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

Part 2: **Pipes**

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Foreword

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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 4437-2 together with the first editions of ISO 4437-1, ISO 4437-3 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 pipes, are specified in ISO 4437-1, ISO 4437-3, 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 pipes.

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

Part 2: Pipes

1 Scope

This part of ISO 4437 specifies the characteristics of pipes made from polyethylene (PE) 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 International Standard.

In conjunction with part of ISO 4437-1, ISO 4437-3, 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, guidance is given in ISO 4437-5:2014.

For above ground application of pipes conforming to this International Standard, the pipes should be protected by a casing pipe, taking into account any relevant national regulations and installation practices or codes.

This part of ISO 4437 covers three types of pipes:

— PE pipes (outside diameter d_n) including any identification stripes;

— PE pipes with co-extruded layers on either or both the outside and/or inside of the pipe (total outside diameter d_n) as specified in Annex A, where all PE layers have the same MRS rating;

— PE pipes (outside diameter d_n) with a peelable and contiguous thermoplastics additional layer on the outside (coated pipe) as specified in Annex B.

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 1133-1, *Plastics — Determination of the melt mass-flow rate (MFR) and 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 1167-2, *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 2505, *Thermoplastics pipes — Longitudinal reversion — Test method and parameters*

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

ISO 4065, *Thermoplastics pipes — Universal wall thickness table*

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

ISO 4437-5:2014, *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, *Thermoplastics pipes — Determination of tensile properties — Part 3: Polyolefin pipes*

ISO 9969, *Thermoplastics pipes — Determination of ring stiffness*

ISO 11922-1:1997, *Thermoplastics pipes for the conveyance of fluids — Dimensions and tolerances — Part 1: Metric series*

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

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 13479:2009, *Polyolefin pipes for the conveyance of fluids — Determination of resistance to crack propagation — Test method for slow crack growth on notched pipes*

ISO 13968, *Plastics piping and ducting systems — Thermoplastics pipes — Determination of ring flexibility*

ISO 13480, *Polyethylene pipes — Resistance to slow crack growth — Cone test method*

EN 12106, *Plastics piping systems — Polyethylene (PE) pipes — Test method for the resistance to internal pressure after application of squeeze-off*

3 Terms and definitions, symbols, and abbreviations

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

4 Material

4.1 Compound for pipes

The pipes shall be made from virgin material or own reprocessible material from the same PE compound or a mixture of both materials. Reprocessible material from co-extruded pipes or from pipes reprocessed with the peelable layer attached shall not be used. Own reprocessible material from the base pipe of peelable-layer pipes can be used.

The compound(s) from which the pipes are made shall conform to ISO 4437-1:2014.

4.2 Compound for identification stripes

For pipes with identifications stripes, the compound used for these identification stripes shall be made from the same base polymer (PE) as one of the pipe compounds for which fusion compatibility has been proven.

4.3 Recyclable material

Recyclable material including reprocessable material obtained from external sources shall not be used.

5 General characteristics

5.1 Appearance

When viewed without magnification, the internal and external surfaces of pipes 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.

The ends of the pipes shall be cut cleanly and square to the axis of the pipes.

5.2 Colour

Pipes shall be black (PE 80 or PE 100), yellow (PE 80), or orange (PE 100). In addition, black PE 80 pipes can be identified by yellow stripes and black PE 100 pipes can be identified by yellow or orange stripes, according to national preference.

The outer co-extruded layer of co-extruded pipes (see Annex A) or the outer peelable layer of peelable-layer pipes (see Annex B) shall be either black, yellow, or orange. In addition, identification stripes can be used according to national preference.

6 Geometrical characteristics

6.1 Measurement of dimensions

The dimensions of the pipes shall be measured in accordance with ISO 3126 and rounded to the next 0,1 mm. In case of dispute, the measurement shall not be made less than 24 h after manufacture and after being conditioned for at least 4 h at (23 ± 2) °C.

Indirect measurement at the stage of production is allowed at shorter time periods, provided that evidence is shown of correlation.

6.2 Mean outside diameters, out-of-roundness (ovality), and tolerances

The mean outside diameters of the pipes, d_{em}, shall conform to Table 1.

For straight pipes, the maximum out-of-roundness shall conform to Table 1. For coiled pipes, the maximum out-of-roundness shall be specified by an agreement between the manufacturer and the end-user.

Table 1 — Mean outside diameters and out-of-roundness

Dimensions in millimetres

Nominal size DN/ OD	Nominal outside diameter d_n	Mean outside diameter		Maximum out-of-roundness for straight pipes[b] [c]
		$d_{em,min}$	$d_{em,max}$[a]	
16	16	16,0	16,3	1,2
20	20	20,0	20,3	1,2
25	25	25,0	25,3	1,2
32	32	32,0	32,3	1,3
40	40	40,0	40,4	1,4
50	50	50,0	50,4	1,4
63	63	63,0	63,4	1,5
75	75	75,0	75,5	1,6
90	90	90,0	90,6	1,8
110	110	110,0	110,7	2,2
125	125	125,0	125,8	2,5
140	140	140,0	140,9	2,8
160	160	160,0	161,0	3,2
180	180	180,0	181,1	3,6
200	200	200,0	201,2	4,0
225	225	225,0	226,4	4,5
250	250	250,0	251,5	5,0
280	280	280,0	281,7	9,8
315	315	315,0	316,9	11,1
355	355	355,0	357,2	12,5
400	400	400,0	402,4	14,0
450	450	450,0	452,7	15,6
500	500	500,0	503,0	17,5
560	560	560,0	563,4	19,6
630	630	630,0	633,8	22,1

[a] Grade B according to ISO 11922-1:1997.

[b] Measurement of out-of-roundness shall be made at the point of manufacturing.

[c] If other values for the out-of-roundness than those given in Table 1 are necessary (e.g. coiled pipes), they shall be agreed between the manufacturer and the end-user.

6.3 Wall thicknesses and related tolerances

6.3.1 Minimum wall thicknesses

The use of any standard dimension ratio (SDR) derived from the pipe series *S* given according to ISO 4065 is permitted.

The minimum wall thickness, e_{min}, of pipes shall conform to Table 2.