INTERNATIONAL STANDARD

ISO 4437-1

Second edition

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

Part 1: General

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

Partie 1: Généralités

PROOF/ÉPREUVE

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Contents

Page

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 document 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 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, fittings and valves for the transport of fluids*, Subcommittee SC 4, *Plastics pipes and fittings for the supply of gaseous fuels*.

This second edition cancels and replaces the first edition (ISO 4437-1:2014), which has been technically revised.

The main changes are as follows:

— PE 100-RC type materials with enhanced resistance to slow crack growth (SCG) have been added;

— Annex A has been added, discussing the performance of PE 100-RC type materials with enhanced resistance to slow crack growth (SCG) and giving additional information for installation techniques;

— test methods have been updated and new test methods have been added for PE 100-RC materials.

A list of all parts in the ISO 4437 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 4437 series specifies the requirements for a piping system and its components made from polyethylene (PE) compounds, which is intended to be used for the supply of gaseous fuels.

This document covers materials and the general aspects of the plastics piping system.

Requirements and test methods for components of the piping system are specified in ISO 4437-2[1)], ISO 4437-3[2)] and ISO 4437-4.

Characteristics for fitness for purpose of the system are covered in ISO 4437-5[3)],

Recommended practice for design, handling and installation is given in ISO/TS 10839.

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

Part 1: General

1 Scope

This document specifies materials and the general aspects of polyethylene (PE) 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 document.

In conjunction with ISO 4437-2, ISO 4437-3, ISO 4437-4 and ISO 4437-5, this document 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) a maximum operating pressure (MOP) up to and including 10 bar[4)], at a reference temperature of 20 °C for design purposes;

b) an operating temperature between −20 °C and 40 °C.

For operating temperatures between 20 °C and 40 °C, derating coefficients are defined in ISO 4437-5.

The ISO 4437 series covers a range of MOPs and gives requirements concerning colours.

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 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 472, *Plastics — Vocabulary*

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

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

4) 1 bar = 0,1 MPa = 10^5 Pa; 1 MPa = 1 N/mm^2.

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

ISO 4437-2:—[5], *Plastics piping systems for the supply of gaseous fuels — Polyethylene (PE) — Part 2: Pipes*

ISO 4437-3:—[6], *Plastics piping systems for the supply of gaseous fuels — Polyethylene (PE) — Part 3: Fittings*

ISO 4437-4, *Plastics piping systems for the supply of gaseous fuels — Polyethylene (PE) — Part 4: Valves*

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 6964, *Polyolefin pipes and fittings — Determination of carbon black content by calcination and pyrolysis — Test method*

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

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

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

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 13479:2022, *Polyolefin pipes for the conveyance of fluids — Determination of resistance to crack propagation — Test method for slow crack growth on notched pipes*

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 15512, *Plastics — Determination of water content*

ISO 16770, *Plastics — Determination of environmental stress cracking (ESC) of polyethylene — Full-notch creep test (FNCT)*

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

ISO 18488, *Polyethylene (PE) materials for piping systems — Determination of Strain Hardening Modulus in relation to slow crack growth — Test method*

ISO 18489, *Polyethylene (PE) materials for piping systems — Determination of resistance to slow crack growth under cyclic loading — Cracked Round Bar test method*

5) Under preparation. Stage at the time of publication: ISO/PRF 4437-2:2023.

6) Under preparation. Stage at the time of publication: ISO/PRF 4437-3:2023.

ISO 18553, *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

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

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

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

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

3.1 Terms related to geometry

3.1.1
nominal size
DN/OD
numerical designation of the size of a component related to the outside diameter

Note 1 to entry: It is a convenient round number approximately equal to the manufacturing dimension in millimetres (mm). It is not applicable to components designated by thread size.

3.1.2
nominal outside diameter
d_n
specified outside diameter assigned to a *nominal size* (3.1.1)

Note 1 to entry: Nominal outside diameter is expressed in millimetres (mm).

3.1.3
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 1 to entry: For thermoplastics components conforming to the ISO 4437 series, the value of the nominal wall thickness, e_n, is identical to the specified *minimum wall thickness at any point* (3.1.5).

3.1.4
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 1 to entry: The symbol for the wall thickness of a fitting and valve body at any point is E.

3.1.5
minimum wall thickness at any point
e_{min}
minimum value for the *wall thickness at any point* (3.1.4) around the circumference of a component

3.1.6
standard dimension ratio
SDR
numerical designation of a *pipe series* (3.1.7), which is a convenient round number, approximately equal to the dimension ratio of the *nominal outside diameter* (3.1.2) and the *nominal wall thickness* (3.1.3)

3.1.7
pipe series
S
number for pipe designation

Note 1 to entry: The relationship between the pipe series, *S*, and the *standard dimension ratio, SDR* (3.1.6) is given by the following formula, as specified in ISO 4065:

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

3.2 Terms related to material

3.2.1
compound
homogenous extruded mixture of *base polymer* (3.2.2) (polyethylene) and additives (i.e. anti-oxidants, pigments, carbon black, UV-stabilizers and others) at a dosage level necessary for the processing and use of components

3.2.2
base polymer
polymer produced by the material supplier for the manufacture of the *compound* (3.2.1)

3.3 Terms related to material characteristics

3.3.1
lower confidence limit of the predicted hydrostatic strength
σ_{LPL}
quantity, with the dimensions of stress, that represents the 97,5 % lower confidence limit of the predicted hydrostatic strength at temperature θ and time t

Note 1 to entry: It is expressed in megapascals (MPa).

3.3.2
minimum required strength
MRS
value of the *lower confidence limit of the predicted hydrostatic strength* (3.3.1) at 20 °C and 50 years, rounded down to the next lower value of the R10 series or the R20 series

Note 1 to entry: Only *compounds* (3.2.1) with an MRS of 8 MPa or 10 MPa are specified in this document.

Note 2 to entry: The R10 series and the R20 series conform to ISO 3.

Note 3 to entry: It is expressed in megapascals (MPa).

[SOURCE: ISO 12162:2009, 3.3, modified — "the next smaller value" has been replaced by "the next lower value" in the definition. Note 1 to entry has been removed and replaced with new Notes 1 to 3 to entry.]

3.3.3
design coefficient
C
coefficient with a value greater than 1 which takes into consideration service conditions as well as properties of the components of a piping system other than those represented in the *lower confidence limit of the predicted hydrostatic strength* (3.3.1)

