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Polyolefin pipes for the conveyance of fluids — Determination of resistance to crack propagation — Test method for slow crack growth on notched pipes

Tubes en polyoléfines pour le transport des fluides — Détermination de la résistance à la propagation de la fissure — Méthode d'essai de la propagation lente de la fissure d'un tube entaillé (essai d'entaille)

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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).

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For an explanation of the voluntary nature of standards, the meaning of ISO specific terms and expressions related to conformity assessment, as well as information about ISO's adherence to the World Trade Organization (WTO) principles in the Technical Barriers to Trade (TBT), see www.iso.org/iso/foreword.html.

This document 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,* in collaboration with the European Committee for Standardization (CEN) Technical Committee CEN/TC 155, *Plastics piping systems and ducting systems,* in accordance with the Agreement on technical cooperation between ISO and CEN (Vienna Agreement).

This third edition cancels and replaces the second edition (ISO 13479:2009), which has been technically revised.

The main changes are as follows:

— warnings have been added to follow the method of test piece preparation and the test procedure because of the influence on the result;

— a maximum notch radius has been specified;

— in case of premature failure, alternative test pressures and times for PE 80 and PE 100 have been added to allow retesting at a lower pressure for a longer time;

— an accelerated method by testing with an external detergent has been added.

Any feedback or questions on this document should be directed to the user’s national standards body. A complete listing of these bodies can be found at www.iso.org/members.html.

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Polyolefin pipes for the conveyance of fluids — Determination of resistance to crack propagation — Test method for slow crack growth on notched pipes

1 Scope

This document specifies a test method for determining the resistance to slow crack growth of polyolefin pipes, expressed in terms of time to failure in a hydrostatic pressure test on a pipe with machined longitudinal notches in the outside surface. The test is applicable to pipes of wall thickness greater than 5 mm.

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.

ISO 161-1, *Thermoplastics pipes for the conveyance of fluids — Nominal outside diameters and nominal pressures — Part 1: Metric series*

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

ISO 1167-2, *Thermoplastics pipes, fittings and assemblies for the conveyance of fluids — Determination of the resistance to internal pressure — Part 2: Preparation of pipe test pieces*

ISO 3126, *Plastics piping systems — Plastics components — Determination of dimensions*

ISO 11922-1, *Thermoplastics pipes for the conveyance of fluids — Dimensions and tolerances — Part 1: Metric series*

ISO 15510, *Stainless steels — Chemical composition*

3 Terms and definitions

For the purposes of this document, the terms and definitions given in ISO 161-1 and ISO 11922-1 and the following apply.

ISO and IEC maintain terminology databases for use in standardization at the following addresses:

— ISO Online browsing platform: available at https://www.iso.org/obp

— IEC Electropedia: available at https://www.electropedia.org/

3.1 Terms related to geometrical dimensions

3.1.1
nominal outside diameter
d_n
specified outside diameter assigned to a nominal size DN/OD

Note 1 to entry: Nominal outside diameter is expressed in millimetres.

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3.1.2
mean outside diameter
d_{em}
value of the measurement of the outer circumference of the pipe or spigot end of a fitting in any cross-section divided by π (= 3,142), rounded to the next greater 0,1 mm

3.1.3
minimum wall thickness
e_{min}
minimum value for the wall thickness at any point around the circumference of a component, as specified

3.1.4
standard dimension ratio
SDR
numerical designation of a pipe series, which is a convenient round number, approximately equal to the dimension ratio of the nominal outside diameter, d_n, and the nominal wall thickness, e_n

3.1.5
pipe series
number for pipe designation

Note 1 to entry: Pipe series values are defined according to ISO 4065.

Note 2 to entry: The relationship between the pipe series, S, and the standard dimension ratio, SDR, is given in ISO 4065 as follows.

$$S = \frac{SDR - 1}{2}$$

3.1.6
ligament thickness
δ_{lg}
value of the measurement or calculation of the remaining ligament after machining of the notch

3.1.7
notch depth
h
value of the depth of the notch after machining, measured or calculated

3.1.8
notch length
l_n
value of the length of the notch

3.1.9
width of machined surface of notch
b_s
value of the width of the machined surface of the notch

3.2 Terms related to machining of notches

3.2.1
climb milling
milling in which the cutting motion of the tool is in the same direction as the feeding direction of the component being milled

Note 1 to entry: This is also referred to as ‘down milling’.

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3.2.2
revolution of the cutter
r
value used as a basis for the cutting rate

4 Symbols and abbreviation

4.1 Symbols

For the purposes of this document, the following symbols apply.

b_s width of machined surface of the notch

d_{em} mean outside diameter

d_n nominal outside diameter

e wall thickness (at any point) of a pipe

e_m mean wall thickness

e_{max} maximum wall thickness (at any point) of a pipe

e_{min} minimum wall thickness (at any point) of a pipe

h notch depth

l_n notch length

p test pressure

r revolution of the cutter

δ_{lg} ligament thickness

σ hydrostatic stress, in megapascals

4.2 Abbreviated terms

ANPT accelerated notch pipe test

PE polyethylene

RC raised crack resistance

S pipe series

SDR standard dimension ratio

5 Principle

A length of pipe with four machined longitudinal external notches is subject to a hydrostatic pressure test whilst immersed in a water tank at 80 °C in accordance with ISO 1167-1 and ISO 1167-2. The time to failure or test period is recorded.

NOTE 1 It is assumed that the following test parameters are set by the standard or specification making reference to this test method:

a) the number of test pieces, if applicable (see 7.5);

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