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

Part 1: General

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

Partie 1: Généralités

[Revision of third edition (ISO 4437:2007)]

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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.

International Standards are drafted in accordance with the rules given in the ISO/IEC Directives, Part 2.

The main task of technical committees is to prepare International Standards. Draft International Standards adopted by the technical committees are circulated to the member bodies for voting. Publication as an International Standard requires approval by at least 75 % of the member bodies casting a vote.

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ISO 4437-1 was prepared by Technical Committee 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 fourth edition, together with the other parts of ISO 4437, cancels and replaces ISO 4437:2007 and ISO 8085-1/2/3:2001, of which it constitutes 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

Characteristics for fitness for purpose are covered in ISO 4437-5. ISO/TS 10839 [1] gives recommended practices for installation.

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Plastics piping systems for the supply of gaseous fuels — Polyethylene (PE) — Part 1: General

1 Scope

This International Standard specifies the general properties of polyethylene (PE) compounds for the manufacture of pipes and fittings intended to be used for the supply of gaseous fuels.

It also specifies the test parameters for the test methods referred to in this standard.

In conjunction with Parts 2 to 5 of ISO 4437 it is applicable to PE pipes, fittings and valves, their joints, and joints with components of 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 MRS divided by the C factor, and taking into account RCP requirements.
- b) a temperature of 20 °C as reference temperature for the design basis.

NOTE 1 For other operating temperatures, derating coefficients should be used, see ISO/DIS 4437-5:2012.

ISO 4437 (all parts) covers a range of maximum operating pressures and gives requirements concerning additives.

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 referenced documents are indispensable for the application 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 472:1999, *Plastics — Vocabulary*

ISO 1043-1:2011, *Plastics — Symbols and abbreviated terms — Part 1: Basic polymers and their special characteristics*

ISO 1133-1:2011, *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, *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 1183-1:2004, *Plastics — Methods for determining the density of non-cellular plastics — Part 1: Immersion method, liquid pycnometer method and titration method*

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ISO 1183-2:2004, *Plastics — Methods for determining the density of non-cellular plastics — Part 2: Density gradient column method*)

ISO/DIS 4437-2:2012, *Plastics piping systems for the supply of gaseous fuels — Polyethylene (PE) — Part 2: Pipes*

ISO/DIS 4437-3:2012, *Plastics piping systems for the supply of gaseous fuels — Polyethylene (PE) — Part 3: Fittings*

ISO/DIS 4437-5:2012, *Plastics piping systems for the supply of gaseous fuels — Polyethylene (PE) — Part 5: Fitness for purpose of the system*

ISO 6259-1, *Thermoplastics pipes — Determination of tensile properties — Part 1: General test method*

ISO 6259-3:1997, *Thermoplastics pipes — Determination of tensile properties — Part 3: Polyolefin pipes*

ISO 6964:1986, *Polyolefin pipes and fittings — Determination of carbon black content by calcination and pyrolysis — Test method and basic specification*

ISO/FDIS 9080:2012, *Plastics piping and ducting systems - Determination of the long-term hydrostatic strength of thermoplastics materials in pipe form by extrapolation*

ISO 12162:2009, *Thermoplastics materials for pipes and fittings for pressure applications — Classification, designation and design coefficient*)

ISO 11357-6:2008, *Plastics — Differential scanning calorimetry (DSC) — Part 6: Determination of oxidation induction time (isothermal OIT) and oxidation induction temperature (dynamic OIT)*

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 13479, *Polyolefin pipes for the conveyance of fluids — Determination of resistance to crack propagation — Test method for slow crack growth on notched pipes*

ISO 13953:2001, *Polyethylene (PE) pipes and fittings — Determination of the tensile strength and failure mode of test pieces from a butt-fused joint*

ISO 13954:1997, *Plastics pipes and fittings — Peel decohesion test for polyethylene (PE) electrofusion assemblies of nominal outside diameter greater than or equal to 90 mm*

ISO 15512:2008, *Plastics — Determination of water content*

ISO 16871, *Plastics piping and ducting systems — Plastics pipes and fittings — Method for exposure to direct (natural) weathering*

ISO 18553:2002, *Method for the assessment of the degree of pigment or carbon black dispersion in polyolefin pipes, fittings and compounds*

EN 12099, *Plastics piping systems — Polyethylene piping materials and components — Determination of volatile content*

3 Terms and definitions, symbols and abbreviations

3.1 Terms and definitions

For the purposes of this document, the terms and definitions given in ISO 472:2001 and ISO 1043-1:2001 and the following apply.

3.1.1 Geometrical definitions

3.1.1.1

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 in millimetres (mm) and related to the outside diameter

3.1.1.2

nominal outside diameter

d_n

specified outside diameter, in millimetres, assigned to a nominal size DN/OD

3.1.1.3

outside diameter at any point

d_e

value of the measurement of the outside diameter through its cross-section at any point of the pipe, rounded to the next greater 0,1 mm

3.1.1.4

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

3.1.1.5

minimum mean outside diameter

$d_{em,min}$

minimum value for the mean outside diameter as specified for a given nominal size

3.1.1.6

maximum mean outside diameter

$d_{em,max}$

maximum value for the mean outside diameter as specified for a given nominal size

3.1.1.7

out-of-roundness

ovality

difference between the maximum and the minimum outside diameter in the same cross-section of a pipe or spigot

3.1.1.8

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 in millimetres (mm)

NOTE For thermoplastics components conforming to the different parts of ISO 4437, the value of the nominal wall thickness, e_n , is identical to the specified minimum wall thickness at any point, e_{min} .

3.1.1.9
wall thickness at any point

e
wall thickness at any point around the circumference of a component rounded to the next greater 0,1 mm

NOTE The symbol for the wall thickness of the fittings and valves body at any point is E .

3.1.1.10
minimum wall thickness at any point

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

3.1.1.11
maximum wall thickness at any point

e_{\max}
maximum value for the wall thickness at any point around the circumference of a component, as specified

3.1.1.12
mean wall thickness

e_m
arithmetical mean of a number of measurements of the wall thickness, regularly spaced around the circumference and in the same cross-section of a component, including the measured minimum and the measured maximum values of the wall thickness in that cross-section

3.1.1.13
tolerance

permitted variation of the specified value of a quantity, expressed as the difference between the permitted maximum and the permitted minimum value

3.1.1.14
wall thickness tolerance

t_y
permitted difference between the wall thickness at any point, e , and the nominal wall thickness, e_n

NOTE $e_n \leq e \leq e_n + t_y$

3.1.1.15
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

3.1.1.16
pipe series
S

dimensionless number for pipe designation conforming to ISO 4065 [5]

NOTE The relationship between the pipe series S and the standard dimension ratio SDR is given by the following equation as specified in ISO 4065 [5].

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