

RAUDTEEALASED RAKENDUSED. RAUDTEEEVEEREMI
TUULEKLAASID

Railway applications - Windscreens for trains

EESTI STANDARDI EESSÕNA

NATIONAL FOREWORD

<p>See Eesti standard EVS-EN 15152:2019+A1:2023 sisaldab Euroopa standardi EN 15152:2019+A1:2023 ingliskeelset teksti.</p> <p>Standard on jõustunud sellekohase teate avaldamisega EVS Teatajas.</p> <p>Euroopa standardimisorganisatsioonid on teinud Euroopa standardi rahvuslikele liikmetele kättesaadavaks 20.12.2023.</p> <p>Standard on kättesaadav Eesti Standardimis- ja Akrediteerimiskeskusest.</p>	<p>This Estonian standard EVS-EN 15152:2019+A1:2023 consists of the English text of the European standard EN 15152:2019+A1:2023.</p> <p>This standard has been endorsed with a notification published in the official bulletin of the Estonian Centre for Standardisation and Accreditation.</p> <p>Date of Availability of the European standard is 20.12.2023.</p> <p>The standard is available from the Estonian Centre for Standardisation and Accreditation.</p>
--	---

Tagasisidet standardi sisu kohta on võimalik edastada, kasutades EVS-i veebilehel asuvat tagasiside vormi või saates e-kirja meiliaadressile standardiosakond@evs.ee.

ICS 45.060.10

Standardite reprodutseerimise ja levitamise õigus kuulub Eesti Standardimis- ja Akrediteerimiskeskusele. Andmete paljundamine, taastekitamine, kopeerimine, salvestamine elektroonsesse süsteemi või edastamine ükskõik millises vormis või millisel teel ilma Eesti Standardimis- ja Akrediteerimiskeskuse kirjaliku loata on keelatud.

Kui Teil on küsimusi standardite autorikaitse kohta, võtke palun ühendust Eesti Standardimis- ja Akrediteerimiskeskusega: Koduleht www.evs.ee; telefon 605 5050; e-post info@evs.ee

The right to reproduce and distribute standards belongs to the Estonian Centre for Standardisation and Accreditation. No part of this publication may be reproduced or utilized in any form or by any means, electronic or mechanical, including photocopying, without a written permission from the Estonian Centre for Standardisation and Accreditation.

If you have any questions about copyright, please contact Estonian Centre for Standardisation and Accreditation: Homepage www.evs.ee; phone +372 605 5050; e-mail info@evs.ee

English Version

Railway applications - Windscreens for trains

Applications ferroviaires - Vitres frontales pour
véhicules ferroviaires

Bahnanwendungen - Frontscheiben für
Schienenfahrzeuge

This European Standard was approved by CEN on 17 June 2019 and includes Amendment approved by CEN on 27 November 2023.

CEN members are bound to comply with the CEN/CENELEC Internal Regulations which stipulate the conditions for giving this European Standard the status of a national standard without any alteration. Up-to-date lists and bibliographical references concerning such national standards may be obtained on application to the CEN-CENELEC Management Centre or to any CEN member.

This European Standard exists in three official versions (English, French, German). A version in any other language made by translation under the responsibility of a CEN member into its own language and notified to the CEN-CENELEC Management Centre has the same status as the official versions.

CEN members are the national standards bodies of 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 United Kingdom.



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

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

Contents	Page
European foreword	4
1 Scope	7
2 Normative references	7
3 Terms and definitions	8
4 Functional requirements	12
4.1 General	12
4.1.1 Windscreen classification	12
4.1.2 Driver's windscreens	13
4.1.3 Passenger windscreens and vehicle end windows	14
4.2 Optical areas	14
4.3 Windscreen test requirements	16
4.3.1 Type tests	16
4.3.2 Routine tests	17
4.4 Marking	17
4.5 Service requirements	17
4.6 Storage and handling of finished windscreens	18
5 Visual and optical requirements	18
5.1 Appearance defects	18
5.1.1 General	18
5.1.2 Visual inspection procedure for appearance defects	18
5.1.3 Definition and classification of defects	21
5.1.4 Defect acceptance criteria	23
5.2 Optical characteristics	23
5.2.1 Secondary image separation	23
5.2.2 Optical distortion	24
5.2.3 Haze	25
5.2.4 Light transmittance	25
5.2.5 Chromaticity	27
6 Mechanical characteristics	30
6.1 Impact resistance	30
6.1.1 Impact test requirements	30
6.1.2 Spalling assessment	32
6.1.3 Impact test projectile velocity	32
6.1.4 Impact test procedure	34
6.1.5 Impact test acceptance criteria	35
6.2 Residual visibility	35
6.2.1 Test samples	35
6.2.2 Test method	36
6.2.3 Acceptance criteria	36
6.3 Resistance against abrasion	36
6.4 Resistance to repeated impact from small particles (gravelling)	36
6.4.1 General	36
6.4.2 Test samples	36
6.4.3 Test method	37
6.5 Bullet resistance	37

7	Performance in service.....	38
7.1	Heating system	38
7.1.1	General	38
7.1.2	Heating uniformity.....	38
7.1.3	Coating based heating systems.....	39
7.1.4	Wire based heating systems	39
7.1.5	Resistance measurement.....	39
7.1.6	Voltage withstand test	39
7.2	Resistance against ageing.....	39
7.2.1	General	39
7.2.2	Accelerated weathering test.....	40
7.2.3	Thermal cycling.....	40
7.2.4	Humidity test.....	41
7.2.5	Windscreen heating test	42
Annex A (normative)	Determination of windscreen angles.....	43
A.1	Determination of windscreen plan view angle.....	43
A.2	Determination of the rake angle	46
Annex B (normative)	Transmittance calculation for inclined windscreen	47
Annex C (normative)	Windscreen test sample mounting	50
Annex D (normative)	Impact test projectile	52
Annex E (normative)	Gravelling test projectile	54
Annex F (informative)	Test samples.....	55
F.1	Test sample properties.....	55
F.2	Test sample for optical tests.....	55
F.3	$\overline{A_1}$ Test sample for mechanical tests $\overline{A_1}$.....	55
F.4	Test sample for ageing tests	55
Annex G (normative)	Summary of testing requirements.....	56
Annex H (informative)	Alternative method for testing resistance to Ultra Violet radiation	57
H.1	General	57
H.2	Test method.....	57
H.3	Interpretation of results	57
Annex ZA (informative)	Relationship between this European Standard and the Essential Requirements of EU Directive 2008/57/EC aimed to be covered.....	58
Bibliography	59

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 editorially 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.

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.

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*

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.