



SLOVENSKI STANDARD
SIST EN 3001:2019

01-september-2019

**Aeronavtika - Utrjene plavajoče steklene plošče za uporabo v zrakoplovih -
Tehnična specifikacija**

Aerospace series - Tempered float glass plies for aircraft applications - Technical specification

Luft- und Raumfahrt - Vorgespannte Floatglasscheiben für Luftfahrzeuganwendungen - Technische Lieferbedingungen

Série aérospatiale - Plis de verre renforcés pour applications aéronautiques - Spécification technique

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49.045 Konstrukcija in konstrukcijski elementi Structure and structure elements

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EUROPEAN STANDARD

EN 3001

NORME EUROPÉENNE

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June 2019

ICS 49.045

English Version

Aerospace series - Tempered float glass plies for aircraft applications - Technical specification

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This European Standard was approved by CEN on 14 January 2019.

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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.

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EUROPEAN COMMITTEE FOR STANDARDIZATION
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 3001:2019) has been prepared by the Aerospace and Defence Industries Association of Europe - Standardization (ASD-STAN).

After enquiries and votes carried out in accordance with the rules of this Association, this Standard has received the approval of the National Associations and the Official Services of the member countries of ASD, prior to its presentation to CEN.

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of an identical text or by endorsement, at the latest by December 2019, and conflicting national standards shall be withdrawn at the latest by December 2019.

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.

According to the CEN-CENELEC Internal Regulations, the national standards organizations of the following countries are bound to implement this European Standard: Austria, Belgium, Bulgaria, Croatia, Cyprus, Czech Republic, Denmark, Estonia, Finland, Former Yugoslav Republic of Macedonia, France, Germany, Greece, Hungary, Iceland, Ireland, Italy, Latvia, Lithuania, Luxembourg, Malta, Netherlands, Norway, Poland, Portugal, Romania, Serbia, Slovakia, Slovenia, Spain, Sweden, Switzerland, Turkey and the United Kingdom.

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EN 3001:2019 (E)**1 Scope**

This document specifies the requirements for tempered soda-lime float glass plies which are made from annealed glass either of the universally available type or of high light transmission type. The annealed glass is manufactured by a continuous process for general use.

The plies are tempered by either a thermal or chemical process.

The tempered glass is used mainly for cockpit glazing.

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 2155-5, *Aerospace series — Test methods for transparent materials for aircraft glazing — Part 5: Determination of visible light transmission*

EN 2155-6, *Aerospace series — Test methods for transparent materials for aircraft glazing — Part 6: Determination of optical defects* ¹⁾

EN 2155-8, *Aerospace series — Test methods for transparent materials for aircraft glazing — Part 8: Determination of optical distortion*

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

EN 9133, *Aerospace series — Qualification Procedure for Aerospace Standard Products*

EN 3861, *Aerospace series — Non-metallic materials — Glass transparencies — Material standard — Thermally tempered soda lime float glass*

EN 3862, *Aerospace series — Non-metallic materials — Glass transparencies — Material standard — Chemically tempered soda lime float glass*

EN 3863, *Aerospace series — Non-metallic materials — Glass transparencies — Test methods — Determination of flatness*

EN 3864, *Aerospace series — Non-metallic materials — Glass transparencies — Test methods — Determination of modulus of rupture*

EN 3865, *Aerospace series — Stress/optical measurement of tempered glass — Test method* ²⁾

EN 3866, *Aerospace series — Non-metallic materials — Glass transparencies — Test methods — Determination of ream and surface ripple*

1) Published as ASD-STAN Prestandard at the date of publication of this standard by AeroSpace and Defence industries Association of Europe - Standardization (ASD-STAN) (<http://www.asd-stan.org/>)

2) In preparation at the date of publication of this standard.

EN ISO 489, *Plastics — Determination of refractive index*

ISO 1183-1, *Plastics — Methods for determining the density of non-cellular plastics — Part 1: Immersion method, liquid pycnometer method and titration method*

ISO 7991, *Glass — Determination of coefficient of mean linear thermal expansion*

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

universally available float glass

universally available float glass is the standard annealed soda-lime glass manufactured by the float process on a bath of tin

3.2

high light transmission float glass

high light transmission float glass differs from universally available float glass only by its low iron content, giving it high light transmission extending into the near infra-red

3.3

tempered glass

this is a glass in which a compression layer has been induced at the surfaces either by thermal or chemical means

3.4

batch

a batch is a quantity of production glass plies, tempered as a group under the same process conditions

3.5

effective diameter of non-circular defects

the effective diameter of an optical defect is the arithmetic mean of the maximum and minimum dimensions

4 Required characteristics

4.1 Composition

The glass is of the soda-lime type. The iron content of high light transmission glass shall be such that the integrated white light transmission and transmission at 800 nm is in accordance with the material standards EN 3861 and EN 3862.

4.2 Material

Materials according to EN 3861 and EN 3862, shall have been made by the float process.

EN 3001:2019 (E)**4.3 Standard thickness** ³⁾

See Table 1.

Table 1 — Standard thickness

Thickness (mm)	2, 3, 4, 5, 6	8, 10, 12	15	19
Tolerances (mm)	± 0,2	± 0,3	± 0,5	± 1

4.4 Dimensions

The shape and size of tempered plies will be as agreed between purchaser and manufacturer.

4.5 Density

The density shall be measured by method A given in ISO 1183-1.

4.6 Linear expansion

The coefficient of mean linear expansion shall be determined in the range 20 °C to 300 °C by the method given in ISO 7991.

4.7 Flatness

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Where it is necessary to measure flatness, the test method given in EN 3863 shall be used.

4.8 Refractive index

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The refractive index at the sodium D line shall be determined by method A given in EN ISO 489 using a refractometer.

4.9 Light transmission

The visible light transmission shall be determined by the method given in EN 2155-5. For high light transmission glass the transmission shall be measured also at 800 nm by means of a spectrophotometer.

4.10 Haze

Haze shall be measured by the method given in EN 2155-9.

4.11 Optical distortion

The optical distortion will be measured by the method given in EN 2155-8.

It shall be ignored in a margin of 25 mm, from the glass edge and a radius of 40 mm from the tong support impressions.

NOTE The optical distortion of flat glass is negligible. It may result from die bending and tong support.

³⁾ Other thicknesses may be agreed upon between purchaser and manufacturer.

4.12 Optical defects

4.12.1 The plies shall be free from surface contamination, such as can occur from long term storage.

4.12.2 The plies shall be examined for optical defects according to EN 2155-6 with the exception of subclauses 6.1 to 6.7.

4.12.3 Defects such a tin pick up, tin streaks and top speck, roller impression and old metal marks are not permitted.

4.12.4 Bubbles up to 0,5 mm effective diameter and stones up to 0,2 mm effective diameter shall be allowed under the following conditions :

- Not more than two per circular area of 300 mm diameter ;
- Not closer than 150 mm to each other ;
- A local accumulation of defects within an area not greater than 125 mm² shall constitute a single fault, if the sum of the individual defect effective diameters does not exceed 0,5 mm.

4.12.5 Scratches shall be allowed up to a maximum width of 0,03 mm within the following limits :

- The maximum length allowed for any single scratch shall be 30 mm, and no more than 90 mm cumulative length shall be allowed in any one square of 300 mm side.

4.12.6 Ream, surface ripple or hammer shall be allowed only if they can be barely seen when viewed by the method described in EN 3866.

4.13 Bending and thermal tempering optical defects

4.13.1 Bending marks

Bending marks shall be allowed up to 15 mm from the glass edge. They shall not cause unacceptable local distortion inside a 25 mm margin of the edge as agreed by the purchaser.

4.13.2 Checker pattern

Checker pattern due to uneven tempering shall cause minimum strain pattern when viewed through cross polaroids. If unacceptable to the purchaser, a reference standard shall be agreed with the supplier.

4.13.3 Tong impressions

For tong supported glass the thickness shall not be reduced by more than one third at the tong points. Fine cracks from tongs, known as vents, shall not be acceptable if seen outside the tong impression by viewing through cross polaroids.

4.14 Strength

4.14.1 Modulus of rupture

The modulus of rupture (MOR) applicable to structural components shall be determined by the method given in EN 3864. The mean MOR and standard deviation shall be determined on glass beams that have been edge worked and tempered to the same standard as the glass components they represent.