DRAFT INTERNATIONAL STANDARD

ISO/DIS 5685

ISO/TC **22**/SC **35**

Secretariat: **UNI**

Voting begins on:
2021-03-25

Voting terminates on:
2021-06-17

Road vehicles — Testing the abrasion resistance of automotive glazing with the windscreen wiper test

Véhicules routiers — Contrôle au test essuie-glace de la résistance à l'abrasion du vitrage automobile

ICS: 43.040.65

This document is circulated as received from the committee secretariat.

Reference number
ISO/DIS 5685:2021(E)

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Published in Switzerland

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Foreword

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This document was prepared by Technical Committee ISO/TC 22, *Road vehicles*, Subcommittee SC 35, *Lighting and visibility*.

Any feedback or questions on this document should be directed to the user's national standards body. A complete listing of these bodies can be found at www.iso.org/members.html.

Introduction

The surfaces of vehicle glazing are usually subject to abrasive wear in service. This is caused by various mechanisms such as the impact of small particles (e.g. sand), the use of car wash brushes, windscreen wipers or ice scrapers, or the rolling up and down of panes of glazing with deposited dirt on them in the case of roll-up windows.

Various test methods are required in order to be able to evaluate to a sufficient extent the abrasion resistance of glazing surfaces with regard to these different mechanisms that occur in service. In addition to the abrasive wheel test [Taber test (see ISO 3537, ISO 15082 and UNECE R43)], the sand drop test (see UNECE R43) and the more recent car wash test (see ISO 15082 and UNECE R43) that have been established in abrasion testing of vehicle glazing for many years, a method is to be standardized that simulates the abrasion that results from the use of windscreen wipers. This is significant for the evaluation of windscreens in particular, but also for other panes of glazing.

Road vehicles — Testing the abrasion resistance of automotive glazing with the windscreen wiper test

1 Scope

This document specifies a method for determining the resistance of a glazing surface to scratching by a wiper rubber under the influence of a standardized test dust suspension.

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.

ISO 3536, *Road vehicles — Safety glazing materials — Vocabulary*

ISO 12103-1:2016, *Road vehicles — Test contaminants for filter evaluation — Part 1: Arizona test dust*

3 Terms and definitions

For the purposes of this document, the terms and definitions given in ISO 3536 and the following apply.

ISO and IEC maintain terminological databases for use in standardization at the following addresses:

— ISO Online browsing platform: available at https://www.iso.org/obp

— IEC Electropedia: available at http://www.electropedia.org/

3.1
individual test
single experiment in which a test piece is subjected to 20 000 wiping cycles

Note 1 to entry: Two test pieces can always be tested at the same time in a test procedure.

3.2
complete test
consists of three individual tests, i.e. a test on three test pieces (i.e. a complete set of test pieces)

Note 1 to entry: One of the three individual tests may be repeated if areas with differing scratching occur (see also 3.7 “chatter marks”). Every valid individual test shall fulfil the requirements in order to fulfil the requirements for a set of test pieces.

3.3
wiping cycle
single forward and backward movement of the abrasion testing device carriage

3.4
stroke length
travel distance of the carriage or bridge

Note 1 to entry: The stroke length corresponds to half a wiping cycle.

3.5
wiper track length
travel distance of the wiper rubber lip

3.6
wiper rubber holder
mounting device for the wiper rubber

3.7
chatter marks
areas with differing scratching that generally have wave patterns and are caused by non-uniform, jerking motion of the wiper rubber lip

4 Principle

A wiper rubber is moved forward and backward across a glazing surface using an abrasion testing device (see 6.1). A standardized aqueous test dust suspension is used as the abrasive medium.

The surface wear is evaluated by measuring the increase in haze.

5 Test Conditions

Unless otherwise specified, the tests are to be carried out under the following conditions:

— ambient temperature: (20 ± 5) °C;

— atmospheric pressure: 86 kPa to 106 kPa (860 mbar to 1 060 mbar);

— relative humidity: (60 ± 20) %.

6 Apparatus

6.1 Abrasion testing device

The apparatus is presented in Figure 1 a) to Figure 1 c) and includes the following individual components as a minimum:

— an abrasion testing device with a moving carriage: The moving carriage shall be set for a forward and backward motion of (37 ± 2) cycles per minute and a stroke length (half a wiping cycle) of (130 ± 5) mm;

— a wiper bridge that is mounted on the moving carriage. Self-supporting arms that the wiper rubber holders can be mounted on are attached to the wiper bridge;

The height of the wiper bridge is to be selected in such a way that the self-supporting arms are at an angle of (45 ± 5)° in the final test apparatus (see 9.1).

— two wiper rubber holders that are suitable for inserting two commercially available wiper rubbers and that can be set in such a way that the test pieces can be subjected to a load of (15 ± 0,5) g per cm of wiper rubber length (see 7.4);

— two specimen boxes (see 6.3) that the test pieces are placed in and that are filled with the standardized aqueous test dust suspension (see 9.3);

— various spacer plates in the dimensions of the test pieces, but with different thicknesses, that are used for compensation of different test piece thicknesses;

It is necessary that the bottom of the specimen box and the test piece surface to be tested are at the same height.

It is to be ensured that the underside of the test piece placed on the spacer plates is not scratched, e.g. by adding a soft film with a maximum thickness of 100 µm[1)] to the surface of the spacer plates.

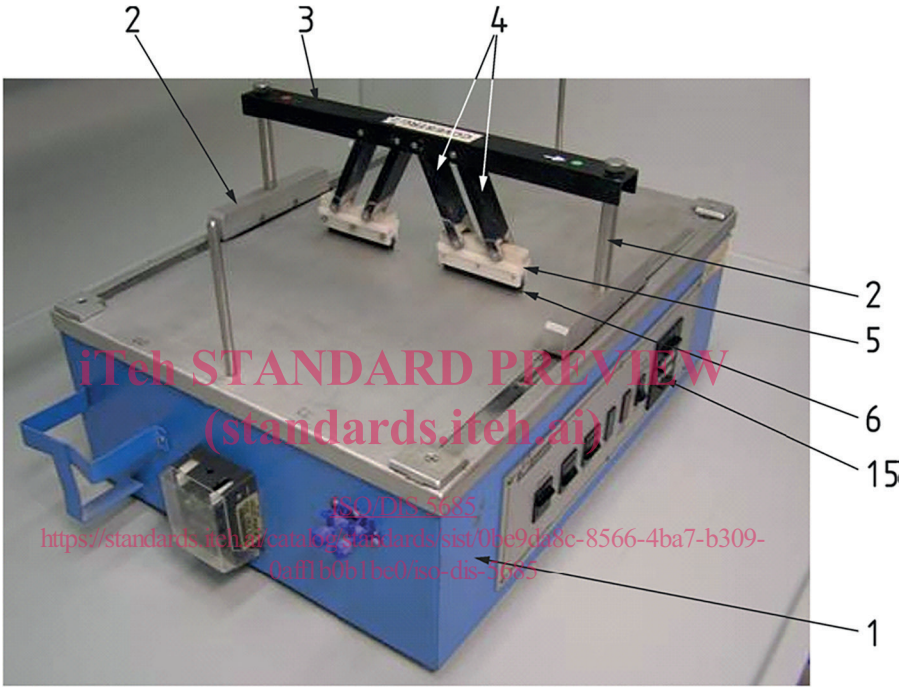
NOTE 1 The spacer plates can be made from the specimen box material, for example.

— five inlay plates to clamp the specimen boxes;

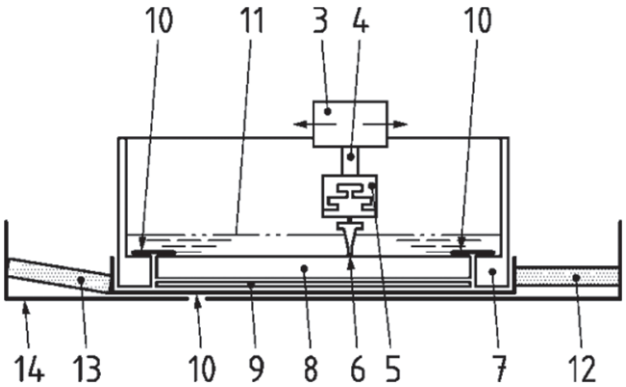
NOTE 2 One of the inlay plates [No. 13 in Figure 1 b) and Figure 1 c)] can be used as a clamp on one of the sides of the specimen box that is perpendicular to the direction of movement in order to increase the clamping effect on the specimen box.

— a stainless steel basin;

— a wiping cycle counter.

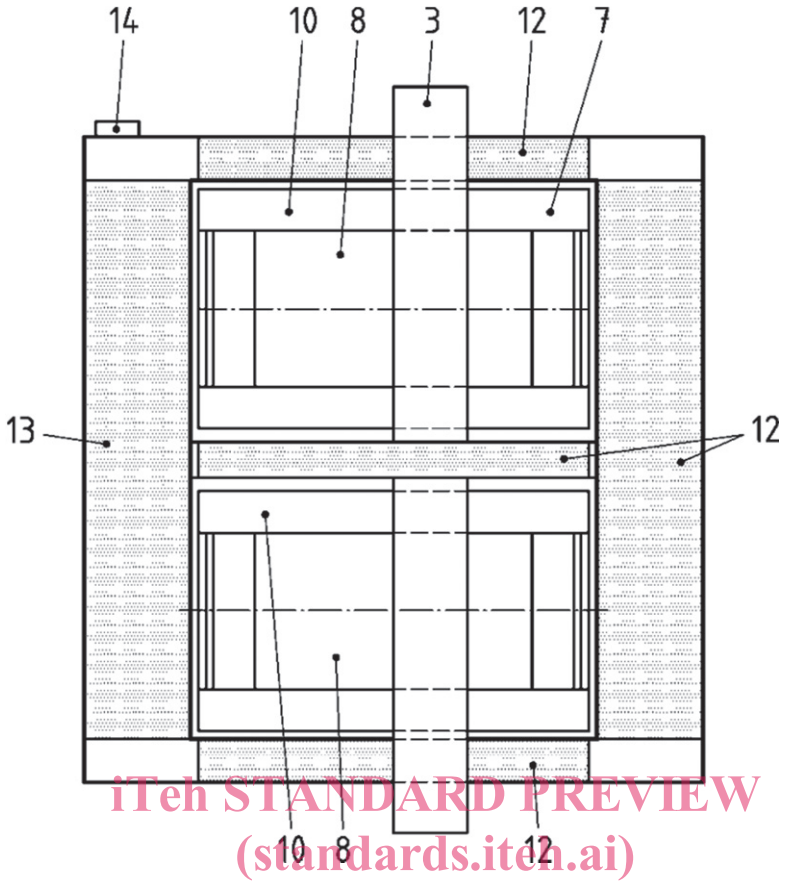


a) Example of an abrasion testing device with a moving carriage, together with components to guide the wiper rubber



b) Cross-sectional view of the abrasion testing device, with added components to hold the test pieces and the standardized test dust suspension

1) The spacer plates can be covered in a manner largely free of creases using so-called masking films, for example, which are normally used to protect hard plastic-glazing materials during storage and transport.



c) Top view of the abrasion testing device

Key

1 abrasion testing device
2 moving carriage
3 wiper bridge
4 self-supporting arms
5 wiper rubber holder
6 wiper rubbers
7 specimen boxes
8 test piece
9 spacer plates
10 adhesive tape
11 standardized aqueous test dust suspension
12 inlay plates
13 clamp plate
14 stainless steel basin
15 wiping cycle counter

Figure 1 — Abrasion testing device

6.2 Components to guide the wiper rubber

Wiper rubber holders[2)] and wiper rubbers[3)] can be added to a commercially available abrasion testing device (e.g. a washing and scrubbing resistance tester) to create an abrasion testing device for the wiper test.

The bridge of the abrasion testing device is modified in such a way that two wiper rubber holders (see A.1) can be mounted underneath on the self-supporting arms. The design of the wiper rubbers has an influence on the wear behaviour of the test pieces and thus on the test results. Only commercially available wiper rubbers shall be used. The type of wiper rubber is to be stated in the test report.

6.3 Specimen boxes with spacer plates

Specimen boxes with the following dimensions are used; see Figure 2 a) and Figure 2 b):

Inner dimensions:

Length: (200 ± 2) mm

Width: (120 ± 2) mm

Height of sides: (55 ± 5) mm

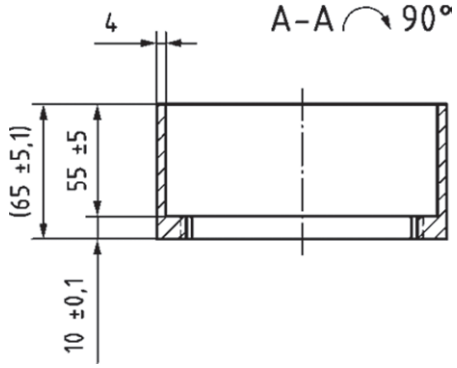
Thickness of bottom plate: (10 ± 0,1) mm

Opening for insertion of the test piece:

Length: (152 + 1) mm

Width: (102 + 1) mm

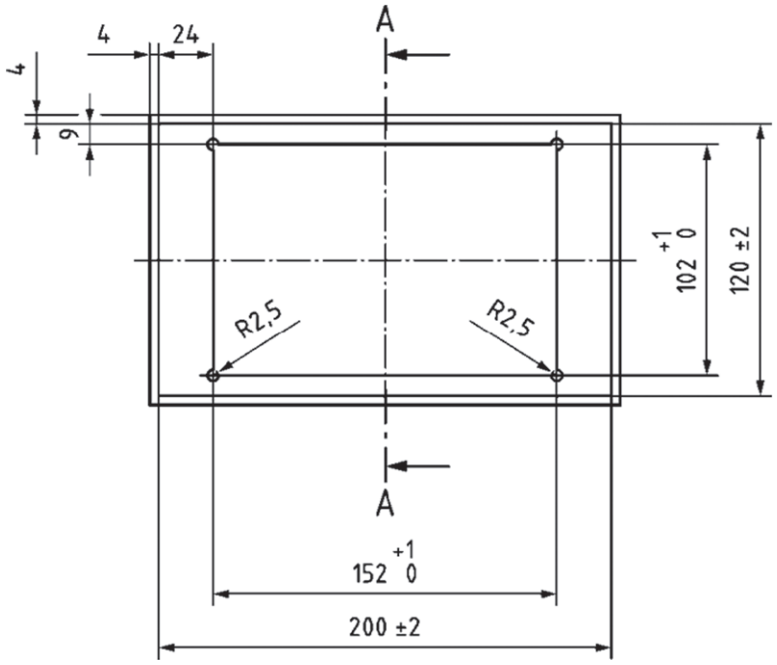
Positioned at the centre of the specimen box, i.e. distance to specimen box walls 24 mm on each side in the longitudinal direction, 9 mm on each side along the width.



a) Top view

2) Suitable abrasion testing devices and wiper holders can be purchased from BYK Gardner, Geretsried, Germany. This information is given for the convenience of users of this document and does not constitute an endorsement by DIN of the product named. Equivalent products may be used if they can be shown to fulfil the requirements of this method.

3) Suitable wiper rubbers can be purchased from Bosch, Bühl, Germany (CR wiper rubber, "H Stoff P32", Item No. 3.391.018.399). This information is given for the convenience of users of this document and does not constitute an endorsement by DIN of the product named. If other wiper rubbers are used, appropriate wiper rubber holders are to be used that hold the wiper rubber in place in a manner analogous to the actual installation situation in the wiper arm of a vehicle.



b) Lateral view

Figure 2 — Specimen box

Spacer plates, 151,5 mm × 101,5 mm in size, that are placed underneath the test piece and are also stuck in place, compensate for the difference between the test piece thickness and the thickness of the bottom plate of the specimen box, so that the height difference is a maximum of ± 0,5 mm.

6.4 Haze measurement device

6.4.1 General

A schematic diagram of a haze measurement device, also known as a haze meter, is shown in Figure 3[4]; this device consists of:

— A light source and a photodetector, and the combination shall be filtered to provide an output corresponding to the luminosity response of the 1931 CIE Standard Colourimetric Observer with CIE Standard Illuminant C or, alternatively, Illuminant A. The output shall be proportional to within 1 % to the incident flux over the range of flux used. The photometric stability for source and detector shall be constant throughout the test of each test piece.

— An integrating sphere to collect transmitted flux; the sphere may be of any diameter as long as the total port areas do not exceed 4,0 % of the internal reflecting area of the sphere. The entrance and exit ports shall be centred on the same great circle of the sphere, and there shall be at least 2,97 rad (170°) of arc between centres. The exit port shall subtend an angle of 0,14 rad (8°) at the centre of the entrance port. With the light trap in position, without the test piece, the axis of the irradiating beam shall pass through the centres of the entrance and exit ports. For a hazemeter, position the photocell or photocells on the sphere 1,57 rad ± 0,17 rad (90° ± 10°) from the entrance port and baffle it from direct exposure to the entrance port. In the pivotable modification where the interior wall adjacent to the exit port is used as the reflectance reference, the angle of rotation of the sphere shall be 0,140 rad ± 0,008 rad (8,0° ± 0,5°).

4) A suitable haze meter can be purchased from BYK Gardner, Geretsried, Germany. This information is given for the convenience of users of this document and does not constitute an endorsement by ISO of the product named. Equivalent products may be used if they can be shown to fulfil the requirements of this method.