INTERNATIONAL STANDARD

ISO 6259-1

Second edition
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Thermoplastics pipes — Determination of tensile properties —

Part 1: General test method

Tubes en matières thermoplastiques — Détermination des caractéristiques en traction —

Partie 1: Méthode générale d'essai

Reference number
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Foreword

ISO (the International Organization for Standardization) is a worldwide federation of national standards bodies (ISO member bodies). The work of preparing International Standards is normally carried out through ISO technical committees. Each member body interested in a subject for which a technical committee has been established has the right to be represented on that committee. International organizations, governmental and non-governmental, in liaison with ISO, also take part in the work. ISO collaborates closely with the International Electrotechnical Commission (IEC) on all matters of electrotechnical standardization.

The procedures used to develop this document and those intended for its further maintenance are described in the ISO/IEC Directives, Part 1. In particular the different approval criteria needed for the different types of ISO documents should be noted. This document was drafted in accordance with the editorial rules of the ISO/IEC Directives, Part 2 (see www.iso.org/directives).

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. Details of any patent rights identified during the development of the document will be in the Introduction and/or on the ISO list of patent declarations received (see www.iso.org/patents).

Any trade name used in this document is information given for the convenience of users and does not constitute an endorsement.

For an explanation on the meaning of ISO specific terms and expressions related to conformity assessment, as well as information about ISO's adherence to the WTO principles in the Technical Barriers to Trade (TBT), see the following URL: Foreword — Supplementary information.

The committee responsible for this document is 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*.

This second edition cancels and replaces the first edition (ISO 6259-1:1997), which has been technically revised.

ISO 6259 consists of the following parts, under the general title *Thermoplastics pipes — Determination of tensile properties*:

— *Part 1: General test method*

— *Part 2: Pipes made of unplasticized poly(vinyl chloride) (PVC-U), chlorinated poly (vinyl chloride) (PVC-C), and high-impact poly (vinyl chloride) (PVC-HI)*

— *Part 3: Polyolefin pipes*

Introduction

This part of ISO 6259 specifies a short-term tensile test method for determining the tensile properties of thermoplastics pipes.

It can provide data for further testing for the purpose of research and development.

It cannot be regarded as significant for applications in which the conditions of application of the force differ considerably with those in this test method, such as applications requiring the appropriate impact, creep, and fatigue tests.

The tests of tensile properties are intended to be principally regarded as tests of material in the form of pipe. The results can be useful as a material process control test but are not a quantitative assessment of long-term pipe performance.

ISO 6259 has been drawn up on the basis of ISO 527.[1][2]

For ease of use, it has been thought preferable to draw up a complete document that can be used for determining the tensile properties of thermoplastics pipes. For greater detail, reference can be made to ISO 527.[1][2]

However, let it be noted that ISO 527[1][2] is applicable to materials in sheet form, whereas ISO 6259 is applicable to materials in pipe form.

As it was considered essential to test the pipes as supplied, i.e. without reduction in thickness, difficulties are those in the choice of test piece.

ISO 527[1][2] specifies test pieces a few millimetres thick, whereas the thickness of a pipe can be in excess of 50 mm. This is why certain changes have been made on this point.

For thin-walled pipes, the test piece can be obtained by die cutting, while for thick pipes, it can be obtained only by machining.

At present, ISO 6259 comprises three parts. The first part gives the general conditions under which the tensile properties of thermoplastics pipes are to be determined. The other two parts provide, respectively, particular information on the execution of tests on pipe made from different materials (see the Foreword).

The basic specifications for the various materials are given in informative annexes in the relevant parts.

Thermoplastics pipes — Determination of tensile properties —

Part 1: General test method

1 Scope

The ISO 6259 series specifies a method of determining the tensile properties of thermoplastics pipes, including the following properties:

— stress at yield;

— elongation at break.

This part of ISO 6259 is applicable to all types of thermoplastics pipe, regardless of their intended use.

2 Normative reference

The following documents, in whole or in part, are normatively referenced in this document and are indispensable for its application. For dated references, only the edition cited applies. For undated references, the latest edition of the referenced document (including any amendments) applies.

ISO 1167-1:2006, *Thermoplastics pipes, fittings and assemblies for the conveyance of fluids — Determination of the resistance to internal pressure — Part 1: General method*

ISO 2602, *Statistical interpretation of test results — Estimation of the mean — Confidence interval*

ISO 5893, *Rubber and plastics test equipment — Tensile, flexural and compression types (constant rate of traverse) — Specification*

ISO 6259-2:1997, *Thermoplastics pipes — Determination of tensile properties — Part 2: Pipes made of unplasticized poly(vinyl chloride) (PVC-U), chlorinated poly (vinyl chloride) (PVC-C) and high-impact poly (vinyl chloride) (PVC-HI)*

ISO 6259-3:2015, *Thermoplastics pipes — Determination of tensile properties — Part 3: Polyolefin pipes*

3 Terms and definitions

For the purposes of this document, the following terms and definitions apply.

3.1 Geometric definitions

3.1.1
gauge length at break
L
distance between the gauge marks on the central part of the test specimen at break

Note 1 to entry: It is expressed in millimetres (mm).

3.1.2
initial cross-section
A
product of initial width and thickness of a test specimen (i.e. $A = bh$)

Note 1 to entry: It is expressed in square millimetres (mm^2).

3.1.3
initial gauge length
L_0
initial distance between the gauge marks on the central part of the test specimen

Note 1 to entry: It is expressed in millimetres (mm).

Note 2 to entry: The values of the gauge length that are indicated for the specimen types in the different parts of ISO 527[1][2] represent the relevant maximum gauge length.

3.1.4
nominal outside diameter
d**n**
specified outside diameter, assigned to a nominal size DN/OD

Note 1 to entry: It is expressed in millimetres (mm).

3.1.5
nominal size
DN/OD
numerical designation of the size of a component, other than a component designated by thread size, which is a convenient round number, approximately equal to the manufacturing dimension, related to the outside diameter

Note 1 to entry: It is expressed in millimetres (mm).

3.1.6
nominal wall thickness
e**n**
numerical designation of the wall thickness of a component, which is a convenient round number, approximately equal to the manufacturing dimension

Note 1 to entry: It is expressed in millimetres (mm).

Note 2 to entry: For thermoplastics components, the value of the nominal wall thickness, e_n, is identical to the specified minimum wall thickness at any point, e_{min}.

3.1.7
thickness
h
smaller initial dimension of the rectangular cross section in the central part of a test specimen

Note 1 to entry: It is expressed in millimetres (mm).

3.1.8
width
b
larger initial dimension of the rectangular cross section in the central part of a test specimen

Note 1 to entry: It is expressed in millimetres (mm).

3.2 Definitions related to material characteristics

3.2.1
elongation at break
ε_b
calculated from the gauge length at break

Note 1 to entry: It is expressed as a percentage (%).

3.2.2
force at yield
F
force measured at yield

Note 1 to entry: It is expressed in Newtons (N).

3.2.3
stress at yield
σ_y
stress measured at the yield strain

Note 1 to entry: It is expressed in megapascals (MPa).

3.2.4
yield
transition from elastic to plastic deformation usually characterised by a decrease or shoulder in the stress-strain curve

4 Principle

Test pieces of given shape and dimensions are obtained from a thermoplastics pipe, in the longitudinal direction, by cutting or machining.

The tensile properties are measured using a test machine under specified conditions.

5 Apparatus

5.1 Tensile-testing machine, complying with ISO 5893 and meeting the specifications given in 5.2, 5.3, and 5.4.

NOTE The use of computer-controlled machines in accordance with ISO 527-1:2012[1] is an option.

5.2 Grips, for holding the test piece and attached to the machine so that the major axis of the test piece coincides with the direction of pull through the centreline of the assembly. This can be achieved, for example, by using pins in the grips to centre.

The test piece shall be held such that slip relative to the grips is prevented as far as possible and this shall be carried out with the type of grip that maintains or increases pressure on the test piece as the force applied to the test piece increases.

The clamping system shall not cause premature fracture of the test piece at the grips.

It might be necessary to pre-stress the test specimen to obtain correct alignment and specimen seating and to avoid any irregularity at the start of the stress/strain diagram.

5.3 Load indicator, incorporating a mechanism capable of showing the total tensile load carried by the test piece when held by the grips. The mechanism shall be essentially free from inertia lag at the specified rate of testing and shall indicate the load with an accuracy of within 1 % of the actual value. Attention is drawn to ISO 5893 and to ISO 7500-1[4].