INTERNATIONAL STANDARD

ISO 9311-2

Second edition
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Adhesives for thermoplastic piping systems —

Part 2: Determination of shear strength

Adhésifs pour réseaux de tuyauteries en matières thermoplastiques — Partie 2: Détermination de la résistance au cisaillement

Reference number
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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 9311-2 was prepared by the European Committee for Standardization (CEN) Technical Committee CEN/TC 193, *Adhesives,* in collaboration with 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*, in accordance with the Agreement on technical cooperation between ISO and CEN (Vienna Agreement).

This second edition cancels and replaces the first edition (ISO 9311-2:2002), which has been technically revised.

ISO 9311 consists of the following parts, under the general title *Adhesives for thermoplastic piping systems*:

— *Part 1: Determination of film properties*

— *Part 2: Determination of shear strength*

— *Part 3: Test method for the determination of resistance to internal pressure*

Introduction

The aim of this part of ISO 9311 is to describe a method to characterize adhesives for thermoplastic piping systems by measuring the shear strength of a bonded joint using a test specimen prepared as described. The results obtained with this method cannot be extrapolated into the resistance of a different specimen – perhaps the real life article – to destructive shear forces.

Adhesives for thermoplastic piping systems —

Part 2:
Determination of shear strength

SAFETY PRECAUTIONS — Persons using this document should be familiar with the normal laboratory practice, if applicable. This document does not purport to address all of the safety problems, if any, associated with its use. It is the responsibility of the user to establish appropriate safety and health practices and to ensure compliance with any regulatory conditions.

CAUTION — It is understood that some of the material permitted in this standard may have negative environmental impact. As technological advantages lead to acceptable alternatives for these materials, they will be eliminated from this standard to the extent possible.

At the end of the test, the user of the standard shall take care to carry out an appropriate disposal of the wastes, according to local regulation.

1 Scope

This part of ISO 9311 specifies a method for the determination of the shear strength of joints made with adhesives for thermoplastic piping systems.

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 15605, *Adhesives — Sampling*

EN 923, *Adhesives — Terms and definitions*

EN 1067, *Adhesives — Examination and preparation of samples for testing*

3 Terms and definitions

For the purposes of this document, the terms and definitions given in EN 923 and the following apply.

3.1
diametrical clearance
difference between the mean outside diameter of the pipe and the mean inside diameter of the socket

4 Principle

The aim is to describe a method to obtain test joints of given dimensions from pipes and fittings, and the measurement of the shear strength of a joint made with the pipes and fittings, but bonded with an adhesive under examination, under specified test conditions.

NOTE It is assumed that the following parameters are set by the reference standards such as EN 14680 and EN 14814, making reference to the test method described in this part of ISO 9311, namely:

a) the pipe and fitting to be used,

b) the diametrical clearance in the bonded assembly, and

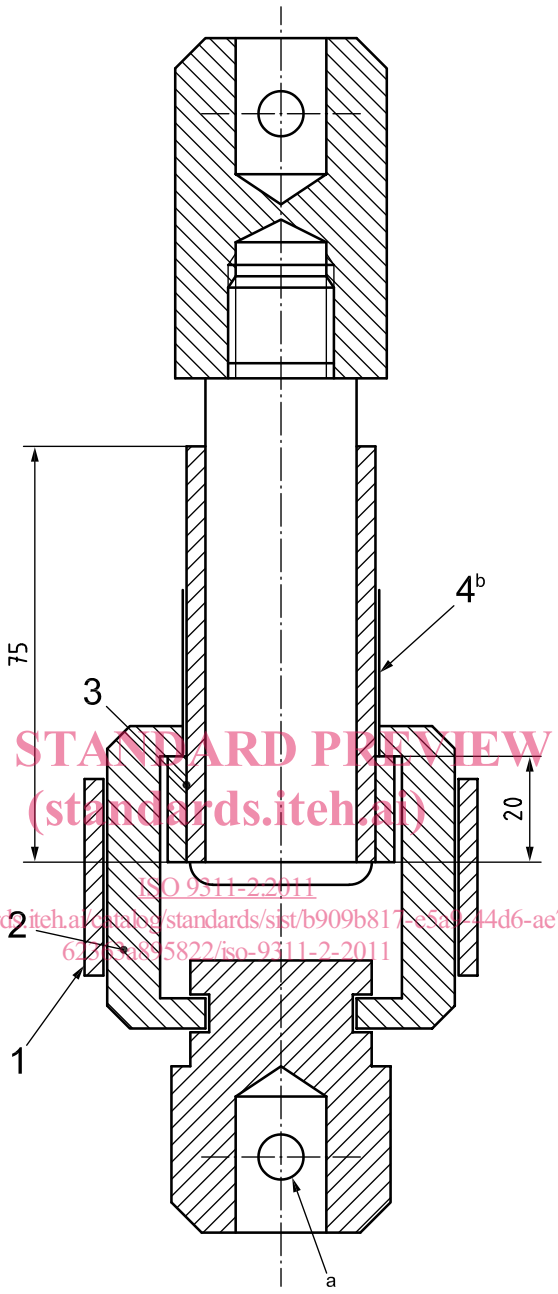
c) the setting time.

5 Apparatus

5.1 A tensile or **press testing machine**, able to move the jaws at a uniform and steady rate of (5 ± 0,5) mm/min.

5.2 A jig, to connect the test assembly to the machine (suitable arrangements are illustrated in Figures 1, 2 and 3).

Dimensions in millimetres



Key

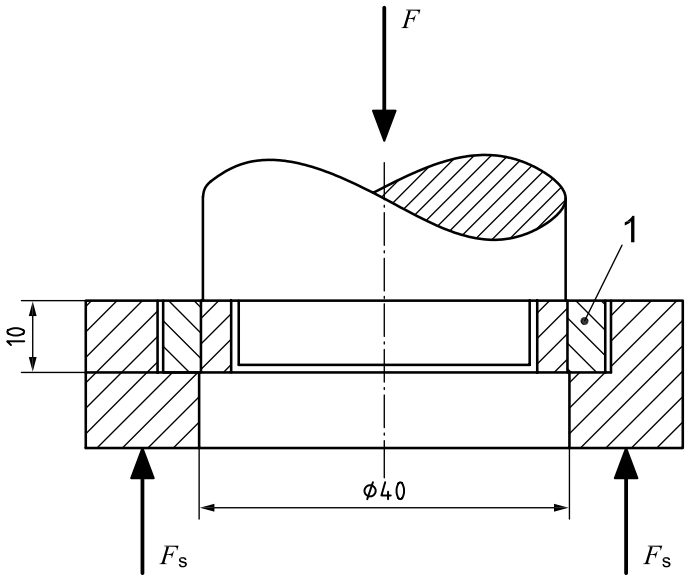
1 retaining ring
2 split collar
3 bonded assembly
4 collar

[a] Connection to tensile machine.

[b] Internal diameter of collar shall not be less than the outside diameter of the pipe.

Figure 1 — Example of connecting jig

Dimensions in millimetres



Key

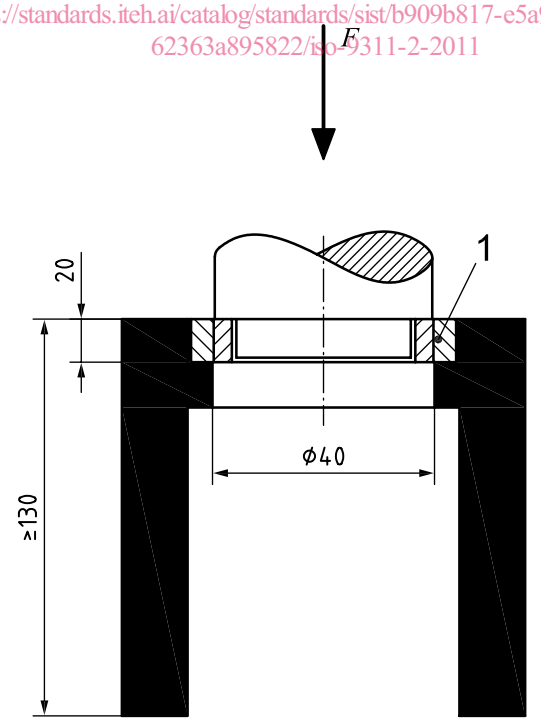
1 bonded assembly

F pressing device

F_s shear strength

Figure 2 — Example of connecting jig for a reduced bonded area

Dimensions in millimetres



Key

1 bonded assembly

F pressing device

Figure 3 — Example of connecting jig for pressing device

6 Sampling

Take a representative sample of the adhesive to be tested in accordance with ISO 15605 and examine and prepare it for testing in accordance with EN 1067.

7 Procedure

7.1 For each test, prepare five test assemblies each one made of a pipe length 75 mm, external diameter 40 mm, and a fitting with a joint contact depth of 20 mm minimum. The assembly shall be of a suitable total wall thickness to withstand the force applied during the test. The diametrical clearance shall be obtained by means of a lathe on the internal fitting surface and never on the pipe external diameter.

7.2 Prepare the pipe and fitting contact surfaces following the adhesive manufacturer recommendations. Remove any swarf and other debris from the joining surfaces of the fitting and pipe.

7.3 Condition the test pieces at (23 ± 2) °C and (50 ± 5) % relative humidity for at least 6 h.

7.4 Apply the adhesive as recommended by the adhesive manufacturer.

7.5 Maintain the test assemblies under the curing conditions (23 ± 2) °C and (50 ± 5) % relative humidity unless otherwise specified in the relevant product standard. Test pieces have to be maintained in vertical position during the curing time.

7.6 Place the test assembly in the appropriate jig at the required test temperature and apply a force by separation or compression at a rate of (5 ± 0,5) mm/min.

7.7 Record the maximum force required that causes failure of the bonded assembly.

7.8 If the force required to cause failure exceeds the maximum load of the testing equipment, reduce the bonded area by cutting, just before the specified setting time ends, a ring of width 10 mm from the bonded area of the test assembly (a suitable jig for the ring is illustrated in Figure 2).

8 Expression of results

Calculate the shear strength, F_s, in Megapascals (MPa) of each test assembly using Equation (1):

$$F_s = \frac{F}{\pi d l} \tag{1}$$

where

F is the force required to cause failure, in Newtons;

d is the internal diameter of the fitting, in millimetres;

l is the length of the joint, in millimetres.

The shear strength is the arithmetic mean of the results obtained for the five test assemblies.

No result shall be discarded and no correction shall be applied to apparently doubtful results without a justification based on experimental, technical or other evident grounds, which should be clearly stated.