



SLOVENSKI STANDARD
SIST EN 2155-14:2001
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Aerospace series - Test methods for transparent materials for aircraft glazing - Part 14: Determination of the 1/10 Vicat softening temperature

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Luft- und Raumfahrt - Prüfverfahren für transparente Werkstoffe zur Verglasung von Luftfahrzeugen - Teil 14: Bestimmung der 1/10-Vicat Erweichungstemperatur

Série aérospatiale - Méthodes d'essais pour matériaux transparents pour vitrages aéronautiques - Partie 14: Détermination du point de ramollissement Vicat 1/10

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ICS:

49.045 Konstrukcija in konstrukcijski elementi Structure and structure elements

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English version

**Aerospace series - Test methods for transparent
materials for aircraft glazing - Part 14:
Determination of the 1/10 Vicat softening
temperature**

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CEN

European Committee for Standardization
Comité Européen de Normalisation
Europäisches Komitee für Normung

Central Secretariat: rue de Stassart, 36 B-1050 Brussels

1 Scope

This standard specifies the method used for the determination of the 1/10 VICAT softening temperature of transparent thermoplastic materials used for aircraft glazing.

2 Principle

Determination of the temperature at which a standard indenter under a specified load penetrates 0,1 mm into the surface of a test specimen ; this temperature is attained during a defined uniform rate of increase of temperature. The temperature corresponding to the 0,1 mm penetration is called 1/10 VICAT softening temperature ; it is expressed in °C.

3 Apparatus

The apparatus consists essentially of :

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3.1 A rod provided with a load carrying plate held in a rigid metal frame so that it can move freely and vertically, the base of the frame serving to support the specimen under the indenter at the end of the rod (see figure 1).

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3.2 Indenting tip

An indenting tip, preferably of hardened steel, 3 mm long, of circular cross-section and area $(1,000 \pm 0,015) \text{ mm}^2$ is fixed at the bottom of the rod. The lower surface of the indenting tip shall be flat and perpendicular to the axis of the rod and free from burrs.

3.3 Micrometer dial gauge (or other suitable measuring instrument)

A micrometer dial gauge (or other suitable measuring instrument), graduated in divisions of 0,01 mm, shall be used to measure the penetration of the indenter into the specimen.

The thrust of the dial gauge, which contributes to the thrust on the specimen, shall be known and shall comply with clause 3.4 below.

3.4 A load carrying plate shall be fitted to the rod (3.1) and a slotted weight adjusted centrally such that the total load applied to the test specimen can be made up to between 9,81 N and 10,30 N. The combined masses of the rod, indenter and load carrying plate shall not exceed 100 g.

NOTE : The construction of the apparatus shall be such that the micrometer dial gauge reading caused by differential thermal expansion over the intended temperature range does not exceed 0,02 mm when the specimen is replaced by a piece of borosilicate glass or low thermal expansion alloy steel.

It is recommended that the apparatus be constructed of low thermal expansion alloy.

3.5 A heating bath, containing a suitable liquid (see note 1), shall be provided in which the apparatus is placed so that the specimen is at least 35 mm below the surface of the liquid. An efficient stirrer shall be provided. The heating bath shall be equipped with a means of control so that the temperature can be raised at a uniform rate of (50 ± 5) K per hour (see note 2).

3.6 A mercury in glass thermometer (or other accurate temperature measuring device), of appropriate range and with graduations at least at each 0,5 K shall be used to measure temperature. The scale error at any reading shall not exceed 0,5 K.

NOTE 1 : A suitable liquid heat transfer media shall be used. In all cases, it shall be established that the liquid chosen is stable at the temperature used and does not affect the material under test.

NOTE 2 : A uniform rate of temperature rise can be obtained by controlling the heat input either manually or automatically, although the latter is strongly recommended. One method of operation found to be satisfactory is to provide an immersion heater adjusted to give the correct rate of temperature rise at the starting temperature of the test and then to increase the power input (either in the same heater or in a subsidiary heater) by adjustment of a rheostat or variable transformer.

NOTE 3 : It is desirable to have a cooling coil in the liquid bath in order to reduce the time required to lower the temperature after previous determinations. It shall be removed or drained before starting a test, as boiling of coolant may affect the rate of temperature rise.

4 Specimens

- 4.1 Two specimens shall be used to test each sample. Their surfaces shall be flat and parallel.
- 4.2 For sheet materials, the thickness of the test specimens shall be equal to the thickness of the sheet. However :
- if the thickness exceeds 6 mm, the specimens shall be reduced in thickness to approximately 3 mm by machining one surface, the other surface being left intact,
 - if the thickness of the sheet is less than 3 mm, not more than three pieces shall be stacked together to give a total thickness of between 3 mm and 6 mm.

5 Procedure

- 5.1 The specimen is mounted horizontally under the indenting tip (3.2) of the unloaded rod (3.1) (see figure 1). The tip of the indenter shall at no point be nearer to the edge of the test specimen than 3 mm. The surface of the test specimen in contact with the base of the apparatus shall be flat.
- 5.2 The assembly is immersed in the heating bath (3.5), the temperature of which shall be constant and at least 50 K below the expected softening temperature of the material (see note 3, clause 3). The bulb of the thermometer (3.6) shall be at the same level as, and as close as is practical to the specimen.
- 5.3 The slotted weight is then added to the load carrying plate (3.4) such that the total thrust on the specimen is between 9,81 N and 10,30 N. After 5 min, with the indenter still in position, the reading of the micrometer dial gauge is noted or the micrometer (3.3) is set to zero.
- 5.4 The temperature of the bath is then raised at a uniform rate of (50 ± 5) K per hour. The liquid is well stirred during the test.
- 5.5 The temperature of the bath at which the indenting tip has penetrated into the specimen by 0,1 mm beyond its starting position defined in clause 5.3 is noted and recorded as the 1/10 VICAT softening temperature (1/10 VST) of the specimen.
- 5.6 The 1/10 VST of the material under test is expressed as the arithmetic mean of the 1/10 VST's of two specimens. If the individual results differ by more than 2 K it shall be verified that the test has been carried out correctly.

6 Test report

The test report shall include the following information :

- reference to this standard,
- VICAT softening temperature (1/10 VST) of the material,
- if composite specimens are used, ie more than one layer, then the thickness and number of layers shall be stated,
- the nature of the immersion medium,
- any particular characteristics of the specimen noted during the test or after removal from the apparatus.

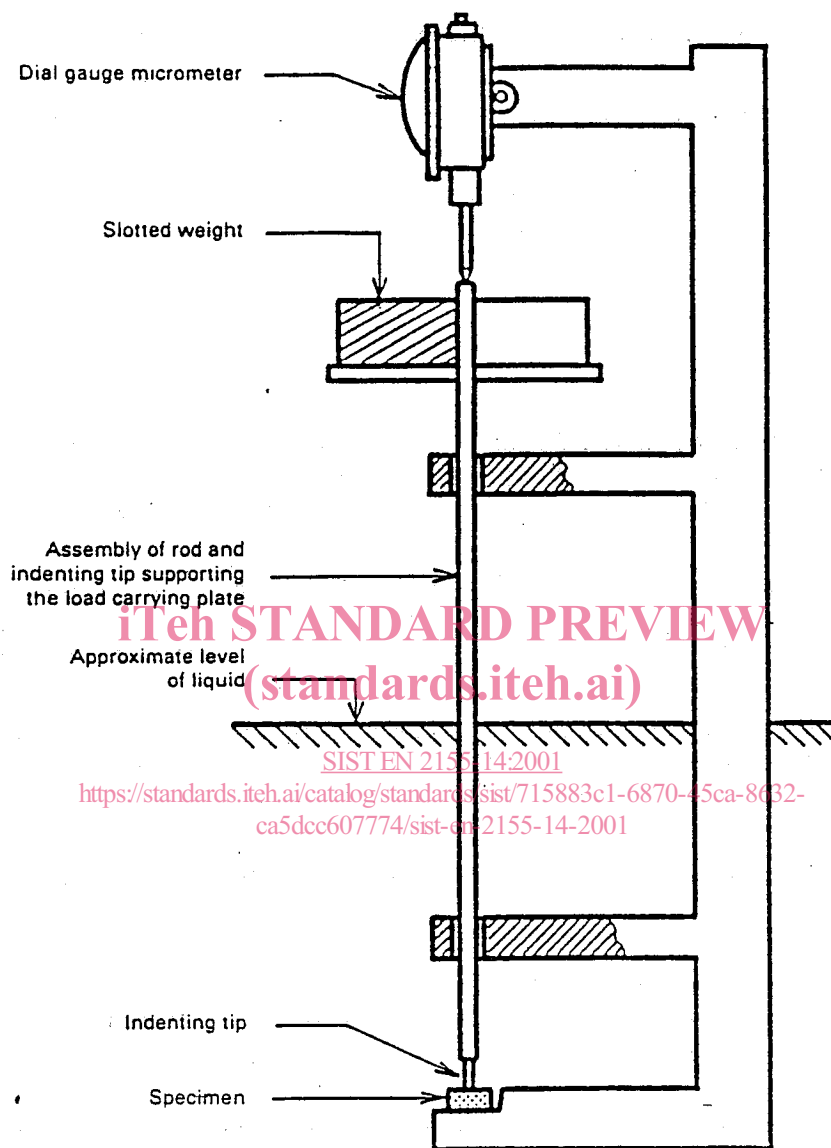


Figure 1 — Schematic diagram of apparatus for the determination of the Vicat softening temperature