SLOVENSKI STANDARD
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Preskus zvarjenih spojev plastomernih polizdelkov - 7. del: Trgalni preskus z zožanimi preskušanci

Testing of welded joints of thermoplastics semi-finished products - Part 7: Tensile test with waisted test specimens

Prüfen von Schweißverbindungen aus thermoplastischen Kunststoffen - Teil 7: Zugversuch an Probekörpern mit Rundkerbe

Essais des assemblages soudés sur produits semi-finis en thermoplastiques - Partie 7: Essai de traction avec éprouvettes entaillées en U

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This European Standard was approved by CEN on 19 August 2002.

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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 Management Centre has the same status as the official versions.

CEN members are the national standards bodies of Austria, Belgium, Czech Republic, Denmark, Finland, France, Germany, Greece, Iceland, Ireland, Italy, Luxembourg, Malta, Netherlands, Norway, Portugal, Spain, Sweden, Switzerland and United Kingdom.

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Contents

Foreword

This document EN 12814-7:2002 has been prepared by Technical Committee CEN/TC 249 "Plastics", the secretariat of which is held by IBN.

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of an identical text or by endorsement, at the latest by April 2003, and conflicting national standards shall be withdrawn at the latest by April 2003.

Annex A is informative.

This standard includes a Bibliography.

According to the CEN/CENELEC Internal Regulations, the national standards organizations of the following countries are bound to implement this European Standard: Austria, Belgium, Czech Republic, Denmark, Finland, France, Germany, Greece, Iceland, Ireland, Italy, Luxembourg, Malta, Netherlands, Norway, Portugal, Spain, Sweden, Switzerland and the United Kingdom.

1 Scope

This European Standard specifies the dimensions, the method of sampling, the preparation of the test specimens and the conditions for performing the tensile test with waisted test specimens in order to determine the tensile energy welding factor.

A tensile test with waisted specimens may be used in conjunction with other tests (e.g. bend, tensile, tensile creep, macro...) to assess the performance of welded assemblies, made from thermoplastics materials.

The test is applicable to co-axial or co-planar welded assemblies made from thermoplastics materials filled or unfilled, but not reinforced, irrespective of the welding process used. It is not applicable to tubular assemblies with a nominal outside diameter less than 90 mm.

2 Normative references

This European 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 European Standard only when incorporated in it by amendment or revision. For undated references the latest edition of the publication referred to applies (including amendments).

EN 13100-1, *Non destructive testing of welded joints of thermoplastics semi-finished products — Visual examination.*

EN ISO 527-1, *Plastics — Determination of tensile properties — Part 1: General principles (ISO 527-1:1993).*

ISO 5893, *Rubber and plastics test equipment — Tensile, flexural and compression types (constant rate of traverse) — Description.*

3 Symbols and designations

Symbols and designations are given in Table 1.

Table 1 — Symbols and designations

Symbols and abbreviations	Designations	Units
f_e	The tensile energy welding factor	—
E_w	The value of energy to break of the welded test specimen used in the calculation of f_e [a]	Joule
E_r	The value of energy to break of the unwelded test specimens taken from the same test piece, used in the calculation of f_e [b]	Joule
a_n	Nominal thickness of the test piece	millimetre
D_n	Nominal outside diameter of the tube	millimetre

[a] Area under the load/extension curve of the welded test specimen.
[b] Area under the load/extension curve of the unwelded test specimen.

4 Principle of the test

The test specimen is extended along its major longitudinal axis at constant speed until the test specimen fractures. During this procedure the load and extension sustained by the test specimen is measured and the energy to break is calculated.

5 Sampling procedures

The test specimens (welded and unwelded) shall be cut perpendicular to the welded joint at least eight hours after welding.

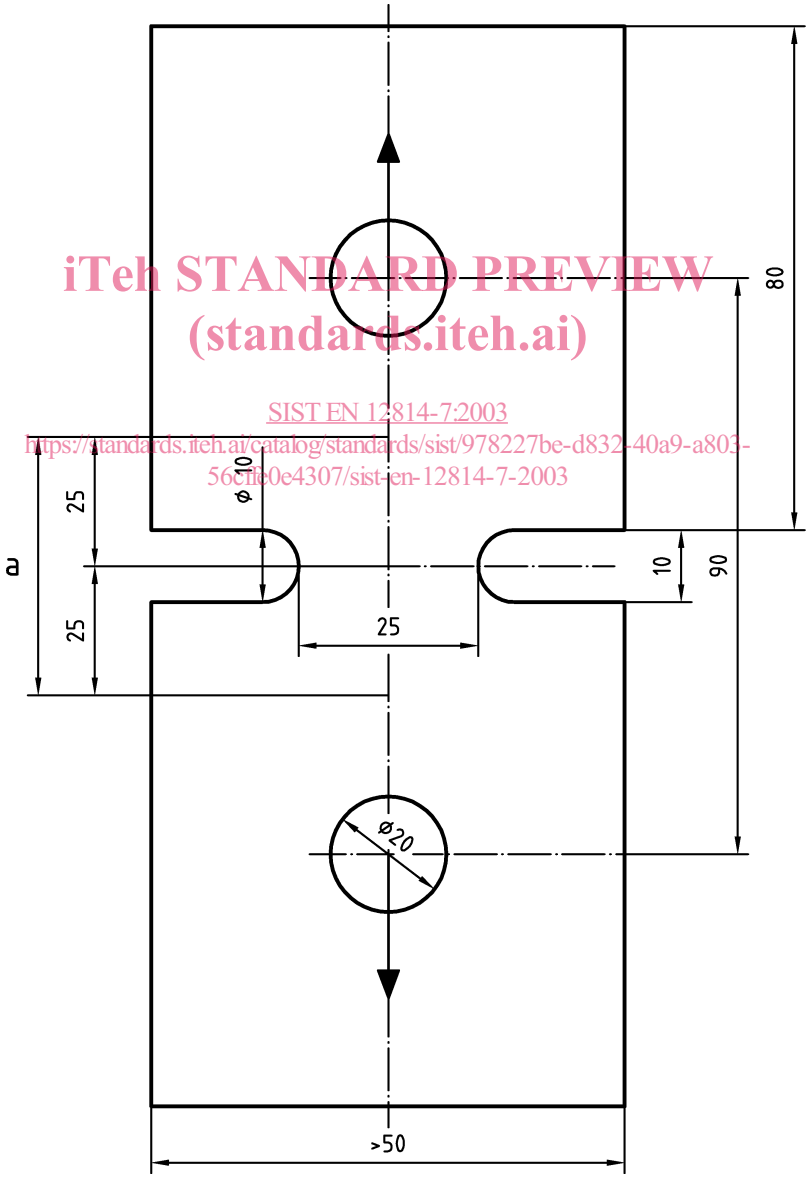
Each test specimen shall be marked in order to identify its original position within the test piece.

No heat treatment or mechanical straightening operations shall be carried out on the test specimen.

6 Dimensions of test specimens

The dimensions of test specimens are given in Figure 1.

Dimensions in millimetres



Key

a Extensometer gauge length

Figure 1 — Waisted tensile test specimen

Where the beads are left intact in service, they should be left intact for the test. Where the beads are removed in service, they should be removed prior to testing.

7 Cutting of test specimens

The tensile test specimens shall be cut with parallel sides as shown in Figure 1.

During cutting, heating of the test specimen shall be minimized.

The radiused portions of the test specimen shall be smooth but the surface finish of the other remaining edges is not critical.

After cutting, a visual examination of the weld, according to EN 13100-1, shall be carried out and recorded.

8 Mechanical testing

Test specimens shall be conditioned at a temperature of (23 ± 2) °C for not less than 12 h for test specimen thicknesses less than or equal to 12 mm, or for not less than 24 h for test specimen thicknesses greater than 12 mm. Unless otherwise specified, the temperature of the test specimen at the beginning of the test shall be (23 ± 2) °C.

The test speeds and tolerances shall be in accordance with EN ISO 527-1.

Examples of test speeds for some relevant thermoplastics materials are listed in annex A.

An extensometer shall be attached to either side of the specimen waisted section, between the loading holes (see Figure 1), to measure true elongation of the specimen during the test. The extensometer shall comply with EN ISO 527-1.

The complete load/extension curve and failure mode (brittle, ductile or mixed) shall be recorded for each specimen.

At least five test specimens shall be tested for each welded and unwelded test piece.

Welded and unwelded test specimens shall be of the same geometry and shall be tested at the same speed.

9 Test equipment

The test equipment shall conform to the requirements given in ISO 5893.

The crosshead displacement shall be continuous, uniform and in accordance with clause 8 of this standard.

10 Determination of the tensile energy welding factor

In order to determine the tensile energy welding factor, welded and unwelded test specimens shall be tested.

The tensile energy welding factor is determined from the arithmetic mean values of the energy to break of the welded test specimens (E_w) and the unwelded test specimens (E_r).

Tensile energy welding factor, $f_e = \dfrac{\overline{E_w}}{\overline{E_r}}$

The values of E_w and E_r are determined from the areas under the load/extension curves of the welded and unwelded test specimens, respectively, and can be determined using an electronic integrator, planimeter, counting squares or weighing the cut-out curve.

At least ten test specimens (five welded and five unwelded) shall be used in the evaluation of the tensile energy welding factor. No test specimen shall be disregarded unless failure occurs at the loading holes.

11 Test report

The test report shall refer to this standard and it shall include at least the following information:

a) description and identification of the test piece and test specimens;

b) appearance of the test pieces before the test:

   1) visual examination of weld;

   2) beads removed or not;

c) weld type;

d) nominal outside diameter of the tube, if applicable;

e) number of test specimens;

f) appearance of all surfaces of the test specimens, (e.g. flaws, scratches, visual imperfections);

g) thickness of test specimen;

h) type of extensometer;

i) temperature of the test specimen at the beginning of the test;

j) room temperature during the test;

k) the crosshead speed;

l) visual examination of the ruptured surface (failure mode);

m) calculated individual energy to break values;

n) calculated average energy to break values ($\overline{E_w}$ and $\overline{E_r}$);

o) calculated value of the tensile energy welding factor (f_e);

p) identification of the laboratory;

q) date of the test;

r) name and signature of the person responsible for the test report.