

Plastics pipes and fittings — Crosslinked polyethylene (PE-X) pipe systems for the conveyance of gaseous fuels — Metric series — Specifications —

Part 1: Pipes

ICS 75.200; 83.140.30

National foreword

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The UK participation in its preparation was entrusted by Technical Committee PRI/88, Plastics piping systems, to Subcommittee PRI/88/2/Panel 6, Pressure piping-gas, which has the responsibility to:

- aid enquirers to understand the text;
- present to the responsible international/European committee any enquiries on the interpretation, or proposals for change, and keep the UK interests informed;
- monitor related international and European developments and promulgate them in the UK.

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

Cross-references

The British Standards which implement international publications referred to in this document may be found in the *BSI Catalogue* under the section entitled “International Standards Correspondence Index”, or by using the “Search” facility of the *BSI Electronic Catalogue* or of British Standards Online.

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Summary of pages

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Plastics pipes and fittings — Crosslinked polyethylene (PE-X) pipe systems for the conveyance of gaseous fuels — Metric series — Specifications —

Part 1: Pipes

*Tubes et raccords en matières plastiques — Systèmes de tubes en
polyéthylène réticulé (PE-X) pour le transport de combustibles gazeux —
Série métrique — Spécifications —*

Partie 1: Tubes



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.

International Standards are drafted in accordance with the rules given in the ISO/IEC Directives, Part 3.

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 part of ISO 14531 may be the subject of patent rights. ISO shall not be held responsible for identifying any or all such patent rights.

International Standard ISO 14531-1 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*.

ISO 14531 consists of the following parts, under the general title *Plastics pipes and fittings — Crosslinked polyethylene (PE-X) pipe systems for the conveyance of gaseous fuels — Metric series — Specifications*:

- *Part 1: Pipes*
- *Part 2: Fittings for heat-fusion jointing*
- *Part 3: Fittings for mechanical jointing (including PE-X/metal transitions)*
- *Part 4: System design and installation guidelines*

Annexes B, C and D form a normative part of this part of ISO 14531. Annexes A and E are for information only.

The inclusion of annex E is an interim measure. The content of annex E is also incorporated in ISO 14531-4, the system design and installation guide. Annex E will be deleted from this part of ISO 14531 as soon as ISO 14531-4 is available as a draft International Standard (DIS).

Introduction

Further to the publication of International Standards for crosslinked polyethylene (PE-X) hot-water pipes, it has become evident that the properties of PE-X, in particular its high fracture resistance and its socket and saddle fusion-jointing capability, render it suitable for use in high-performance gas-distribution systems. The philosophy of ISO 14531 is to provide the platform for the introduction of PE-X gas pipe systems by embracing a performance envelope beyond that covered by existing PE standards, whilst taking its application into regimes of higher operating pressure and extremes of operating temperature.

ISO 14531-1 is therefore one part of a four-part system standard covering pipes, fittings for heat-fusion jointing, fittings for mechanical jointing and design and installation guidelines. The content is suitable for use by procurement authorities and distribution engineers responsible for the design, installation and operation of pipeline systems.

Plastics pipes and fittings — Crosslinked polyethylene (PE-X) pipe systems for the conveyance of gaseous fuels — Metric series — Specifications —

Part 1: Pipes

1 Scope

This part of ISO 14531 specifies the physical properties and mechanical-performance requirements for crosslinked polyethylene (PE-X) pipes intended for use in the supply of gaseous fuels. In addition, it lays down dimensional requirements and specifies some general material properties (including chemical resistance) together with a classification scheme for PE-X produced in the form of pipe.

This part of ISO 14531, when used in conjunction with the other parts of ISO 14531, is applicable as the basis for the design, manufacture and installation of PE-X piping systems (PE-X pipes, PE-X fusion fittings and mechanical fittings) for the supply of category D and category E hydrocarbon-based fuels (see ISO 13623) at

- a) maximum operating pressures (MOPs) up to and including 16 bar¹⁾;
- b) a maximum operating temperature of + 60 °C;
- c) a minimum operating temperature of
 - i) — 50 °C
 - ii) — 35 °C
 - iii) — 20 °C.

This part of ISO 14531 may also be used in conjunction with the restricted specification for PE heat-fusion fittings detailed in ISO 14531-2 to support the introduction of a hybrid PE-X pipe/PE fitting system for operation within a narrower temperature range (– 20 °C to + 40 °C) with a maximum pressure as determined by ISO 8085-3.

For installation, this standard provides for the jointing of PE-X fusion fittings and mechanical fittings to PE-X pipes within the temperature range – 5 °C to + 40 °C.

2 Normative references

The following normative documents contain provisions which, through reference in this text, constitute provisions of this part of ISO 14531. For dated references, subsequent amendments to, or revisions of, any of these publications do not apply. However, parties to agreements based on this part of ISO 14531 are encouraged to investigate the possibility of applying the most recent editions of the normative documents indicated below. For undated references, the latest edition of the normative document referred to applies. Members of ISO and IEC maintain registers of currently valid International Standards.

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*

1) 1 bar = 10⁵ N/m² = 100 kPa

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

ISO 1167, *Thermoplastics pipes for the conveyance of fluids — Resistance to internal pressure — Test method*

ISO 2505-1, *Thermoplastics pipes — Longitudinal reversion — Part 1: Determination methods*

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

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

ISO 4437, *Buried polyethylene (PE) pipes for the supply of gaseous fuels — Metric series — Specifications*

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:—¹⁾, *Plastics piping and ducting systems — Determination of the long-term hydrostatic strength of thermoplastics materials in pipe form by extrapolation*

ISO 10147, *Pipes and fittings made of crosslinked polyethylene (PE-X) — Estimation of the degree of crosslinking by determination of the gel content*

ISO/TR 10837, *Determination of the thermal stability of polyethylene (PE) for use in gas pipes and fittings*

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

ISO 12162, *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 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 13623, *Petroleum and natural gas industries — Pipeline transportation systems*

ISO 13760, *Plastics pipes for the conveyance of fluids under pressure — Miner's rule — Calculation method for cumulative damage*

ISO 14531-2:—²⁾, *Plastics pipes and fittings — Crosslinked polyethylene (PE-X) pipe systems for the conveyance of gaseous fuels — Metric series — Specifications — Part 2: Fittings for heat-fusion jointing*

ISO 16871:—³⁾, *Plastics piping and ducting systems — Plastics pipes and fittings — Method for exposure to direct (natural) weathering*

1) To be published. (Revision of ISO/TR 9080:1992)

2) To be published.

3) To be published.

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

3 Terms and definitions

For the purposes of this part of ISO 14531, the following terms and definitions apply.

3.1 Geometrical terms

3.1.1

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 The nominal outside diameter expressed in millimetres is the minimum mean outside diameter $d_{em,min}$ defined in 3.1.3.

3.1.2

mean outside diameter

d_{em}

value of the outer circumference of the pipe at any cross-section divided by π ¹⁾ and rounded up to the nearest 0,1 mm

3.1.3

minimum mean outside diameter

$d_{em,min}$

minimum value of the mean outside diameter of the pipe specified for a given nominal outside diameter

3.1.4

maximum mean outside diameter

$d_{e,max}$

maximum value of the mean outside diameter of the pipe specified for a given nominal outside diameter

3.1.5

outside diameter at any point

d_{ey}

value of the outside diameter through the pipe cross-section at any point along the pipe

3.1.6

absolute out-of-roundness

ovality

difference between the measured maximum mean outside diameter $d_{em,max}$, and the measured minimum mean outside diameter $d_{em,min}$ at any point in the same cross-section of the pipe

3.1.7

nominal wall thickness

e_n

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

3.1.8

wall thickness at any point

e_y

value of the wall thickness at any point around the circumference of the pipe

1) The value of π is taken to be 3,141 6.