

# Buried polyethylene (PE) pipes for the supply of gaseous fuels — Metric series — Specifications

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# National foreword

This British Standard is the UK implementation of ISO 4437:2007.

The UK participation in its preparation was entrusted by Technical Committee PRI/88, Plastics piping systems, to Subcommittee PRI/88/2, Plastics piping for pressure applications.

A list of organizations represented on this committee can be obtained on request to its secretary.

This publication does not purport to include all the necessary provisions of a contract. Users are responsible for its correct application.

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# INTERNATIONAL STANDARD

**ISO  
4437**

Third edition  
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## **Buried polyethylene (PE) pipes for the supply of gaseous fuels — Metric series — Specifications**

*Canalisations enterrées en polyéthylène (PE) pour réseaux de  
distribution de combustibles gazeux — Série métrique — Spécifications*



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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.

Attention is drawn to the possibility that some of the elements of this document may be the subject of patent rights. ISO shall not be held responsible for identifying any or all such patent rights.

ISO 4437 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 third edition cancels and replaces the second edition (ISO 4437:1997), which has been technically revised as follows. A clear distinction has been made between requirements on compounds and requirements on pipes. Substantial changes have been made in introducing specifications for pipes, including additional layers, and in amending the relationship of the S4 critical pressure to the maximum operating pressure and FS critical pressure. An informative annex (Annex B) has been added, giving an alternative design approach using a pre-set, overall service (design) coefficient. Normative references have been updated and changed as appropriate. It also incorporates the Technical Corrigendum ISO 4437:1997/Cor.1:1999.

# Buried polyethylene (PE) pipes for the supply of gaseous fuels — Metric series — Specifications

## 1 Scope

This International Standard specifies the general properties of the polyethylene (PE) compounds for the manufacture of pipes, the physical and mechanical properties of the pipes made from these compounds, and the requirements for the marking of such pipes, intended to be used for the supply of gaseous fuels.

It deals with three types of pipe:

- 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 C, where all layers have the same MRS rating;
- PE pipes (outside diameter  $d_n$ ) with a peelable, contiguous thermoplastics additional layer on the outside of the pipe (“coated pipe”) as specified in Annex D.

This International Standard also gives guidance on a calculation and design scheme on which the maximum operating pressure (MOP) of the pipes is based. The pipes are intended to be buried.

**NOTE** For above-ground application of pipes conforming to this International Standard, the pipes need always to be protected by a casing pipe.

## 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 3, *Preferred numbers — Series of preferred numbers*

ISO 161-1, *Thermoplastics pipes for the conveyance of fluids — Nominal outside diameters and nominal pressures — Part 1: Metric series*

ISO 497, *Guide to the choice of series of preferred numbers and of series containing more rounded values of preferred numbers*

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

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 (all parts), *Plastics — Methods for determining the density of non-cellular plastics*

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 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 and basic specification*

ISO 8085-3, *Polyethylene fittings for use with polyethylene pipes for the supply of gaseous fuels — Metric series — Specifications — Part 3: Electrofusion fittings*

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) <sup>1)</sup>*

ISO 11413, *Plastics pipes and fittings — Preparation of test piece assemblies between a polyethylene (PE) pipe and an electrofusion fitting*

ISO 11414:1996, *Plastics pipes and fittings — Preparation of polyethylene (PE) pipe/pipe or pipe/fitting test piece assemblies by butt fusion*

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

ISO 12162:1995, *Thermoplastics materials for pipes and fittings for pressure applications — Classification and designation — Overall service (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, *Polyolefin pipes for the conveyance of fluids — Determination of resistance to crack propagation — Test method for slow crack growth on notched pipes (notch test)*

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

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*

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1) To be published. (Revision of ISO 11357-6:2002)

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

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

ASTM D3849, *Standard test method for carbon black — Morphological characterization of carbon black using electron microscopy*

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

### 3 Terms and definitions

For the purpose of this document, the following terms and definitions apply.

#### 3.1

##### **nominal outside diameter**

$d_n$

numerical designation of size which is common to all components in a thermoplastics piping system other than flanges and components designated by thread size

NOTE 1 It is a convenient round number for reference purposes.

NOTE 2 For metric pipes conforming to ISO 161-1, the nominal outside diameter, expressed in millimetres, is the minimum mean outside diameter,  $d_{em,min}$ .

#### 3.2

##### **mean outside diameter**

$d_{em}$

measured length of the outer circumference of the pipe divided by  $\pi$ , rounded up to the nearest 0,1 mm

NOTE The value for  $\pi$  is taken to be 3,142.

#### 3.3

##### **minimum mean outside diameter**

$d_{em,min}$

minimum mean outside diameter of the pipe

#### 3.4

##### **maximum mean outside diameter**

$d_{em,max}$

maximum mean outside diameter of the pipe

#### 3.5

##### **out-of-roundness**

##### **ovality**

difference between the measured maximum outside diameter and the measured minimum outside diameter in the same cross-sectional plane of the pipe

#### 3.6

##### **nominal wall thickness**

$e_n$

wall thickness, in millimetres, tabulated in ISO 4065, corresponding to the minimum wall thickness  $e_{y,min}$  at any point  $e_y$