British Standard

BRITISH STANDARD

BS EN
12814-6:2000

Testing of welded joints of thermoplastics semi-finished products —

Part 6: Low temperature tensile test

The European Standard EN 12814-6:2000 has the status of a British Standard

ICS 25.160.40

National foreword

This British Standard is the official English language version of EN 12814-6:2000.

The UK participation in its preparation was entrusted to Technical Committee PRI/80, Welding thermoplastics, which has the responsibility to:

— aid enquirers to understand the text;

— present to the responsible European committee any enquiries on the interpretation, or proposals for change, and keep the UK interests informed;

— monitor related international and European developments and promulgate them in the UK.

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Summary of pages

This document comprises a front cover, an inside front cover, the EN title page, pages 2 to 11 and a back cover.

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Testing of welded joints of thermoplastics semi-finished products – Part 6: Low temperature tensile test

Essais des assemblages soudés sur produits semi-finis en thermoplastiques – Partie 6: Essai de traction à basse température

Prüfen von Schweißverbindungen aus thermoplastischen Kunststoffen – Teil 6: Zugversuch bei tiefen Temperaturen

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EUROPÄISCHES KOMITEE FÜR NORMUNG

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Foreword

This European Standard 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of an identical text or by endorsement, at the latest by July 2000, and conflicting national standards shall be withdrawn at the latest by July 2000.

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, Netherlands, Norway, Portugal, Spain, Sweden, Switzerland and the United Kingdom.

1 Scope

This standard specifies the dimensions, the method of sampling and the preparation of the test specimens, also the conditions for performing the low temperature tensile test perpendicular to the weld in order to determine the low temperature tensile welding factor.

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

The low temperature tensile welding factor and the appearance of the fracture surface provide a guide regarding the ductility of the joint and the quality of the work.

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.

The test is not applicable for tubes of nominal diameter less than 20 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 standard only when incorporated in it by amendment or revision. For undated references the latest edition of the publication referred to applies.

ISO 5893: 1993, *Rubber and plastics test equipment - Tensile, flexural and compression types (constant rate of traverse) - Description.*

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

3 Symbols and designations

Symbols and designations are given in Table 1.

Table 1 - Symbols and designations

Symbols and abbreviations	Designations	Units
a	Minimum measured thickness of the test specimen within calibrated and parallel length	millimetre
a_n	Nominal thickness of the test piece	millimetre
b	Width of calibrated and parallel length of the test specimen	millimetre
b_1	Width of shoulder of the test specimen	millimetre
D_n	Nominal outside diameter of the tube	millimetre
F_r	The value of force of the unwelded test specimens taken from the same test piece, used in the calculation of f_t	Newton
f_t	The low temperature tensile welding factor	
F_w	The value of force of the welded test specimens used in the calculation of f_t	Newton
L	Total length of the test specimen	millimetre
L_j	Minimum distance between the clamping jaws	millimetre
r	Radius of machining of the test specimen	millimetre
σ_r	The value of stress of the unwelded test specimens taken from the same test piece, used in the calculation of f_t	N/mm^2
σ_w	The value of stress of the welded test specimens used in the calculation of f_t	N/mm^2

4 Principle of the test

The test consists of subjecting a test specimen to a constant rate of displacement at low temperature until fracture occurs.

5 Sampling procedures

Welded and unwelded test specimens shall be taken from the same test piece.

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 so that its original position in the test piece can be identified.

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

6 Dimensions of test specimens

The dimensions for the test specimens are given in Figure 1 and Table 2 and Table 3.

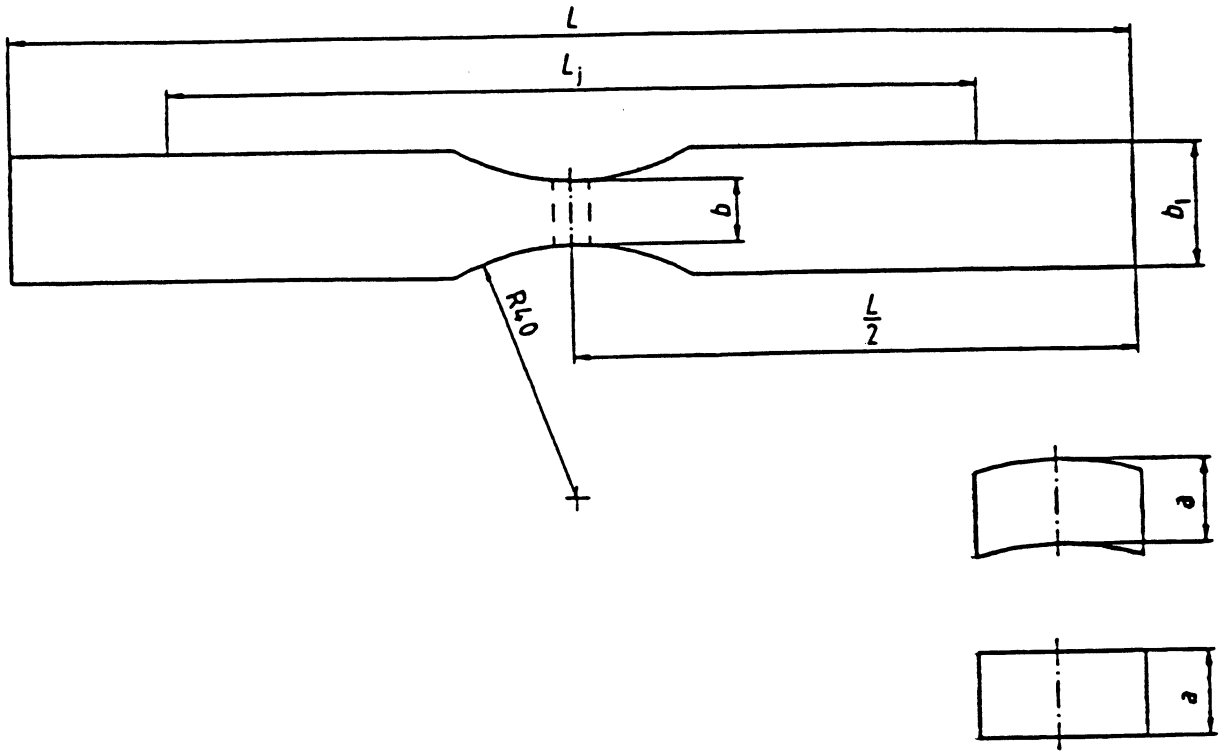

Figure 1 - Low temperature tensile test specimen

Table 2 - Dimensions of test specimens from tubes

Dimensions in millimetres

D_n	L	b_1	b
20	160	10	5
25	160	12	6
32	160	12	6
40	160	12	6
50	160	12	6
63	160	12	6
75	160	14	7
90	160	14	7
110	160	14	7
125	180	16	8
140	180	16	8
160	180	16	8
200	180	18	9
225	180	20	10
250	180	20	10
280	180	22	11
315	180	22	11
355	180	24	12
400	180	26	13
450	180	28	14

Table 3 - Dimensions of test specimens from plates

Dimensions in millimetres

a_n	L	b_1	b
$a_n \leq 10$	160	14	7
$10 < a_n \leq 20$	180	18	9
$20 < a_n$	180	28	14

For all test specimens, r shall be 40 mm.

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

The tolerance for b shall be $\pm$0,5 mm.

The tolerance for b_1 shall be $\pm$1 mm.

The maximum deviation of the centre line of the weld from the centre of the test specimen shall be $\pm$1 mm.

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.

Cutting of the test specimen shall not produce notches.

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

8 Mechanical testing

At least five test specimens shall be tested at the same test temperature and speed for each welded and unwelded test piece.

Examples of test speeds and maximum test temperatures, for some materials, are given in annex A.

If a test specimen yields, the test shall be repeated at a lower temperature and/or at a higher test speed, in order to generate a brittle fracture behaviour.

9 Test equipment

The test equipment shall conform to the requirements given in ISO 5893:1993.

10 Determination of the low temperature tensile welding factor

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

The low temperature tensile welding factor (f_t) is determined from the arithmetic mean values of the fracture stresses of the welded test specimens (σ_w) and the unwelded test specimens (σ_r) :

$$f_t = \frac{\overline{\sigma_w}}{\overline{\sigma_r}}$$

where :

$$\sigma_w = \frac{F_w}{ab}$$

$$\sigma_r = \frac{F_r}{ab}$$

At least ten test specimens (five welded and five unwelded) shall be used in the evaluation of the low temperature tensile welding factor. No test specimen shall be disregarded unless failure occurs in the clamps or yielding occurs.

The type of fracture and the fracture appearance of the test specimens after the test shall be assessed and recorded.

The low temperature tensile welding factor shall be calculated at a reference temperature and test speed as agreed between the contracting parties.

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 welding work;

   2) beads removed or not;

c) weld type;

d) maximum width of the weld bead, if applicable;

e) nominal outside diameter of the tube, if applicable (D_n);

f) number of test specimens;

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

h) thickness of test specimen (a);

i) total length of the test specimen (L);

j) radius of machining *(r)*;

k) distance between the clamping jaws (L_j);

l) test temperature (°C);

m) the crosshead speed (mm/min);

n) visual examination of the ruptured surface;

o) individual values of measured forces (F_w and F_r);

p) individual values of calculated stresses (σ_w and σ_r);

q) values of calculated average stresses ($\overline{\sigma_w}$ and $\overline{\sigma_r}$);

r) calculated value of the low temperature tensile welding factor (f_t);

s) identification of the laboratory;

t) date of the test;

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

Annex A (informative)

Test speed and maximum test temperature for low temperature tensile test

Test speeds and test temperatures for some thermoplastics materials are given in Table A.1.

Table A.1 - Test speeds and test temperatures for some thermoplastics materials

Material	Test speed	Maximum test temperature
PVDF	50 mm/min	-40 °C
PP	50 mm/min	-40 °C

During the test the variation of the test temperature shall not exceed ±5 °C.

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