INTERNATIONAL STANDARD

ISO 21751

First edition
2011-04-01

Plastics pipes and fittings — Decohesion test of electrofusion assemblies — Strip-bend test

Tubes et raccords en matières plastiques — Essai de décohésion des assemblages électrosoudables — Essai de pliage d'une languette

Reference number
ISO 21751:2011(E)

ISO copyright office
Case postale 56 • CH-1211 Geneva 20
Tel. + 41 22 749 01 11
Fax + 41 22 749 09 47
E-mail copyright@iso.org
Web www.iso.org

Published in Switzerland

Foreword

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International Standards are drafted in accordance with the rules given in the ISO/IEC Directives, Part 2.

The main task of technical committees is to prepare International Standards. Draft International Standards adopted by the technical committees are circulated to the member bodies for voting. Publication as an International Standard requires approval by at least 75 % of the member bodies casting a vote.

Attention is drawn to the possibility that some of the elements of this document may be the subject of patent rights. ISO shall not be held responsible for identifying any or all such patent rights.

ISO 21751 was prepared by Technical Committee ISO/TC 138, *Plastics pipes, fittings and valves for the transport of fluids*, Subcommittee SC 5, *General properties of pipes, fittings and valves of plastic materials and their accessories — Test methods and basic specifications*.

Plastics pipes and fittings — Decohesion test of electrofusion assemblies — Strip-bend test

1 Scope

This International Standard specifies a strip-bend test method for the evaluation of ductility of the fusion joint interface of assemblies of pipe and electrofusion fittings and saddle fittings intended for the conveyance of fluids.

It is applicable to polyolefin assemblies.

NOTE The aim of the strip-bend test method is to provide a quick check in order to have an indication of the ductility of the electrofusion interface.

2 Normative references

The following referenced documents are indispensable for the application 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.

ISO 11413, *Plastics pipes and fittings — Preparation of test piece assemblies between a polyethylene (PE) pipe and an electrofusion fitting*

3 Symbols

s width of test strip

l length of brittle fracture

L_d brittle failure, expressed as a percentage

y length of fusion zone at location of brittle fracture

4 Principle

The purpose of the test is to check the failure behaviour of an electrofusion assembly by examination of the fusion interface of a strip test piece, which is bent manually using an appropriate tool. The test is conducted at (23 ± 2) °C.

The ductility of the fusion joint interface of the assembly is characterized by the type of failure in the fusion zone and by the percentage of fusion area in which there is a lack of cohesion.

NOTE It is assumed that the required number of test pieces (see 6.2) is set by the standard or specification making reference to this International Standard.

5 Apparatus

The apparatus shall include the following main parts.

5.1 Band-saw or equivalent tool, for preparation of the test pieces.

5.2 Bench vice, with sufficient width to clamp the total length of the fusion zone under test; clamps undamaged.

5.3 Pliers, with clamp width 10 mm for nominal pipe diameters up to and including 75 mm and clamp width 25 mm for nominal pipe diameters greater than 75 mm; clamps undamaged.

6 Test piece

6.1 Preparation of test pieces

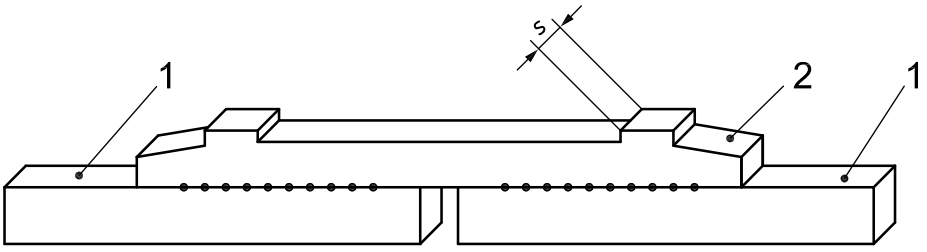
Pipes and fittings shall be jointed according to the manufacturer's instructions and under conditions given in the product standard. For polyethylene (PE) assemblies, the conditions for electrofusion shall be as specified in ISO 11413.

The minimum pipe lengths shall be 250 mm or two times the pipe diameter, whichever is the greater. The pipe ends shall be cut back after fusion to achieve at least 25 mm projection from the edge of the electrofusion fitting.

For socket assemblies, cut at least four strips for nominal pipe diameters up to and including 75 mm or at least eight strips for nominal pipe diameters greater than 75 mm from each socket, along the longitudinal axis of the assembly and equally spaced around the circumference, with a width $s = (2{,}5 \pm 0{,}5)$ mm for nominal pipe diameters up to and including 75 mm or $s = \left(4^{+2}_{-1}\right)$ mm for nominal pipe diameters greater than 75 mm. See Figure 1. The length equals the complete length of the assembly. The strips shall include the position of maximum gap between the fitting and the pipe, identified by visual examination prior to sectioning.

For saddles, at least four strips shall be taken from planes through the branch axis or axis of the tapping unit, of which one strip shall belong to the main pipe axis and one strip shall be perpendicular to the main pipe axis. The other strips shall be taken at 45° of the aforementioned strip positions. The width s of the strips shall be $s = (2{,}5 \pm 0{,}5)$ mm for nominal main pipe diameters up to and including 75 mm or $s = \left(4^{+2}_{-1}\right)$ mm for nominal main pipe diameters greater than 75 mm.

In case of fittings with fusion lengths greater than or equal to 50 mm, the length of the fusion zone may be segmented into sections of maximum 25 mm, starting from the ends of the fusion zone. These sections may be obtained by introducing slits in the fitting part of the strips.



Key

1 pipe
2 fitting

Figure 1 — Preparation of strips from an electrofusion socket assembly

6.2 Number of test pieces

Unless otherwise specified by the referring standard or specification, the number of test pieces shall be three.

7 Conditioning

Between the fusion and the machining operations, the assembly shall be conditioned for at least 4 h at ambient temperature. Polybutylene (PB) assemblies shall be conditioned according to the recommendations of the manufacturer.

After preparation of the strips from the assembly, the strips shall be conditioned at the test temperature of (23 ± 2) °C for at least 1 h.

8 Procedure

For each strip, carry out the following procedure at (23 ± 2) °C. (See Figure 2 for a schematic representation of the test setup.)

a) Clamp the fitting part of the strip into the bench vice just below the level of the electrical wires. The bench vice shall be tightened manually.

b) Clamp the pipe into the pliers. If the width of clamps does not cover the complete fusion zone, start from one end of the fusion zone. If adjustable pliers are used, the tightening force shall be set such that slippage of the test piece in the pliers is prevented.

c) Move the pliers smoothly in 2 s to 3 s over an angle of about 90° (or until contact between the vice and the pliers) in one direction, then back to the original position. Continue over about 90° in the other direction, then back again to the original position. Reposition the pliers on the pipe at a distance that corresponds to the width of the plier jaws and repeat the operation until the other end of the fusion zone is reached.

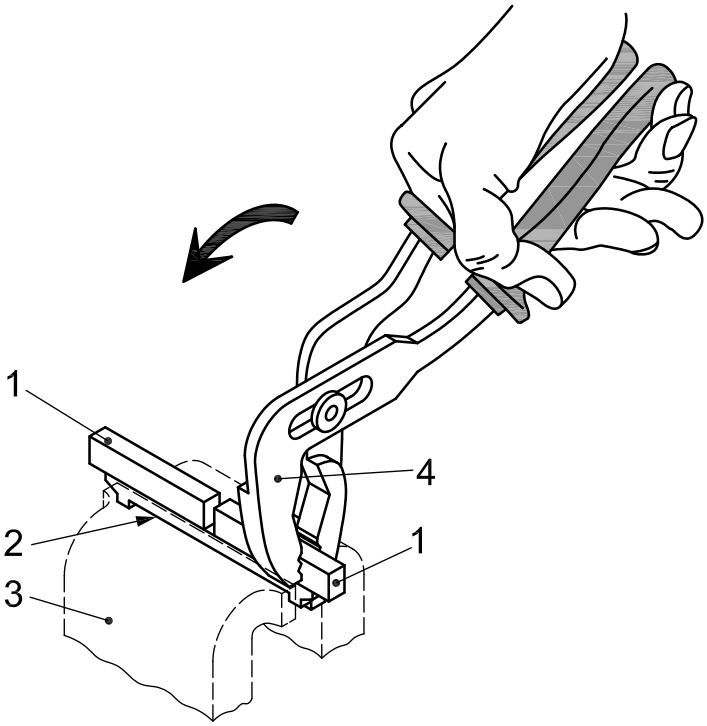
d) Report the position and type of break (brittle or ductile).

NOTE Typical failure patterns are characterized in Figures 3, 4, 5 and 6;

e) Measure and record the largest length of brittle fracture (l) and the total length of the fusion zone at the same location (y).

f) Calculate the percentage of brittle failure, L_d, using the following equation: $L_d = \frac{l}{y} \times 100\ (\%)$.

NOTE See Annex A for recommended value of L_d.



Key

1 pipe
2 fitting
3 bench vice
4 pliers

Figure 2 — Positioning of strip

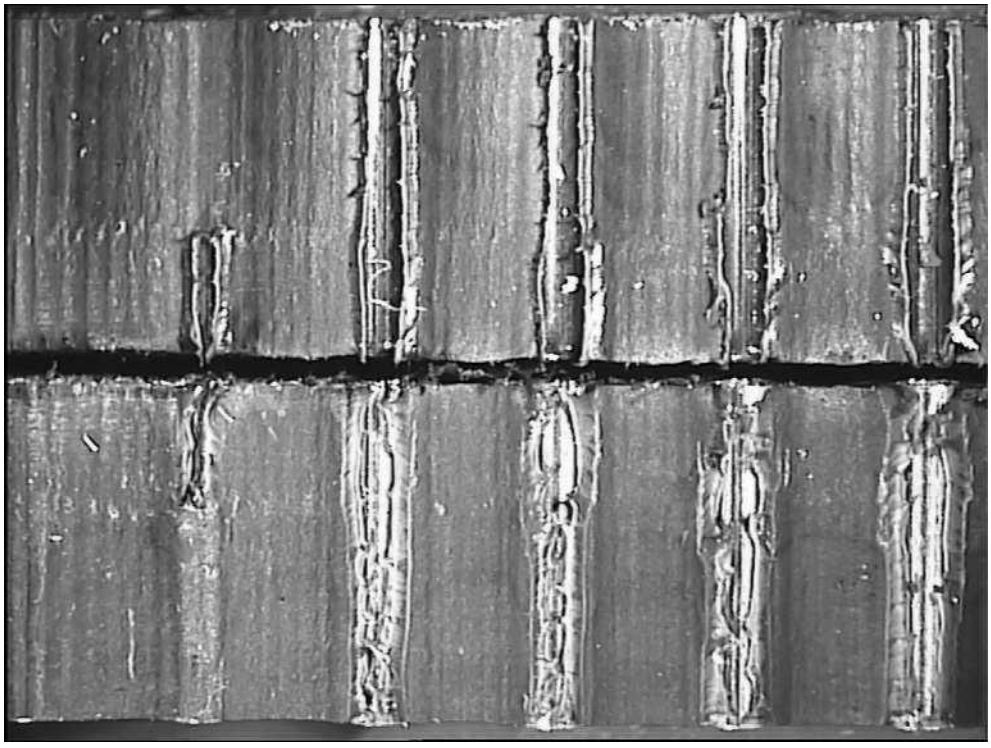


Figure 3 — Typical brittle fracture – view on fracture surface

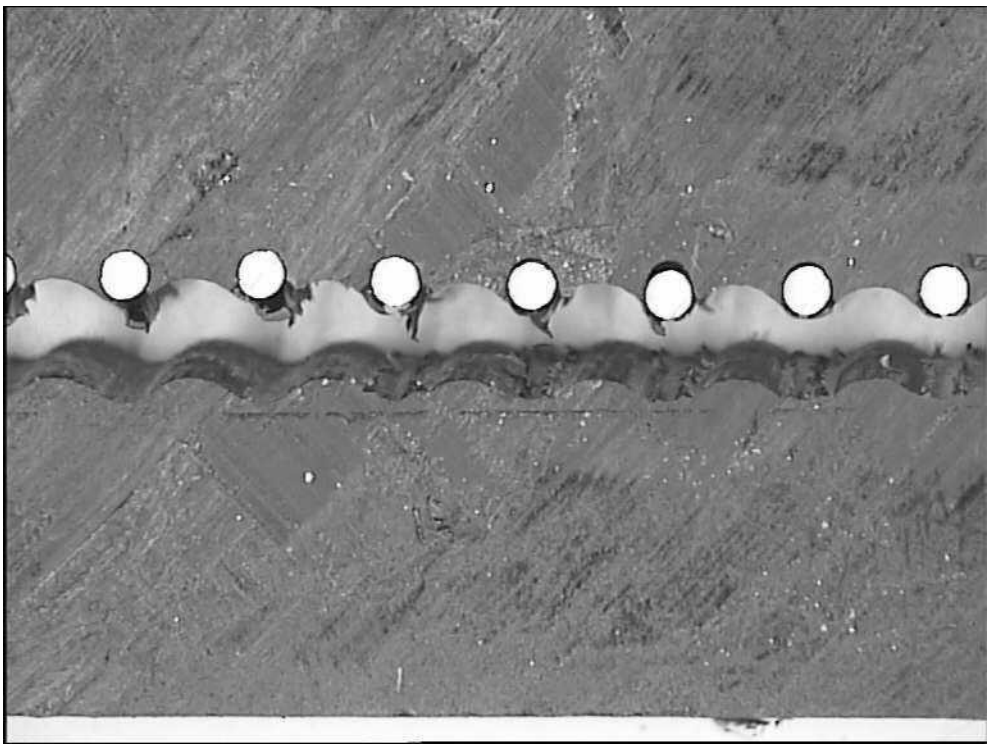


Figure 4 — Typical brittle fracture – side view

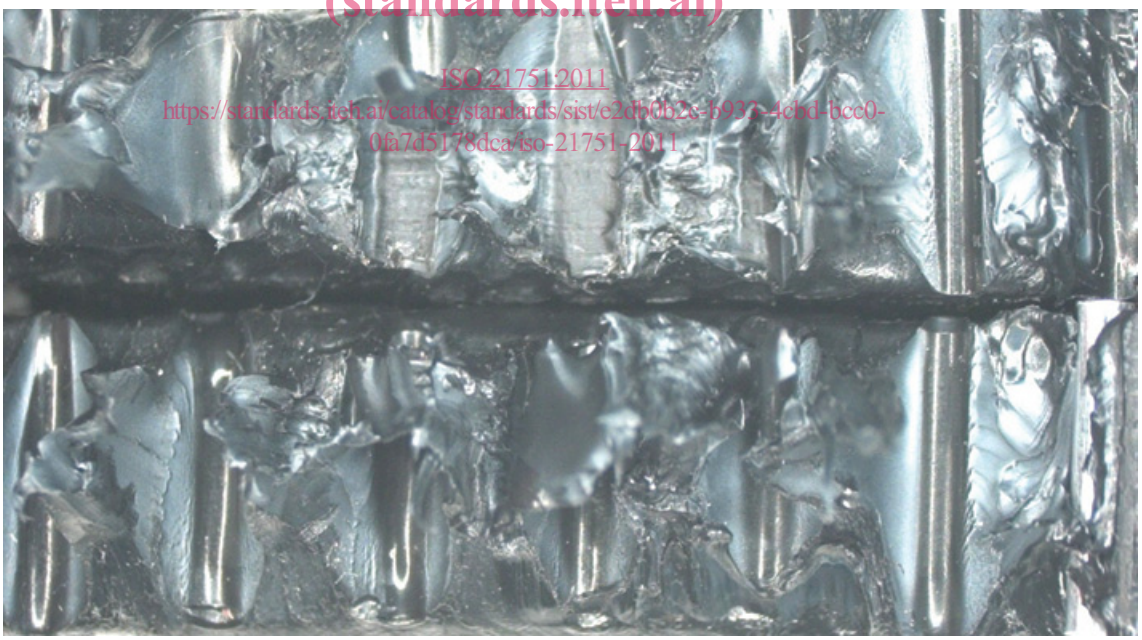


Figure 5 — Typical ductile fracture between wires – view on fracture surface