
Cevni sistemi iz polimernih materialov - Plastomerne cevi in fittingi - Določanje temperature z mehčiča po Vicatu (VST)

Plastics piping and ducting systems - Thermoplastics pipes and fittings - Determination of Vicat softening temperature (VST)

Kunststoff-Rohrleitungs- und Schutzrohrsysteme - Rohre und Formstücke aus Thermoplasten - Bestimmung der Vicat-Erweichungstemperatur (VST)

Systemes de canalisations et de gaines plastiques - Tubes et raccords thermoplastiques - Détermination de la température de ramollissement Vicat (VST)

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EUROPEAN STANDARD

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English version

**Plastics piping and ducting systems -
Thermoplastics pipes and fittings - Determination
of Vicat softening temperature (VST)**

Systèmes de canalisations et de gaines
plastiques - Tubes et raccords thermoplastiques
- Détermination de la température de
ramollissement Vicat (VST)

Kunststoff-Rohrleitungs- und Schutzrohrsysteme
- Rohre und Formstücke aus Thermoplasten -
Bestimmung der Vicat-Erweichungstemperatur
(VST)

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Up-to-date lists and bibliographical references concerning such national standards may be obtained on application to the Central Secretariat or to any CEN member.

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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

Foreword

This standard was prepared by CEN/TC 155 "Plastics piping systems and ducting systems". It received approval from the CEN members on 1994-08-22.

This standard is based on ISO 2507:1982 "Unplasticized polyvinyl chloride (PVC) pipes and fittings - Vicat softening temperature - Test method and specification", published by the International Organization for Standardization (ISO). It is a modification of ISO 2507:1982 for reasons of applicability to other plastics materials and/or other test conditions and alignment with texts of other standards on test methods.

The modifications are:

- no material is mentioned;
- the test force and the loading procedure have been aligned with those of ISO 306:1987.
- test parameters, except those common to all plastics, are omitted;
- no material-dependent requirements are given;
- editorial changes have been introduced.

The material-dependent parameters and/or performance requirements are incorporated in the System Standard(s) concerned.

No existing European Standard is superseded by this standard.

This standard is one of a series of standards on test methods which support System Standards for plastics piping systems and ducting systems.

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 1995, and conflicting national standards shall be withdrawn at the latest by February 1995.

In accordance with the CEN/CENELEC Internal Regulations, following countries are bound to implement this European Standard: Austria, Belgium, Denmark, Finland, France, Germany, Greece, Iceland, Ireland, Italy, Luxembourg, Netherlands, Norway, Portugal, Spain, Sweden, Switzerland and United Kingdom.

1 Scope

This standard specifies a method for determining the Vicat softening temperature (VST) of pipes and fittings (see note) of thermoplastics materials, based on method B of ISO 306:1987, i.e. using a force of (50 ± 1) N and a rate of temperature increase of $50 \text{ }^\circ\text{C/h}$.

A measure of the temperature is obtainable only for those thermoplastics for which the softening becomes rapid.

NOTE: The term "fittings" is intended to also cover valves and other ancillaries made of thermoplastics material(s).

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2 Normative references (standards.iteh.ai)

This standard incorporates by dated or undated reference provisions from other publications. These normative references are cited at the appropriate places in the text and the publications are listed hereafter.

For dated references, subsequent amendments to, or revisions of, any of these publications apply to this standard only when incorporated in it by amendment or revision.

For undated references, the latest edition of the publication referred to applies.

ISO 306:1987 *Plastics - Thermoplastics materials - Determination of Vicat softening temperature*

3 Principle

The temperature at which a standard indenting tip (see note 1 to 4.1) under a constant force of (50 ± 1) N, penetrates 1 mm into the surface of a test piece cut from the wall of the pipe or fitting is determined when the temperature is raised at a uniform rate.

The temperature at 1 mm penetration is quoted as VST in degrees Celsius.

NOTE 1: It is assumed that the following test parameters are set by the standard making reference to this standard:

- a) if necessary, the temperature and time for predrying the test pieces (see 4.2 and clause 6);
- b) if necessary, the temperature to be used to flatten the lower segment of a test piece (see 5.2.3);
- c) if necessary, for testing a pipe or fitting, or a homogeneous layer therefrom, with a wall thickness less than 1,2 mm, the method of test piece preparation and mounting (see 5.2.3 and 7.2);
- d) for structured-wall pipes and fittings, the method of test piece preparation and mounting (see 5.2.3 and 7.2).

NOTE 2: It is assumed that the significance of results from measurements which vary by more than 2 °C will be dealt with by the referring standard.

4 Apparatus

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4.1 Apparatus conforming to clause 4 of ISO 306:1987 as necessary for testing in accordance with method B when using a heating rate of (50 ± 5) °C/h. For a schematic diagram, see figure 1.

NOTE 1: <https://standards.itih.ai/catalog/standards/sist/787ebad8-9aa9-4803-b603-958a9cc503c4/sist-en-727-1997> ISO 306:1987 specifies the indenting tip as follows. Indenting tip, preferably of hardened steel, 3 mm long, of circular cross-section, and area $(1,000 \pm 0,015)$ mm², fixed at the bottom of the rod. The lower surface of the indenting tip shall be plane and perpendicular to the axis of the rod and free from burrs.

NOTE 2: The uniform rate of temperature rise can be obtained by controlling the heat either manually or automatically, although the latter is strongly recommended. If a cooling coil is used in the liquid of the heating bath, in order to reduce the time required to lower the temperature between two consecutive tests, it is necessary to remove or drain such a coil before starting a new test, as boiling of residual coolant can affect the rate of temperature rise.

4.2 Oven with air circulation or other appropriate apparatus, if applicable (see clause 6), capable of maintaining the temperature specified by the referring standard, for predrying and/or annealing the test pieces.

5 Test pieces

5.1 Sampling

5.1.1 Pipes

The test pieces shall consist of segments of rings, removed from the pipe, limited by cross sections and having the following dimensions:

- length: approximately 50 mm;
- width: between 10 mm and 20 mm.

5.1.2 Fittings

The test pieces shall consist of segments of rings removed from the socket(s) or the spigot(s) of the fitting, limited by cross sections with a length as long as possible with a maximum of 50 mm.

Where a fitting has no socket or spigots then the test piece shall be taken from a convenient section of the fitting.

The width of each test piece shall be between 10 mm and 20 mm.

The test pieces shall be cut from a zone which does not include a weld line, injection point or an insert.

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5.2 Preparation

5.2.1 Wall thickness greater than 6 mm

For a wall thickness greater than 6 mm, reduce the thickness to 6 mm by machining the outer surface only of the pipe or fitting, using a technique which does not cause tangible heating of the non-planar surfaces of the test piece.

NOTE: Reduction to 6 mm (not 4 mm as given ISO 306) is considered sufficient for the purposes of this standard.

If the socket of the fitting is threaded, machine the threaded part until a smooth surface is obtained.

5.2.2 Wall thickness between 2,4 mm and 6 mm

Test pieces of wall thickness between 2,4 mm and 6 mm shall be tested using the full wall thickness.

5.2.3 Wall thickness less than 2,4 mm

If the wall thickness of the pipe or fitting is less than 2,4 mm but not less than 1,2 mm, each test piece shall comprise two ring segments superimposed so as to obtain an overall thickness of at least 2,4 mm. Flatten the lower segment, which will serve as a base (see 7.2), by heating it to the specified temperature [see item b) of note 1 to clause 3] for 15 min, while resting a thin metal plate on it. The upper segment shall not be flattened.

If the wall thickness of the pipe or fitting is less than 1,2 mm, the preparation and mounting of the test piece shall be as specified in the referring standard.

5.3 Number of test pieces

Use two test pieces for each test, but provide additional test pieces, in case the difference between the results is too great (e.g. $> 2^{\circ}\text{C}$, see 7.7).

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6 Conditioning

If required by the referring standard, predry and/or anneal and/or condition the test pieces as specified in the referring standard [see item a) of note 1 to clause 3, and 4.2).

7 Procedure

7.1 Raise the heating bath to a temperature about 50°C lower than that anticipated for the VST of the product under test (see note 2 to 4.1).

Maintain this temperature constant.

7.2 Mount the test piece horizontally under the indenting tip of the unloaded rod (see figure 1) so that the tip rests on the concave face of the test piece. Ensure that the interface between the base of the apparatus and the test piece, i.e. the underside of a stacked test piece (see 5.2.3) or the line of contact of a single test piece, is continuous.

(Hence, in the case of pipes and fittings with a wall thickness of less than 2,4 mm, the indenting tip will rest on the concave surface of the non-flattened segment, the latter being placed on the flattened segment.)

The indenting tip shall at no point be less than 3 mm from the edge of the test piece.

7.3 Immerse the assembly in the heating bath (see 7.1). The bulb of the thermometer or sensitive part of the temperature-measuring instrument shall be at the same level as, and as close as possible to, the test piece.

7.4 After 5 min, with the indenting tip still in position, add the weight to the load-carrying plate (see figure 1) so that the total thrust on the test piece is (50 ± 1) N. Then note the reading of the micrometer dial gauge (or other indentation-measuring instrument) (see figure 1) or set the instrument to zero.

7.5 Increase the temperature of the bath at a uniform rate of (50 ± 5) °C/h; stir the liquid well during the test.

7.6 Note the temperature of the bath at which the indenting tip has penetrated into the test piece by $(1 \pm 0,01)$ mm beyond its starting position, as noted or set in accordance with 7.4, and record it as the Vicat softening temperature (VST) of the test specimen.

7.7 Express as the VST, in degrees Celsius, of the pipe or fitting under test the arithmetic mean of the VSTs of the test pieces tested. If the difference between the two results exceeds 2 °C, record the individual results [see item f) of clause 8] and repeat the test once using a further set of at least two test pieces (see 5.3).

8 Test report

The test report shall include the following information:

- a) a reference to this standard and to the referring standard;
- b) a complete identification of the pipe or fitting tested;
- c) the thickness of the test pieces and, if applicable (see 5.2.3), whether they consisted of two parts or were otherwise specified by the referring standard;
- d) the liquid or other heat-transfer medium;
- e) if any, the method(s) of predrying, annealing and conditioning used (see clause 6);
- f) the Vicat softening temperature (VST) (the average of the results) obtained for the pipe or fitting or, if the difference between results for single test pieces exceeded 2 °C, the result for each of the test pieces and the results of the repeat test;