

Testing of welded joints of thermoplastics semi-finished products —

Part 3: Tensile creep test

The European Standard EN 12814-1:2000, with the incorporation of amendment A1:2005, has the status of a British Standard

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National foreword

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Summary of pages

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**Testing of welded joints of thermoplastics semi-finished products
– Part 3: Tensile creep test
(includes amendment A1:2005)**

Essais des assemblages soudés sur produits semi-finis en
thermoplastiques – Partie 3: Essai de fluage
(inclut les amendement A1:2005)

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of an identical text or by endorsement, at the latest by July 2000, and conflicting national standards shall be withdrawn at the latest by July 2000.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

Foreword to amendment A1

This European Standard (EN 12814-3:2000/A1:2005) has been prepared by Technical Committee CEN/TC 249 "Plastics", the secretariat of which is held by IBN/BIN.

This Amendment to the European Standard EN 12814-3:2000 shall be given the status of a national standard, either by publication of an identical text or by endorsement, at the latest by January 2006, and conflicting national standards shall be withdrawn at the latest by January 2006.

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Introduction

The design of welded thermoplastics constructions under static load is based on the long-term creep rupture with behaviour, specifically the resistance to slow crack growth of the thermoplastics material and the welds.

For design purposes the relevant characteristic values for the welded joints are the 'long-term tensile welding factors' to which this standard provides the test method.

The long-term tensile welding factors are normally used in conjunction with the creep rupture curve of the parent material, given for example in EN 1778, when designing welded semi-finished products under static load.

The long-term tensile welding factor(s), the crack behaviour and the appearance of the fracture surface provide information on the quality of the weld.

NOTE The behaviour of the failure obtained during the tensile creep test can be related to the notch sensitivity of the parent material. An example of a test to provide information about the notch sensitivity of parent material is given in annex A.

1 Scope

This standard specifies the dimensions, the method of sampling and the preparation of the test specimens, and the conditions for performing the tensile creep test perpendicular to the weld in order to determine the long-term tensile welding factor.

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

The test is applicable to welded assemblies made from thermoplastics materials filled or unfilled such as tubes and fittings, sheets, plates and profiles, but not reinforced, irrespective of the welding process used.

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.

ISO 899-1, *Plastics - Determination of creep behaviour - Part 1: Tensile creep*.

EN 1778, *Characteristic values for welded thermoplastics constructions - Determination of allowable stresses and moduli for design of thermoplastics equipment*.

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

3 Terms and definitions

For the purposes of this standard, the following definitions apply:

3.1

test temperature

temperature of the medium surrounding the test specimen during the test

3.2

test stress

test load divided by the minimum cross sectional area of the test specimen

3.3

creep rupture curve

regression curve through the geometric mean values of failure times

3.4

minimum failure time t_{tm}

creep rupture time of the parent material to ensure that the test method is applicable

3.5

ductile fracture

large scale deformation of material from fracture surfaces

3.6

brittle fracture

little or no deformation of material from fracture surfaces

4 Symbols and designations

Symbols and designations are given in Table 1.

Table 1 — Symbols and designations

Symbols	Designations	Units
a	Minimum measured thickness of test specimen within calibrated and parallel length	millimetre
a_n	Nominal thickness of 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
c	Depth of the notch	millimetre
D_n	Nominal outside diameter of the tube	millimetre
f_l	The long-term tensile welding factor.	
F_s	The value of the force applied to the welded test specimen calculated from the chosen value of σ_s	Newton
F_t	The value of the force applied to the unwelded test specimen calculated from the chosen value of σ_t	Newton
L	Total length of the test specimen	millimetre
L_j	Minimum distance between the clamping jaws	millimetre
L_0	Calibrated and parallel length of the test specimen	millimetre
L_w a)	Maximum width of the weld bead of the test specimen	millimetre
r	Radius of shoulder of the test specimen	millimetre
t_{tm}	Minimum failure time	hour
σ_s	The value of stress of the welded test specimens used in the calculation of f_l	N/mm ²
σ_t	The reference stress. The value of stress of the unwelded test specimens, used in the calculation of f_l	N/mm ²
a) For extrusion and hot gas welds only.		

5 Principle of the test

The test involves subjecting a test specimen to a constant load until fracture occurs. The time to fracture is measured and recorded.

The tests are carried out over a range of temperatures and loads, and in a test medium. Only such media shall be used which cause no swelling or degradation of the polymer. Examples of available test media are air, water or solutions of demineralized water with detergents.

The applicability of the long-term tensile welding factor for design purposes requires a minimum creep rupture time for the parent material (t_{tm}). Before determining the long-term welding factor for the materials mentioned in annex B, a tensile creep test should be carried out on the parent material at one of the test conditions given in Table B.1. The values of creep rupture time should be at least that quoted in Table B.1.

NOTE Application standards may prescribe higher values for these rupture times depending upon the semi-finished product and material.

6 Sampling procedures

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

A1 NOTE In the case of socket joints, see Annex C. **A1**

The test specimens (welded and unwelded) shall be cut perpendicular to the welded joint at least eight hours after welding. For sheets where the extrusion direction is different on either side of the weld, the unwelded test specimens shall be taken from the side of the test piece which has the lowest creep rupture time.

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.

7 Dimensions of test specimens

The dimensions of test specimens according to Figure 1 are given in Table 2 and those according to Figure 2 are given in Table 3.

Profiles can be tested if test specimens are in accordance with the dimensions given in Table 2 or Table 3.

For tubes having nominal outside diameter less than 20 mm the whole tube shall be tested. In this case, the minimum distance between the clamps shall be 200 mm.