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Plastics piping systems for the supply of gaseous fuels - Polyethylene (PE) —

Part 5:
Fitness for purpose of the system

Systèmes de canalisations en matières plastiques pour la d istribution de combustibles gazeux — Polyéthylène (PE) —
Partie 5: Aptitude à l'emploi du système

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ISO copyright office
Case postale 56 • CH-1211 Geneva 20
Tel. + 41 22 749 01 11
Fax + 41 22 749 09 47
E-mail copyright@iso.org
Web www.iso.org

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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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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 4, *Plastics pipes and fittings for the supply of gaseous fuels*.

This first edition of ISO 4437-5 together with the first editions of ISO 4437-1, ISO 4437-2 and ISO 4437-3 cancel and replace ISO 4437:2007, ISO 8085-1:2001, ISO 8085-2:2001 and ISO 8085-3:2001, of which they constitute a technical revision.

ISO 4437 consists of the following parts, under the general title *Plastics piping systems for the supply of gaseous fuels — Polyethylene (PE)*:

— *Part 1: General*

— *Part 2: Pipes*

— *Part 3: Fittings*

— *Part 4: Valves*

— *Part 5: Fitness for purpose of the system*

Introduction

This part of ISO 4437 specifies the requirements of a piping system and its components made from polyethylene (PE), and which is intended to be used for the supply of gaseous fuels.

Requirements and test methods for material and components are specified in ISO 4437-1, ISO 4437-2, ISO 4437-3, and ISO 4437-4.

Recommended practice for installation is given in ISO/TS 10839.[2]

This part of ISO 4437 covers the characteristics of fitness for purpose of the system.

Plastics piping systems for the supply of gaseous fuels - Polyethylene (PE) —

Part 5: Fitness for purpose of the system

1 Scope

This part of ISO 4437 specifies the requirements of fitness for purpose of the polyethylene (PE) piping system to be used for the supply of gaseous fuels.

It specifies the definitions of electrofusion, socket fusion, butt fusion, and mechanical joints.

It specifies the method of preparation of test piece joints and the tests to be carried out on these joints for assessing the fitness for purpose of the system under normal and extreme conditions.

It specifies the test parameters for the test methods referred to in this part of ISO 4437.

In conjunction with ISO 4437-1, ISO 4437-2, ISO 4437-3, and ISO 4437-4, it is applicable to PE pipes, fittings, valves, their joints, and joints with components of PE and other materials intended to be used under the following conditions:

a) the maximum operating pressure (MOP) is based on the design stress, determined from the compound minimum required strength (MRS) divided by the *C* factor, and taking into account rapid crack propagation (RCP) requirements;

b) a temperature of 20 °C as reference temperature for the design basis.

NOTE 1 For other operating temperatures, derating coefficients are given in Annex A.

NOTE 2 It is the responsibility of the purchaser or specifier to make the appropriate selections from these aspects, taking into account their particular requirements and any relevant national regulations and installation practices or codes.

2 Normative references

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 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 4437-2, *Plastics piping systems for the supply of gaseous fuels — Polyethylene (PE) — Part 2: Pipes*

ISO 4437-3, *Plastics piping systems for the supply of gaseous fuels — Polyethylene (PE) — Part 3: Fittings*

ISO 10838-1[1)], *Mechanical fittings for polyethylene piping systems for the supply of gaseous fuels — Part 1: Metal fittings for pipes of nominal outside diameter less than or equal to 63 mm*

ISO 10838-2[1)], *Mechanical fittings for polyethylene piping systems for the supply of gaseous fuels — Part 2: Metal fittings for pipes of nominal outside diameter greater than 63 mm*

ISO 10838-3[1)], *Mechanical fittings for polyethylene piping systems for the supply of gaseous fuels — Part 3: Thermoplastics fittings for pipes of nominal outside diameter less than or equal to 63 mm*

ISO 11413:2008, *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 13477, *Thermoplastics pipes for the conveyance of fluids — Determination of resistance to rapid crack propagation (RCP) — Small-scale steady-state test (S4 test)*

ISO 13478, *Thermoplastics pipes for the conveyance of fluids — Determination of resistance to rapid crack propagation (RCP) — Full-scale test (FST)*

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 21751, *Plastics pipes and fittings — Decohesion test of electrofusion assemblies — Strip-bend test*

3 Terms and definitions

For the purposes of this document, the terms and definitions given in ISO 4437-1 and the following apply.

3.1
mechanical joint
joint made by assembling a PE pipe with a fitting that generally includes a compression part to provide for pressure integrity, leak tightness, and resistance to end loads

4 Fitness for purpose of the system

4.1 Method of preparation of assemblies for testing

4.1.1 General

The joints shall be made by using pipes conforming to ISO 4437-2 and fittings conforming to ISO 4437-3.

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.

Test assemblies should be prepared taking into consideration applicable national safety regulations.

1) These International Standards are under revision and will be replaced by ISO 17885.

4.1.2 Butt fusion joints

PE pipes, spigot end fittings, and valves intended to be used for jointing by butt fusion shall be prepared and assembled in accordance with ISO 11414:2009. 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.

4.1.3 Electrofusion joints

PE pipes, fittings and valves intended to be used for jointing by electrofusion shall be prepared and assembled in accordance with ISO 11413:2008. 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.

For joints with electrofusion saddle fittings, the electrofusion saddle fitting shall be fused to the pipe while it is pneumatically pressurized to the allowable maximum operating pressure. The pipe shall be cut immediately after the manufacturer 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 $0{,}05d_n$ 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°.

4.1.4 Mechanical joints

For mechanical joints, the assembly of the PE pipe and the fitting shall be prepared in accordance with ISO 10838-1, ISO 10838-2, or ISO 10838-3, as applicable.

NOTE The ISO 10838 series will be replaced by ISO 17885.

A support sleeve inserted into the pipe bore should be used to provide a permanent support for the PE pipe to prevent creep in the pipe wall under radial compressive forces. The metallic part of this fitting can be assembled to a metallic pipe by screw threads, compression joints, welded or brazed flanges, or by other means.

4.1.5 Socket fusion joints

Fitness for purpose of the system testing shall be agreed between the manufacturer and the end-user.

4.2 Requirements for fitness for purpose of the system

4.2.1 General

When tested in accordance with the test methods in Table 5 using the indicated parameters, joints prepared in accordance with 4.1 shall have mechanical characteristics conforming to the requirements given in Table 5, as applicable to the following types of joints:

— (A) electrofusion socket fittings;

— (B) electrofusion saddle fitting;

— (C) spigot end fitting, pipe.

4.2.2 Fitness for purpose of the system for butt fusion joints

4.2.2.1 Under normal conditions (ambient temperature 23 °C)

For the assessment of fitness for purpose of the system under normal conditions, butt fusion joints shall have the characteristic of tensile strength conforming to the requirement given in Table 5, using the