SLOVENSKI STANDARD
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Plastics -- Amorphous thermoplastics -- Preparation of test specimens with a specified reversion -- Part 2: Plates

Plastiques -- Thermoplastiques amorphes -- Préparation des éprouvettes à niveau de retrait spécifié -- Partie 2: Plaques

Ta slovenski standard je istoveten z: **ISO 2557-2:1986**

ICS:

83.080.20	Plastomeri	Thermoplastic materials

SIST ISO 2557-2:1996 **en**

International Standard ISO 2557/2

INTERNATIONAL ORGANIZATION FOR STANDARDIZATION•МЕЖДУНАРОДНАЯ ОРГАНИЗАЦИЯ ПО СТАНДАРТИЗАЦИИ•ORGANISATION INTERNATIONALE DE NORMALISATION

Plastics — Amorphous thermoplastics — Preparation of test specimens with a specified reversion — Part 2: Plates

Plastiques — Thermoplastiques amorphes — Préparation des éprouvettes à niveau de retrait spécifié — Partie 2: Plaques

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Foreword

ISO (the International Organization for Standardization) is a worldwide federation of national standards bodies (ISO member bodies). The work of preparing International Standards is normally carried out through ISO technical committees. Each member body interested in a subject for which a technical committee has been established has the right to be represented on that committee. International organizations, governmental and non-governmental, in liaison with ISO, also take part in the work.

Draft International Standards adopted by the technical committees are circulated to the member bodies for approval before their acceptance as International Standards by the ISO Council. They are approved in accordance with ISO procedures requiring at least 75 % approval by the member bodies voting.

International Standard ISO 2557/2 was prepared by Technical Committee ISO/TC 61, *Plastics*.

This second edition cancels and replaces the first edition (ISO 2557/2-1979), of which it constitutes a minor revision.

Users should note that all International Standards undergo revision from time to time and that any reference made herein to any other International Standard implies its latest edition, unless otherwise stated.

Printed in Switzerland

Plastics — Amorphous thermoplastics — Preparation of test specimens with a specified reversion — Part 2: Plates

1 Scope and field of application

This part of ISO 2557 specifies the procedure for the preparation of test specimens with predominantly monoaxial orientation in the form of rectangular plates, made from rigid amorphous thermoplastic material. Cellular plastic materials and fibre-containing plastic materials are excluded.

The rectangular plates may be used for impact testing by the falling weight method.

Bars cut from the plate in different directions may serve as test specimens for the determination of the dependence of mechanical strength upon the degree and direction of the predominant orientation in the plate.

2 References

ISO 294, *Plastics — Injection moulding test specimens of thermoplastic materials.*

ISO 2557/1, *Plastics — Amorphous thermoplastics — Preparation of test specimens with a specified reversion — Part 1: Bars.* [1)]

ISO 2818, *Plastics — Preparation of test specimens by machining.*

ISO 8328, *Plastics — Amorphous thermoplastics — Determination of reversion.* [2)]

3 Definitions

For the purpose of this International Standard, the following definitions apply.

3.1 state of a specimen: The condition of a specimen as characterized by its longitudinal reversion.

3.2 specified state of specimens: The state in which the specimens have a specified level of reversion which is either specified in the relevant International Standard or established by agreement between the interested parties.

3.3 basic state of specimens: The state in which the specimens are nearly free of internal stresses and orientation. The specimens shall be considered to be in their basic state if, after the heat treatment specified in ISO 8328,

— the surface does not change;

— the values of their mechanical properties are unchanged;

— their maximum reversion is nearly zero.

NOTE — The maximum reversion to be considered as nearly zero depends on the type of thermoplastic and should be specified in the relevant material standard.

3.4 reversion: The percentage change in length of a defined portion of a moulded specimen when this specimen is subjected to a specified heat treatment:

$$S = \frac{L_0 - L_1}{L_0} \times 100$$

where

S is the reversion;

L_0 is the length before heat treatment (initial length);

L_1 is the length after the specified heat treatment (final length).

3.5 maximum reversion (S_m): The reversion measured when the specimen is subjected to a heat treatment at a temperature above the glass transition temperature of the material, high enough to make the degree of reversion independent of small changes in heating time or temperature.

3.6 partial reversion (S_p): The reversion measured under specified conditions of heat treatment that are less extreme

1) At present at the stage of draft. (Revision of ISO 2557/1-1976.)

2) At present at the stage of draft.

than those used to produce maximum reversion. S_p, in contrast to S_m, is influenced by the temperature and the time of treatment ($S_p < S_m$).

4 Moulding conditions

The injection moulding conditions for the rectangular plate shall be set in such a way that in the specimen a predominantly monoaxial orientation results parallel to the longitudinal axis of the mould. For this purpose, the mould shall consist of two parts, viz. the relaxation area and the cavity. The uncontrolled orientations of the melt due to flow through the nozzle of the moulding machine relax in the relaxation area. The relaxation area and the cavity are connected by a film gate (see figure 1). The flow through the film gate determines the final orientation of the melt. The degree of orientation of the melt depends upon its temperature, viscosity, velocity of injection and other specific properties of the melt. The state of the specimen also depends on the subsequent cooling.

The average injection velocity, calculated in accordance with ISO 294, shall be within the range 150 to 300 mm/s. The selected average injection velocity, the corresponding injection time and the mould temperature shall be kept constant for a given material. Any change in reversion of the specimen will then be due to a change in the plastic melt temperature. For comparison of samples of different materials of the same type, it is essential that the average injection velocity shall be the same for all materials.

The values of reversion of the specimens cut lengthwise or crosswise shall not differ by more than ± 2 % absolute. In addition, the reversion of the specimen cut crosswise shall be zero or negative. Positive reversion of these specimens indicates biaxial orientation due to incomplete relaxation in the relaxation area, for example by low plastic melt temperatures.

Rectangular plates in the basic state can be prepared according to ISO 2557/1, by thermal relaxation in a mould cavity with dimensions identical to those of the injection mould. The plate has attained its basic state if bars cut lengthwise and crosswise show the same mechanical properties.

5 Design and shape of the plate

5.1 An example of a test plate 50 mm × 80 mm with predominantly monoaxial orientation is shown in figure 1. The injection moulded specimen is composed of a triangular relaxation area which is connected by a film gate to the rectangular test plate. The thickness of the relaxation area increases from the vertex to the base. The moulding material is injected near the vertex either by a pin-point gate ($\phi \approx 1,1$ mm) or by a sprue ($\phi \approx 4$ mm) corresponding to the thickness of the specimen.

5.2 To ensure a continuous filling of the mould, the film gate shall be situated flush with one surface of the plate over the complete length of the narrow side. The film gate shall be thick enough to avoid sink marks. In the example given in figure 1, the thickness of the gate shall be $1,0 \, ^{+0,1}_{\;\;0}$ mm.

5.3 The surfaces of the plate have slightly different states of orientation and accordingly different mechanical properties due to the position of the film gate. The ejector pins of the mould shall be positioned on the opposite side from the film gate so that the markings form these ejector pins will identify one side of the specimen.

6 Injection mould

6.1 The mould can be used with a normal sprue or with a hot-runner with a pin-point gate. It is recommended that only single-cavity moulds be used in order to facilitate production of identical specimens by exact reproduction of the moulding conditions.

6.2 Depending on the moulding material, it may be advantageous to reduce the thickness of the test specimen, for example to 2 mm, by inserting appropriate plates in the mould.

6.3 Ejector pins shall be placed on the opposite side from the film gate (see 5.3 and figure 1).

7 Preparation of test specimens

7.1 Test side

The test side of the plate or specimens cut from the plate is the side flush with the film gate. Stresses shall be applied to the opposite side marked by the ejector pins, thus producing strain in the test side (see figure 1) when the plates or specimens cut from them are subjected to such mechanical tests as impact and flexure.

When there are different reversions on the two sides of the plate, the mechanical properties shall be related to the reversion on the test side.

7.2 Test plate

The rectangular plate can be used without any trimming (for example for impact testing) as long as the force is applied to the centre of the plate.

7.3 Test bars

In the region of the plate near the film gate, at the dead end and at the edges, the orientation of the material is usually disturbed and indefinable. The useful area with predominantly uniform monoaxial orientation depends to a small degree on the moulding conditions and the moulding material. Before cutting the plate into specimens of 6 mm width for example, testing and appropriate trimming (see ISO 2818) are necessary.

The plate shown in figures 1 and 2 with the dimensions 80 mm × 50 mm × 4 mm can be cut lengthwise into six specimens with uniform reversion after removal of 5 mm of width from each long side and 10 mm of the length from the gate end and the dead end.

The same plate can be cut crosswise into eight specimens after removal of approximately one-fifth of the length from the gate end and the dead end.

NOTE — The reversion of the six specimens cut lengthwise will normally meet the requirements defined in clause 4, whereas it may happen that not all of the eight specimens cut crosswise have the reversion required in clause 4, depending on material and moulding conditions. In this case it is necessary to remove more than one-fifth of the gate end and/or the dead end accordingly before cutting the plate crosswise.

8 Test report

The test report shall include the following particulars:

a) reference to this part of ISO 2557;

b) complete identification of the moulding material (type, designation, etc.);

c) the type of mould and moulding conditions (plastic melt temperature, average injection velocity, mould temperature);

d) the dimensions of the test specimens;

e) the method of specimen preparation:

1) rectangular plates:

the method of trimming (position of parts removed);

2) bars:

the method of cutting and/or milling, and direction (length- or crosswise); if necessary a sketch shall be provided;

f) reversion:

— values lengthwise and mean value;

— values crosswise and mean value.

Dimensions in millimetres

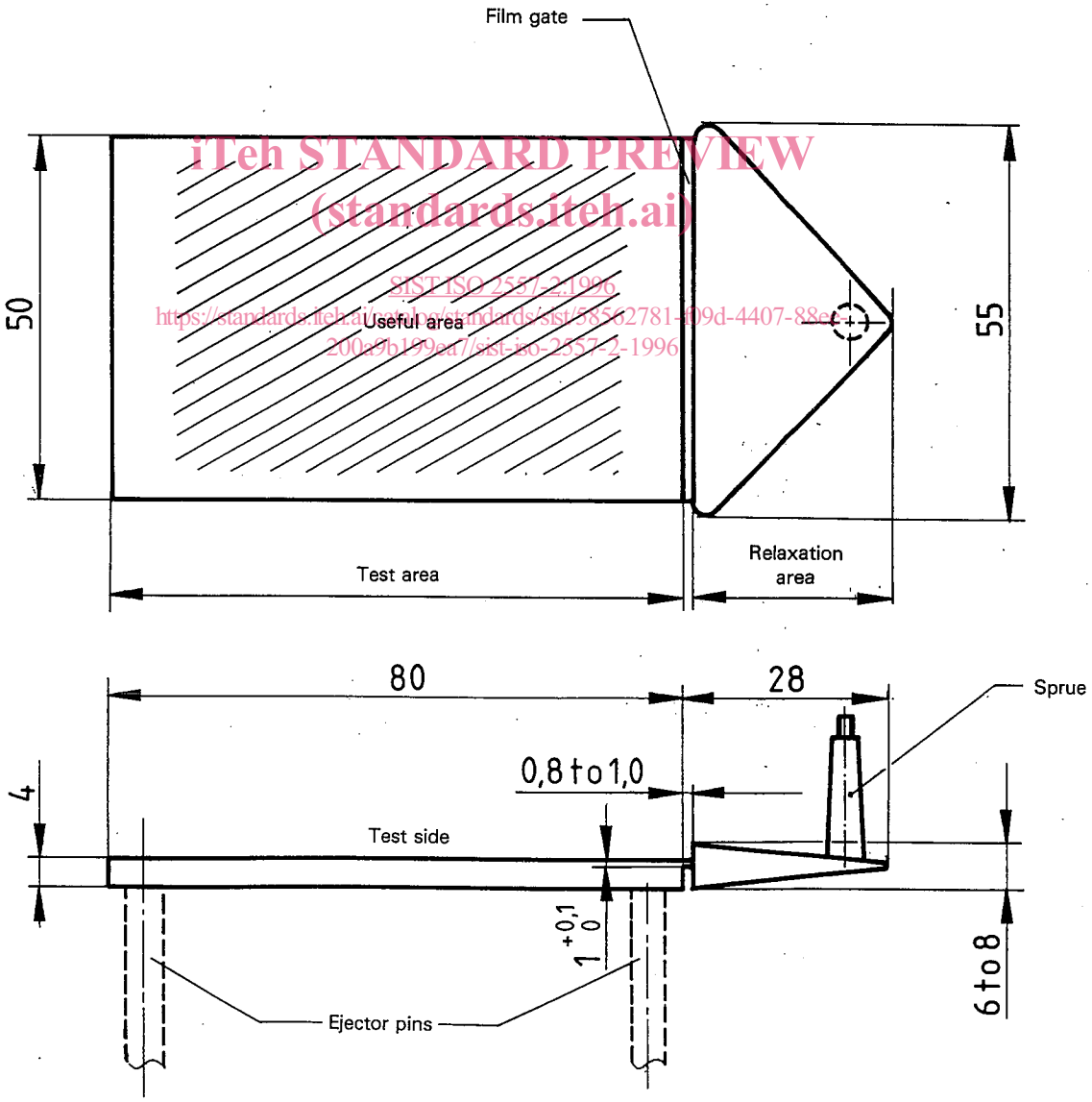
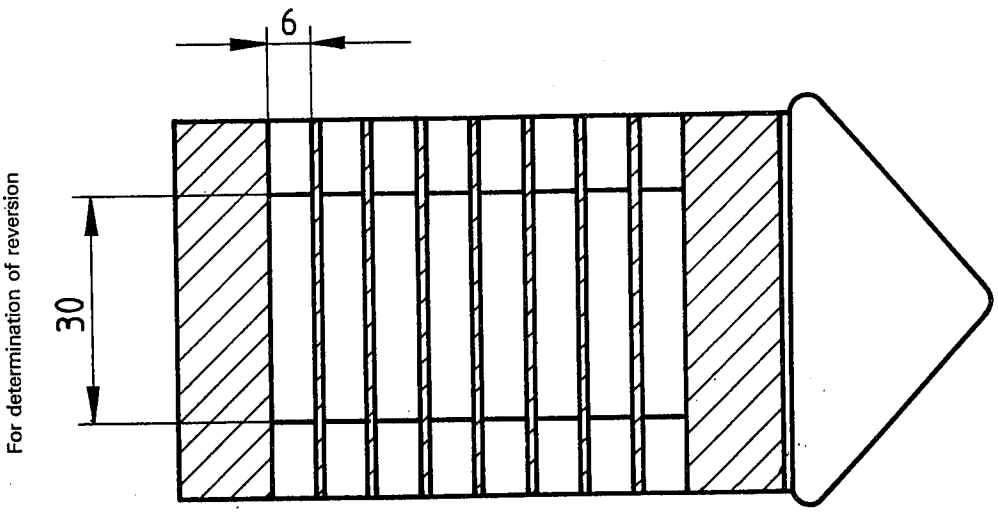


Figure 1 — Test specimen with rectangular test plate

Dimensions in millimetres



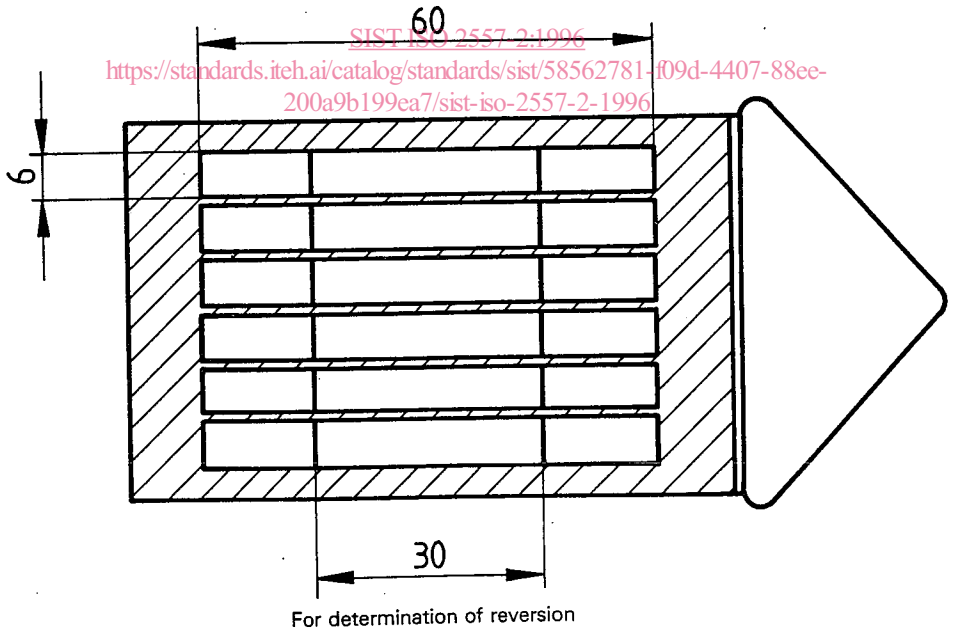


Figure 2 — Test bars cut length- or crosswise (see 7.3)