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**Plastics pipes and fittings — Peel  
decohesion test for polyethylene (PE)  
electrofusion assemblies of nominal  
outside diameter greater than or equal  
to 90 mm**

*Tubes et raccords en matières plastiques — Essai de décohésion  
par pelage des assemblages électrosoudables en polyéthylène (PE)  
de diamètres extérieurs nominaux supérieurs ou égaux à 90 mm*



## Foreword

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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.

International Standard ISO 13954 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*.

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# Plastics pipes and fittings — Peel decohesion test for polyethylene (PE) electrofusion assemblies of nominal outside diameter greater than or equal to 90 mm

## 1 Scope

This International Standard describes a peel test method for determining the decohesive resistance of polyethylene electrofusion socket assemblies for use in the distribution of fluids. This method is applicable to assemblies with nominal outside diameters greater than or equal to 90 mm.

## 2 Normative reference

The following standard contains provisions which, through reference in this text, constitute provisions of this International Standard. At the time of publication, the edition indicated was valid. All standards are subject to revision, and parties to agreements based on this International Standard are encouraged to investigate the possibility of applying the most recent edition of the standard indicated below. Members of IEC and ISO maintain registers of currently valid International Standards.

ISO 11413:1996, *Plastics pipes and fittings — Preparation of test piece assemblies between a polyethylene (PE) pipe and an electrofusion fitting.*

## 3 Principle

The purpose of the test is to assess the cohesion of a PE pipe/electrofusion socket assembly by examination of the decohesion of the assembly by tensile stressing of a strip test piece under conditions which cause progressive peeling of the fused interface. The test is conducted at  $23\text{ °C} \pm 2\text{ °C}$ .

The decohesive strength of the assembly is characterized by the nature of the failure in the tube wall, the fitting wall or the plane of the fused material and by the percentage decohesion.

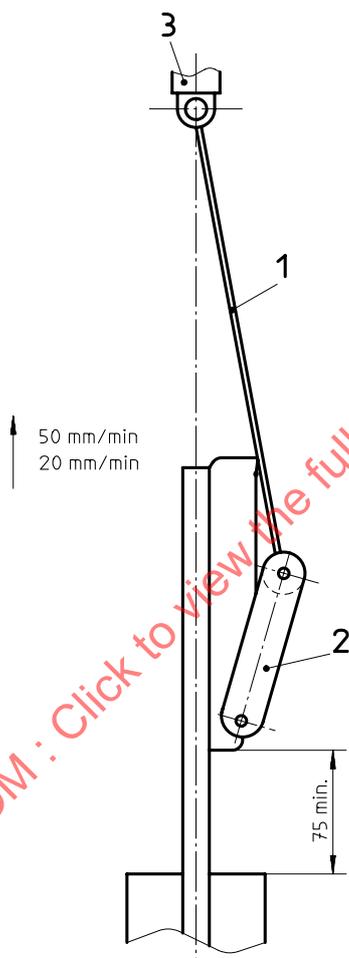
## 4 Apparatus

The apparatus shall include the following main elements (see figure 1):

**4.1 Tensile-testing machine**, capable of pulling at the specified test speed (see clause 7) with sufficient force to separate the test piece components (see clause 5 and figure 4).

**4.2 Shackle-type link**, as shown in figure 2.

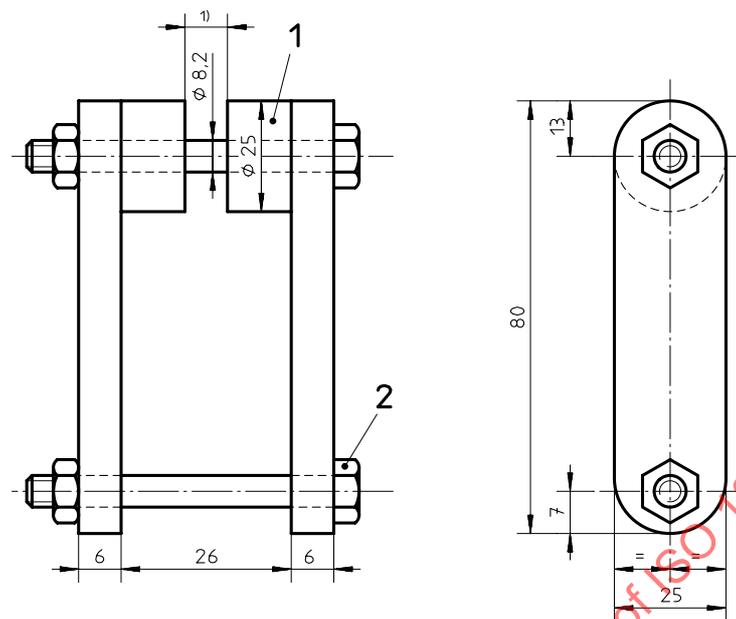
Dimensions in millimetres

**Key**

- 1 Tensioning chain or wire rope (minimum length 300 mm)
- 2 Shackle-type link
- 3 Tensile-testing machine

**Figure 1 — Peel test assembly**

Dimensions in millimetres

**Key**

- 1 Spacer
  - 2 Bolt, designed to fit the hole in the test piece (see figures 1 and 3)
- 1) Gap sized to accommodate tensioning chain/rope

**Figure 2 — Shackle-type link****5 Test pieces****5.1 Preparation of assembly**

Samples of electrofusion socket fittings and of pipe obtained by sampling as specified by the product standard shall be assembled in accordance with ISO 11413 and so that the end of each pipe projects at least 125 mm from each electrofusion socket.

**5.2 Preparation of test pieces**

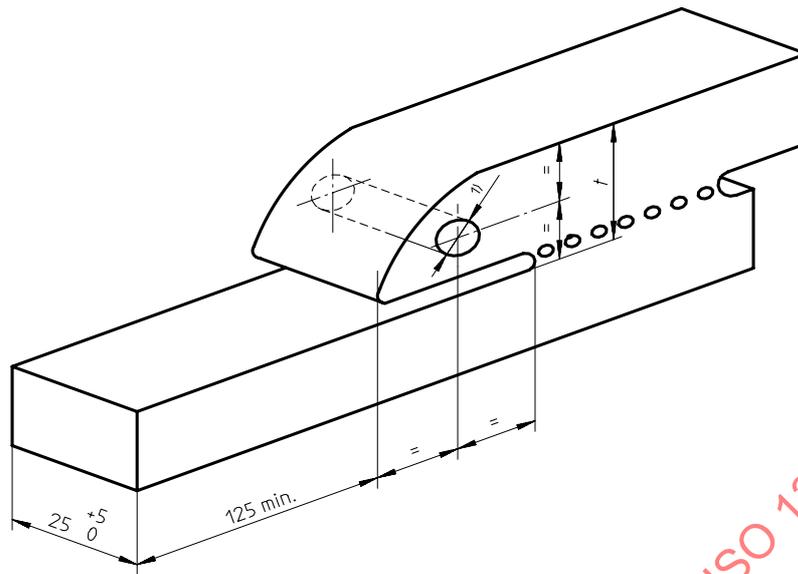
**5.2.1** Prepare the test pieces in accordance with 5.2.2, at least 24 h after fusion.

**5.2.2** Cut four test pieces from the assembly so that:

- a) test pieces are included with the minimum gap between the fitting and the pipe and with the maximum gap, identified by visual examination prior to sectioning;
- b) the cut sides of the test piece are parallel over its whole length and the width of the test piece is  $25\text{ mm} +^5_0\text{ mm}$  or equal to the nominal thickness of the pipe wall to a tolerance of  $+^5_0\text{ mm}$ , whichever is the greater.

In the case of assemblies incorporating a coupler, cut the test pieces in half across the centre of the coupler to produce eight test pieces (see figure 3).

Dimensions in millimetres



- 1) Hole, diameter  $t/5$  with a minimum of 3 mm, for bolt of shackle-type link.

**Figure 3 — Dimensions and shape of test piece**

**5.2.3** In each test piece, drill a hole through the fitting for attachment of the shackle-type link, as shown in figure 2, the diameter of the hole being  $t/5$  with a minimum of 3 mm. If yielding occurs at the hole, move the hole to above the first winding.

### 5.3 Number of test pieces

The number of test pieces shall be as specified in the product standard.

NOTE — Testing of at least three test pieces is recommended.

## 6 Conditioning

Carry out the procedure given in clause 7 at least 12 h after the fusion operation.

Between the fusion and cutting operations, condition the assembly for at least 6 h at  $23\text{ °C} \pm 2\text{ °C}$ .

After the test pieces have been cut from the assembly, leave them at the test temperature for at least 6 h.

## 7 Procedure

Carry out the following procedure at  $23\text{ °C} \pm 2\text{ °C}$ .

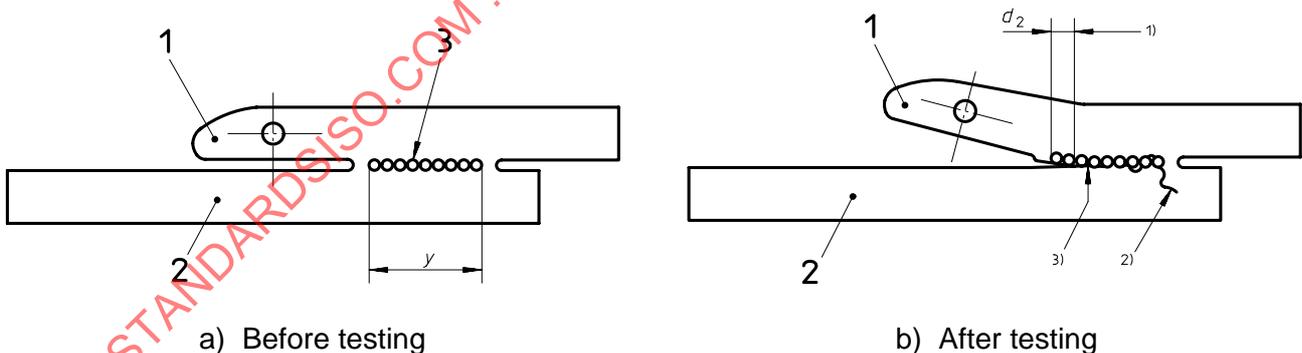
- Measure the overall distance  $y$  between the first and the last windings in the electrofusion socket as shown in figure 4.
- Attach the socket portion of the test piece to the shackle-type link (4.2) and insert the end of the pipe projecting from the socket in the tensile tester (4.1), as shown in figure 1.
- Apply a tensile load along the longitudinal axis of the test piece at a speed of 20 mm/min to 50 mm/min. In cases of dispute, use a speed of  $25\text{ mm/min} \pm 10\%$ .
- Continue the test until complete separation of the test piece. Record the location of the rupture, e.g. in the pipe or the socket, between the windings or at the interface. Measure the total maximum brittle-fracture length  $d_2$  in the fusion plane, parallel to the pipe axis (see figure 4).
- Record the maximum breaking load.
- For each test piece, calculate the percentage decohesion  $C_C$ , using the following equation:

$$C_C = \frac{d_2}{y} \times 100$$

where

$d_2$  is the maximum brittle-fracture length observed;

$y$  is the overall length between the first and the last winding in the electrofusion socket.



### Key

- 1 Socket
- 2 Pipe
- 3 Coil windings

- 1) Brittle failure in the fusion plane
- 2) Ductile failure of the pipe
- 3) Failure in the plane of the coil with ductile deformation of the plastic material

**Figure 4 — Assessment of decohesion of test piece**

## 8 Interpretation of results

If the percentage decohesion is higher than the value stated in the relevant product standard, the assembly is considered to have failed the test.

## 9 Test report

The test report shall contain the following information:

- a) a reference to this International Standard;
- b) full identification of the sample tested;
- c) the material of each of the components of the assembly tested;
- d) the nominal size of the fitting;
- e) the dimensions of the pipe before assembly (mean diameter, ovality, wall thickness and length);
- f) the dimensions of the test pieces, including the free length of pipe projecting from the socket;
- g) the fusion conditions used when preparing the assemblies;
- h) the test temperature and the accuracy to which it was measured;
- i) the number of test pieces tested;
- j) details as to which test pieces had the minimum gap between the pipe and the fitting and which had the maximum gap;
- k) the length of time between fusion and cutting the test pieces from the assembly and the length of the conditioning period;
- l) the test speed;
- m) the maximum breaking load;
- n) the percentage decohesion;
- o) in the case of failure, the type of failure (failure at the interface, tearing between windings, failure of the pipe or failure of the socket);
- p) any special observations made during or after the test;
- q) the date of the test;
- r) the laboratory which carried out the test.