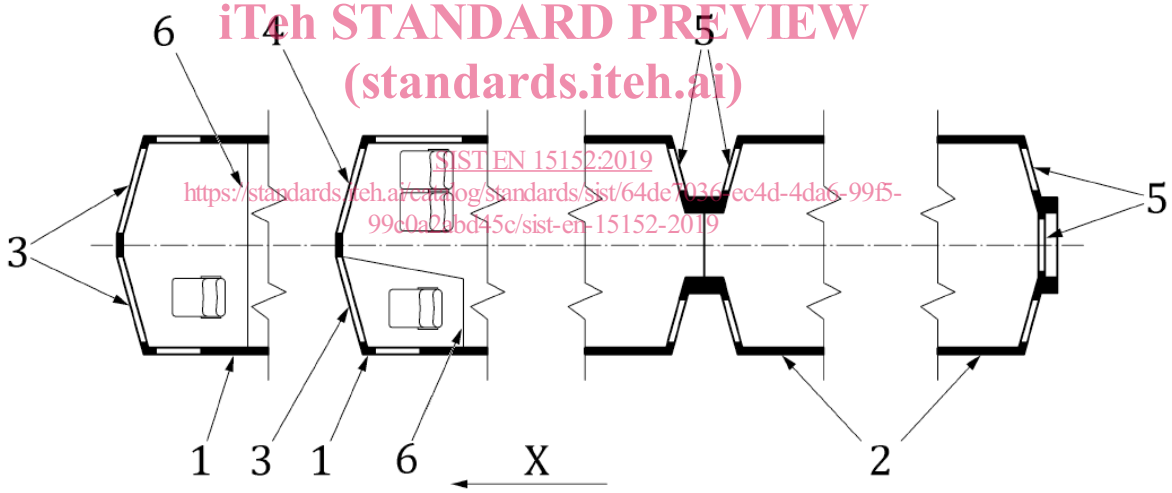
Where samples are used to determine mechanical properties such as impact resistance, the minimum installation angle shall be used (see for example 6.1).

4.1.2 Driver's windscreens

All windows in driver's cabs that are fully or partially in front of the driver's seat reference point (SRP), measured in the longitudinal direction shall be considered as windscreens or side windscreens (see Figure 2).

Where two, or more, windscreens are fitted (for example two on either side of a cab end gangway) and only one of which is required to be a driver's windscreen, the requirements for driver's windscreens shall apply to both (or all) windscreens (see Figure 3).

For driver's windscreens, the plan view angle shall be determined using the points defining the primary vision area (see 4.2, see Zone A in Figure 4).



Key

1 leading vehicle (alternate cab types shown)
2 intermediate and/or end vehicles
3 driver's windscreen(s)
4 passenger windscreen
5 vehicle end windows
6 driver's cab partition wall
X direction of travel

Figure 3 — Windscreens and body end windows