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Preskušanje zvarjenih spojev plastomernih polizdelkov - 2. del: Trgalni preskus

Testing of welded joints of thermoplastics semi-finished products - Part 2: Tensile test

Prüfen von Schweißverbindungen aus thermoplastischen Kunststoffen - Teil 2:
Zugversuch

Essais des assemblages soudés sur produits semi-finis en thermoplastiques - Partie 2 :
Essai de traction

Ta slovenski standard je istoveten z: prEN 12814-2

ICS:

| 25.160.40 | Varjeni spoji in vari | Welded joints and welds |
| :--- | :--- | :--- |
| 83.080.01 | Polimerni materiali na | Plastics in general |
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## English Version

# Testing of welded joints of thermoplastics semi-finished products - Part 2: Tensile test 

Essais des assemblages soudés sur produits semi-finis en thermoplastiques - Partie 2 : Essai de traction

Prüfen von Schweißverbindungen aus thermoplastischen Kunststoffen - Teil 2: Zugversuch

This draft European Standard is submitted to CEN members for enquiry. It has been drawn up by the Technical Committee CEN/TC 249.

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EUROPEAN COMMITTEE FOR STANDARDIZATION
COMITÉ EUROPÉEN DE NORMALISATION
EUROPÄISCHES KOMITEE FÜR NORMUNG

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## European foreword

This document (prEN 12814-2:2019) has been prepared by Technical Committee CEN/TC 249 "Plastics", the secretariat of which is held by NBN.

This document is currently submitted to the CEN Enquiry.
This document will supersede EN 12814-2:2000.
In comparison with the previous edition, the following technical modifications have been made:

- the references standards ISO 5893 and ISO 13953 have been changed to undated;
- a new annex (Annex A), describing the tensile test specimen geometry for overlap joints, has been added.


## 1 Scope

This document specifies the dimensions, the method of sampling, the preparation of the test specimens and the conditions for performing the tensile test in order to determine the short-term tensile welding factor.
A 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 test is applicable to welded assemblies made from thermoplastics materials filled or unfilled, but not reinforced, irrespective of the welding process used.

## 2 Normative references

The following documents are referred to in the text in such a way that some or all of their content constitutes requirements of this document. For dated references, only the edition cited applies. For undated references, the latest edition of the referenced document (including any amendments) applies.
EN ISO 527-1, Plastics — Determination of tensile properties — Part 1: General principles (ISO 527-1)
ISO 5893, 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

For the purposes of this document, the symbols and designations given in Table 1 apply.
ISO and IEC maintain terminological databases for use in standardization at the following addresses:

- IEC Electropedia: available at http://www.electropedia.org/
- ISO Online browsing platform: available at http://www.iso.org/obp

Table 1 - Symbols and designations

| Symbols and <br> abbreviations | Designations | Units |
| :---: | :--- | :---: |
| $a$ | Minimum measured thickness of the test <br> specimen within calibrated and parallel length | millimetre |
| $a_{\mathrm{n}}$ | Nominal thickness of the test piece | millimetre |
| $b$ | Width of calibrated and parallel length of the test <br> specimen | millimetre |
| $b_{1}$ | Width of shoulder of the test specimen | millimetre |
| $D_{\mathrm{n}}$ | Nominal outside diameter of the tube | millimetre |
| $F_{\mathrm{r}}$ | The value of force of the unwelded test specimens <br> taken from the same test piece, used in the <br> calculation of $f_{\mathrm{s}}$ | Newton |
| $f_{\mathrm{s}}$ | The short-term tensile welding factor |  |


| Symbols and <br> abbreviations | Designations | Units |
| :---: | :--- | :---: |
| $F_{\mathrm{w}}$ | The value of force of the welded test specimen <br> used in the calculation of $f_{\mathrm{s}}$ | Newton |
| $L$ | Total length of the test specimen | millimetre |
| $L_{\mathrm{j}}$ | Minimum distance between the clamping jaws | millimetre |
| $L_{\mathrm{o}}$ | Calibrated and parallel length of the test specimen | millimetre |
| $L_{\mathrm{w}}$ | Maximum width of the weld bead of the test <br> specimen | millimetre |
| $r$ | Radius of shoulder of the test specimen | millimetre |
| $a_{\mathrm{r}}$ | The value of stress of the unwelded test specimens <br> taken from the same test piece, used in the <br> calculation of $f_{\mathrm{s}}$ | $\mathrm{N} / \mathrm{mm}^{2}$ |
| $a_{\mathrm{w}}$ | The value of stress of the welded test specimens <br> used in the calculation of $f_{\mathrm{s}}$ | $\mathrm{N} / \mathrm{mm}^{2}$ |

## 4 Principle of the test

The test specimen is extended along its major longitudinal axis at constant speed until the test specimen fractures or yields. During this procedure the load sustained by the test specimen is measured.

## 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

For tubes of nominal outside diameter $D_{\mathrm{n}}$ less than 20 mm the whole tube shall be tested and the minimum distance between the clamps shall be 200 mm .
The dimensions of test specimens are given in Table 2 and Table 3.

Table 2 - Dimension of type 1 test specimens

| Dimension in millimetres |  |  |  |
| :---: | :---: | :---: | :---: |
| $D_{\mathrm{n}}$ or $a_{\mathrm{n}}$ | $\boldsymbol{b}$ | $\boldsymbol{L}_{\mathbf{o}}$ | $\boldsymbol{L}$ |
| $20 \leq D_{\mathrm{n}}<50$ | $a_{\mathrm{n}+} \frac{D_{\mathrm{n}}}{10}$ | 80 | $\geq 120$ |
|  |  |  |  |
| $50 \leq D_{\mathrm{n}}<100$ | $a_{\mathrm{n}+} \frac{D_{\mathrm{n}}}{10}$ | 120 | $\geq 170$ |
|  |  |  |  |
| $D_{\mathrm{n}} \geq 100$ |  |  |  |
| or flat assemblies: |  |  |  |
| $a_{\mathrm{n}} \leq 10$ | 15 | 120 | $\geq 170$ |
| $10<a_{\mathrm{n}} \leq 20$ | 30 | 120 | $\geq 400$ |
| $a_{\mathrm{n}}>20$ | $1,5 a_{\mathrm{n}}$ | 200 |  |



Key
1 weld
Figure 1 - Type 1 test specimen for flat and tubular assemblies

Table 3 - Dimension of type 2 test specimens
Dimensions in millimetres

| $D_{\mathrm{n}}$ or $a_{\mathrm{n}}$ | $\boldsymbol{b}$ | $\min . b_{1}$ | $\boldsymbol{L}_{\mathbf{o}}$ | $\boldsymbol{L}$ | $\boldsymbol{r}$ |
| :---: | :---: | :---: | :---: | :---: | :---: |
| $20 \leq D_{\mathrm{n}}<50$ | $a_{\mathrm{n}}+\frac{D_{\mathrm{n}}}{10}$ | $b+10$ | 80 | $\geq 120$ | 60 |
| $50 \leq D_{\mathrm{n}}<100$ | $a_{\mathrm{n}}+\frac{D_{\mathrm{n}}}{10}$ | $b+10$ | 120 | $\geq 170$ | 60 |
|  |  |  |  |  |  |
| $D_{\mathrm{n}} \geq 100$ |  |  |  |  |  |
| or flat assemblies: | 15 | 20 | 120 | $\geq 170$ | 60 |
| $a_{\mathrm{n}} \leq 10$ | 30 | 40 | 120 | $\geq 300$ | 60 |
| $10<a_{\mathrm{n}} \leq 20$ | $1,5 a_{\mathrm{n}}$ | 80 | 200 | $\geq 400$ | 60 |
| $a_{\mathrm{n}}>20$ |  |  |  |  |  |



Key
1 weld
Figure 2 - Type 2 test specimen for flat and tubular assemblies

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 $\pm 1 \mathrm{~mm}$ and the minimum value shall be 6 mm . The tolerance for $L_{0}$ shall be $\pm 2 \mathrm{~mm}$.
The variation of b over the length $L_{0}$ shall not exceed $\pm 2 \%$ of the average value of $b$.
The forms of the test specimens are given in Figure 1 and Figure 2.
For overlap joints, the dimensions and form of the test specimens are given in Annex A.

## 7 Cutting of test specimens

The tensile test specimens shall be cut with parallel sides as shown in Figures 1 and 2. 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

Test specimen shall be conditioned to a temperature of $(23 \pm 2)^{\circ} \mathrm{C}$ and unless otherwise specified, the test shall be carried out at a room temperature of $\left(23_{-5}^{+2}\right){ }^{\circ} \mathrm{C}$.

The test speeds and tolerances shall be in accordance with EN ISO 527-1.
For all materials the test speed shall be chosen to ensure that the test is terminated in about one minute. Examples of test speeds for some relevant thermoplastics materials are listed in Annex B.

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 with the same distance between the clamps.

If all welded test specimens fracture or yield within the calibrated length, but outside of the weld $\left(L_{\mathrm{w}}\right)$, the unwelded test specimen do not need to be tested, and the short-term tensile welding factor shall be taken as 1.

In order to achieve a failure in the weld and thus a better differentiation of the weld quality, the test specimens should be as described in ISO 13953 or in Annex C.

## 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.

## 10 Determination of the short-term tensile welding factor

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

The short-term tensile welding factor is determined from the arithmetic mean values of the fracture stresses of the welded test specimens, $\sigma_{\mathrm{w}}$, and the unwelded test specimens $\sigma_{\mathrm{r}}$, where:

$$
\begin{aligned}
& \sigma_{\mathrm{w}}=\frac{F_{\mathrm{w}}}{a b} \\
& \sigma_{\mathrm{r}}=\frac{F_{\mathrm{r}}}{a b}
\end{aligned}
$$

If the test specimens yield prior to fracture, the yield stress shall be used instead of fracture stress.
Short-term tensile welding factor $f_{\mathrm{s}}=\frac{\bar{a}_{\mathrm{w}}}{\overline{\bar{a}}_{\mathrm{r}}}$. If $\bar{a}_{\mathrm{w}}>\bar{a}_{\mathrm{r}}$, then $f_{\mathrm{s}}=1$.

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

