INTERNATIONAL STANDARD

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Plastics piping systems for water supply, and for drainage and sewerage under pressure — Polyethylene (PE) —

Part 5: Fitness for purpose of the system

Systèmes de canalisations en plastique destinés à l'alimentation en eau et aux branchements et collecteurs d'assainissement sous pression — Polyéthylène (PE) —

Partie 5: Aptitude à l'emploi du système

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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 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, fitting and valves for the transport of fluids*, Subcommittee SC 2, *Plastics pipes and fittings for water supplies*.

This second edition cancels and replaces the first edition (ISO 4427-5:2007), which has been technically revised.

The main changes compared to the previous edition are:

— Update of the normative references;

— Technical consistency with ISO 4437-5 (see Reference [1] in the Bibliography).

A list of all parts in the ISO 4427 series can be found on the ISO website.

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.

Introduction

The ISO 4427 series of standards are a set of system standards that specify the requirements for a piping system and its components when made from polyethylene (PE). The piping system is intended to be used in buried or above ground applications, for the conveyance of water for human consumption, raw water prior to treatment, drainage and sewerage under pressure, vacuum sewer systems, and water for other purposes.

In respect of potential adverse effects on the quality of water intended for human consumption caused by the products covered by the ISO 4427 series, it does not provide information on the restriction on the use of products.

NOTE Guidance for assessment of conformity can be found in Reference [2] in the Bibliography .

Plastics piping systems for water supply, and for drainage and sewerage under pressure — Polyethylene (PE) —

Part 5: Fitness for purpose of the system

1 Scope

This document specifies the characteristics of the fitness for purpose of pipes and/or fittings assemblies made from polyethylene (PE) for buried or above ground applications, intended for the conveyance of water for human consumption, raw water prior to treatment, drainage and sewerage under pressure, vacuum sewer systems, and water for other purposes.

NOTE 1 The intended uses include sea outfalls, laid in water and pipes suspended below bridges.

NOTE 2 This document is intended to be only used by the product manufacturer to assess the performance of components according to ISO 4427-2 and/or ISO 4427-3 when joined together under normal and extreme conditions. It is not intended for on-site testing of pipe systems.

This document also specifies the test parameters for the test methods referred to in this document.

In conjunction with the other parts of the ISO 4427 series, this document is applicable to PE pipes, fittings, their joints and to joints with components of PE and other materials, intended to be used under the following conditions:

a) a maximum allowable operating pressure (PFA) up to and including 25 bar[1];

b) an operating temperature of 20 °C as the reference temperature.

NOTE 3 For other operating temperatures, guidance is given in ISO 4427-1: 2019, Annex A.

The ISO 4427 series covers a range of maximum allowable operating pressures and gives requirements concerning colours.

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 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 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 1167-4, *Thermoplastics pipes, fittings and assemblies for the conveyance of fluids — Determination of the resistance to internal pressure — Part 4: Preparation of assemblies*

ISO 4427-1:2019, *Plastics piping systems for water supply, and for drainage and sewerage under pressure — Polyethylene (PE) — Part1: General*

1) 1 bar = 0,1 MPa = 10^5 Pa; 1 MPa = 1 N/mm^2.

ISO 4427-2:2019, *Plastics piping systems for water supply, and for drainage and sewerage under pressure — Polyethylene (PE) — Part 2: Pipes*

ISO 4427-3:2019, *Plastics piping systems for water supply, and for drainage and sewerage under pressure — Polyethylene (PE) — Part 3: Fittings*

ISO 11413:2019, *Plastics pipes and fittings — Preparation of test piece assemblies between a polyethylene (PE) pipe and an electrofusion fitting*

ISO 11414:2009, *Plastics pipes and fittings — Preparation of polyethylene (PE) pipe/pipe or pipe/fitting test piece assemblies by butt fusion*

ISO 13953, *Polyethylene (PE) pipes and fittings — Determination of the tensile strength and failure mode of test pieces from a butt-fused joint*

ISO 13954, *Plastics pipes and fittings — Peel decohesion test for polyethylene (PE) electrofusion assemblies of nominal outside diameter greater than or equal to 90 mm*

ISO 13955, *Plastics pipes and fittings — Crushing decohesion test for polyethylene (PE) electrofusion assemblies*

ISO 13956, *Plastics pipes and fittings — Decohesion test of polyethylene (PE) saddle fusion joints — Evaluation of ductility of fusion joint interface by tear test*

ISO 17885, *Plastics piping systems — Mechanical fittings for pressure piping systems — Specifications*

3 Terms, definitions, symbols and abbreviated terms

For the purposes of this document, the terms, definitions, symbols and abbreviated terms given in ISO 4427-1 apply.

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

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

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

4 Fitness for purpose of pipes and/or fittings assemblies

4.1 Method of preparation of assemblies for testing

4.1.1 General

The assemblies shall be made by using pipes conforming to ISO 4427-2 and fittings conforming to ISO 4427-3.

Test pieces for pressure testing shall be closed with pressure-tight, end-load-bearing end caps, plugs, or flanges which shall be provided with connections for the entry of water and release of air.

The peelable layer of peelable-layer pipe shall be removed in the area of the joint prior to jointing.

If failures that call for a redesign of the fitting are detected during testing according to this document, retesting according to ISO 4427-3 automatically becomes necessary.

4.1.2 Grouping

For testing purposes, the size groups for pipes and fittings shall be in accordance with Table 1.

Table 1 — Size groups for pipes and fittings

Size group	1	2	3	4	5
Nominal outside diameter, d_n	≥16 and <75	≥75 and <250	≥250 and <710	≥710 and <1 800	≥1 800

One diameter from each size group (see Table 1) per product type (see 4.1.3.) shall be taken as test pieces.

4.1.3 Fitting types

For testing purposes, assemblies shall be classified as follows:

— (A) electrofusion socket joints;

— (B) electrofusion saddle joints;

— (C) butt fusion joints;

— (D) mechanical joints;

— (E) socket fusion joint.

4.1.4 Electrofusion joints (A and B)

PE pipes and fittings intended to be used for jointing by electrofusion shall be prepared and assembled in accordance with ISO 11413. The conditions for the preparation of the joints are given in 4.2.2.1 for the assessment of fitness for purpose of the system under normal conditions and in 4.2.2.2 for the assessment of fitness for purpose of the system under extreme conditions.

For joints with electrofusion saddle fittings, the electrofusion saddle fitting shall be fused to the pipe while it is pressurized to the allowable maximum operating pressure. The pipe shall be cut immediately after the manufacturer's prescribed cooling time has elapsed.

For straight equal electrofusion socket fittings (couplers), test joints on selected diameters out of the product range shall be prepared with a gap of 0,05 d_n between the pipe end and the maximum theoretical depth of penetration of the fitting, where for diameters greater than 225 mm, the adjoining pipes shall be arranged to provide the maximum angular deflection possible for the fitting, limited to 1,5°.

4.1.5 Butt fusion joints (C)

PE pipes and spigot end fittings intended to be used for jointing by butt fusion shall be prepared and assembled in accordance with ISO 11414. The conditions for the preparation of the joints are given in 4.2.3.1 for the assessment of fitness for purpose of the system under normal conditions and in 4.2.3.2 for the assessment of fitness for purpose of the system under extreme conditions.

4.1.6 Mechanical joints (D)

For mechanical joints, the assembly of the PE pipe and the fitting shall be prepared in accordance with ISO 17885.

4.1.7 Socket fusion joints (E)

Socket fusion joints shall be prepared as recommended by the manufacturer.