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

Part 3: **Fittings**

Systèmes de canalisations en matières plastiques pour la distribution de combustibles gazeux — Polyéthylène (PE) —

Partie 3: Raccords

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).

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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 4437-3 together with the first editions of ISO 4437-1, ISO 4437-2 and ISO 4437-5 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 for 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, other than fittings, are specified in ISO 4437-1, ISO 4437-2, and ISO 4437-4.

Characteristics for fitness for purpose of the system are covered in ISO 4437-5.

Recommended practice for installation is given in ISO/TS 10839.[1]

This part of ISO 4437 covers the characteristics of fittings.

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

Part 3: Fittings

1 Scope

This part of ISO 4437 specifies the characteristics of fusion fittings made from polyethylene (PE) as well as of mechanical fittings for piping systems in the field of the supply of gaseous fuels.

It also 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 4437-4, and ISO 4437-5, it is applicable to PE pipes, fittings and 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 ISO 4437-5:2014.

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.

This part of ISO 4437 is applicable for fittings of the following types:

— electrofusion socket fittings;

— electrofusion saddle fittings;

— spigot end fittings (for butt fusion using heated tools and electrofusion socket fusion);

— socket fusion fittings;

— mechanical fittings.

The fittings can for example be in the form of couplers, saddles, equal and reduced tees, reducers, elbows, bends, or end caps.

NOTE 3 Fabricated fittings are normally not used for gas applications except for larger dimensions or in the absence of other solutions. Guidance can be found in ISO 4427-3:2007, Annex B.[2]

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 7-1, *Pipe threads where pressure-tight joints are made on the threads — Part 1: Dimensions, tolerances and designation*

ISO 228-1, *Pipe threads where pressure-tight joints are not made on the threads — Part 1: Dimensions, tolerances and designation*

ISO 1133-1, *Plastics — Determination of the melt mass-flow rate (MFR) and the melt volume-flow rate (MVR) of thermoplastics — Part 1: Standard method*

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

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

ISO 4437-1:2014, *Plastics piping systems for the supply of gaseous fuels — Polyethylene (PE) — Part 1: General*

ISO 4437-2:2014, *Plastics piping systems for the supply of gaseous fuels — Polyethylene (PE) — Part 2: Pipes*

ISO 4437-5:2014, *Plastics piping systems for the supply of gaseous fuels — Polyethylene (PE) — Part 5: Fitness for purpose of the system*

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 11357-6, *Plastics — Differential scanning calorimetry (DSC) — Part 6: Determination of oxidation induction time (isothermal OIT) and oxidation induction temperature (dynamic OIT)*

ISO 12176-4, *Plastics pipes and fittings — Equipment for fusion jointing polyethylene systems — Part 4: Traceability coding*

ISO 13950, *Plastics pipes and fittings — Automatic recognition systems for electrofusion joints*

ISO 13951, *Plastics piping systems — Test method for the resistance of polyolefin pipe/pipe or pipe/fitting assemblies to tensile loading*

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 13957, *Plastics pipes and fittings — Polyethylene (PE) tapping tees — Test method for impact resistance*

ISO 16010, *Elastomeric seals — Material requirements for seals used in pipes and fittings carrying gaseous fuels and hydrocarbon fluids*

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

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

EN 12117, *Plastics piping systems — Fittings, valves and ancillaries — Determination of gaseous flow rate/pressure drop relationships*

3 Terms and definitions, symbols, and abbreviations

For the purposes of this document, the terms and definitions, symbols, and abbreviations given in ISO 4437-1:2014 and the following apply.

3.1
electrofusion socket fitting
polyethylene (PE) fitting which contains one or more integral heating elements that are capable of transforming electrical energy into heat to realize a fusion joint with a spigot end or a pipe

3.2
electrofusion saddle fitting
polyethylene (PE) fitting which contains one or more integral heating elements that are capable of transforming electrical energy into heat to realize a fusion joint onto a pipe

3.2.1
electrofusion tapping tee
electrofusion saddle fitting (top loading or wrap round) which contains an integral cutter to cut through the wall of the main pipe, which remains in the body of the tapping tee after installation

3.2.2
electrofusion branch saddle
electrofusion saddle fitting (top loading or wrap round) which requires an ancillary cutting tool for drilling a hole in the adjoining main pipe

3.3
spigot end fitting
polyethylene (PE) fitting where the outside diameter of the spigot end is equal to the nominal outside diameter, d_n, of the corresponding pipe

3.4
socket fusion fitting
polyethylene (PE) fitting heated by a purpose-made heating tool to realize a fusion joint with a spigot end or a pipe

3.5
mechanical fitting
fitting that generally includes a compression part to provide pressure integrity, leak tightness, and resistance to end loads for assembling polyethylene (PE) pipe to another PE pipe or any other element of the piping system

Note 1 to entry: A pipe-supporting sleeve providing a permanent support for a polyethylene (PE) pipe to prevent creep in the pipe wall under radial compressive forces is applicable. The metallic parts of the fitting can be assembled to metallic pipes by screw-threads, compression joints, and welded or flanged connections, including PE flanges. In some cases, the supporting sleeve at the same time constitutes a grip ring.

Note 2 to entry: The fitting can allow either a dismountable or permanently assembled joint.

Note 3 to entry: The mechanical fitting can be supplied for field assembly or pre-assembled by the manufacturer.

3.6
voltage regulation
control of energy supplied during the fusion process of an electrofusion fitting by means of the voltage parameter

3.7
intensity regulation
control of energy supplied during the fusion process of an electrofusion fitting by means of the current parameter

4 Materials

4.1 PE compound

The PE compound from which the fittings are made shall conform to ISO 4437-1:2014.

The stress bearing parts shall only be made from virgin material conforming to ISO 4437-1:2014.

4.2 Material for non-polyethylene parts

4.2.1 General

All components shall conform to the relevant International Standards. Alternative standards can be applied in cases where International Standards do not exist. In all cases, fitness for purpose of the system of the components shall be demonstrated.

The materials and the constituent elements used in making the fitting (including elastomers and any metal parts as can be used) shall be as resistant to the external and internal environments as the other elements of the piping system, and shall have an expected lifetime under the following conditions at least equal to that of the PE pipes conforming to ISO 4437-2:2014 with which they are intended to be used:

a) during storage;

b) under the effect of the gas conveyed therein;

c) with respect to the service environment and operating conditions.

The requirements for the level of material performance of non-polyethylene parts shall be at least as stringent as that of the PE compound for the piping system. Rework materials shall not be used for stress bearing polymeric parts.

Other materials used in fittings in contact with the PE pipe shall not adversely affect pipe performance or initiate stress cracking.

NOTE 4.2 does not apply to non-stress bearing fitting parts.

4.2.2 Metal parts

All metal parts susceptible to corrosion shall be adequately protected, providing this is necessary for the durability and function of the system.

When dissimilar metallic materials are used, which can be in contact with moisture, steps shall be taken to avoid the possibility of galvanic corrosion.

4.2.3 Elastomers

Elastometric seals shall conform to ISO 16010.

Other sealing materials are permitted if suitable for gas service.

4.2.4 Other materials

Greases or lubricants shall not exude onto fusion areas and shall not affect the long-term performance of fitting materials.

5 General characteristics

5.1 Appearance

When viewed without magnification, the internal and external surfaces of fittings shall be smooth and clean, and shall have no scoring, cavities, and other surface defects to an extent that would prevent conformity to this part of ISO 4437.

No component of the fitting shall show any signs of damage, scratches, pitting, bubbles, blisters, inclusions, or cracks to an extent that would prevent conformity of the fittings to the requirements of this part of ISO 4437.

5.2 Colour

The colour of the PE parts of the fitting shall be either black, yellow, or orange.

5.3 Design

The design of the fitting shall be such that, when assembling the fitting onto the pipe or other component, electrical coils and/or seals are not displaced.

5.4 Appearance of factory made joints

The internal and external surfaces of the pipe and fitting after fusion jointing, examined visually without magnification, shall be free from melt exudation outside the confines of the fitting, apart from that which can be declared acceptable by the fitting manufacturer or used deliberately as a fusion marker.

Any melt exudation shall not cause wire movement in electrofusion fittings such that it leads to short-circuiting when jointed in accordance with the manufacturer's instructions. There shall be no excessive creasing of the internal surfaces of the adjoining pipes.

5.5 Electrical characteristics for electrofusion fittings

The electrical protection that shall be provided by the fusion process depends on the voltage and the current used and on the characteristics of the electricity power source.

For voltages greater than 25 V, direct human contact with energized parts shall not be possible when the fitting is in the fusion cycle during assembly in accordance with the instructions of the manufacturers of the fittings and of the assembly equipment, as applicable.

NOTE 1 The fitting during the fusion process is part of an electrical system as defined in EN 60335–1,[3] HD 60364–1,[4] and IEC 60449.[5]

The tolerance on the electrical resistance of the fitting at 23 °C shall be stated by the manufacturer. The resistance shall be between nominal resistance (–10 %) and nominal resistance (+10 %) + 0,1 Ω.

NOTE 2 0,1 Ω is the assumed value of the contact resistance.

The surface finish of the terminal pins shall allow a minimum contact resistance in order to satisfy the resistance tolerance requirements.

NOTE 3 See Annex B for the examples of typical electrofusion terminal connections.