
**Plastics piping systems for water
supply, and for drainage and sewerage
under pressure — Polyethylene (PE) —**

**Part 2:
Pipes**

iTeh STANDARD PREVIEW
*Systemes de canalisations en plastique destinés à l'alimentation
en eau et aux branchements et collecteurs d'assainissement sous
pression — Polyéthylène (PE) —*

Partie 2: Tubes
ISO 4427-2:2019

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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.

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).

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. Details of any patent rights identified during the development of the document will be in the Introduction and/or on the ISO list of patent declarations received (see www.iso.org/patents).

Any trade name used in this document is information given for the convenience of users and does not constitute an endorsement.

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, fitting and valves for the transport of fluids*, Subcommittee SC 2, *Plastics pipes and fittings for water supplies*.

This second edition cancels and replaces the first edition (ISO 4427-2:2007), which has been technically revised. It also incorporates Amendment ISO 4427-2:2007/Amd. 1:2014.

The main changes compared to the previous edition are:

- Update of the normative references;
- Technical consistency with ISO 4437-2 (see Bibliography [1]).

A list of all parts in the ISO 4427 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 4427 series of standards are a set of system standards that specify the requirements for a piping system and its components when made from polyethylene (PE). The piping system is intended to be used in buried or above ground applications, for the conveyance of water for human consumption, raw water prior to treatment, drainage and sewerage under pressure, vacuum sewer systems, and water for other purposes.

In respect of potential adverse effects on the quality of water intended for human consumption caused by the products covered by the ISO 4427 series, it does not provide information on the restriction on the use of products.

NOTE Guidance for assessment of conformity can be found in Reference [2] in the Bibliography.

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Plastics piping systems for water supply, and for drainage and sewerage under pressure — Polyethylene (PE) —

Part 2: Pipes

1 Scope

This document specifies the pipes made from polyethylene (PE) for buried or above ground applications, intended for the conveyance of:

- water for human consumption;
- raw water prior to treatment;
- drainage and sewerage under pressure;
- vacuum sewer systems;
- water for other purposes.

NOTE 1 The intended uses include sea outfalls, laid in water and pipes suspended below bridges.

Pipes complying with this document are not intended for the transport of water intended for human consumption in contaminated soils unless special consideration has been taken.

NOTE 2 For example, ISO 21004 provides an alternative solution for use in contaminated soils. See Reference [3] in the Bibliography.

This document specifies 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) where all layers have the same MRS rating;
- PE pipes (outside diameter d_n) having a peelable and contiguous thermoplastics additional layer on the outside of the pipe (“coated pipe”).

This document also specifies the test parameters for the test methods referred to in this document.

In conjunction with the other parts of the ISO 4427 series, this document is applicable to PE pipes, their joints and to joints with components made of PE and other materials, intended to be used under the following conditions:

- a) a maximum allowable operating pressure (PFA) up to and including 25 bar¹⁾;
- b) an operating temperature of 20 °C as the reference temperature.

NOTE 3 For other operating temperatures, guidance is given in ISO 4427-1:2019, Annex A.

1) 1 bar = 0,1 MPa = 10⁵ Pa; 1 MPa = 1 N/mm².

This document covers a range of maximum allowable operating pressures and gives requirements concerning colours.

NOTE 4 It is the responsibility of the purchaser or specifier to make the appropriate selections from these aspects, taking into account their particular requirements 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 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 4427-1:2019, *Plastics piping systems — Polyethylene (PE) pipes and fittings for water supply — Part 1: General*

ISO 4427-5:2019, *Plastics piping systems — Polyethylene (PE) pipes and fittings for water supply — Part 5: Fitness for purpose of the system*

ISO 4433-1, *Thermoplastics pipes — Resistance to liquid chemicals — Classification — Part 1: Immersion test method*

ISO 4433-2, *Thermoplastics pipes — Resistance to liquid chemicals — Classification — Part 2: Polyolefin pipes*

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

3 Terms and definitions

For the purposes of this document, the terms and definitions given in ISO 4427-1 and the following apply.

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

- IEC Electropedia: available at <http://www.electropedia.org/>
- ISO Online browsing platform: available at <http://www.iso.org/obp>

3.1 application code

code letter which identifies the intended use of the product

Note 1 to entry: The code letter mentioned in this document is W indicating "water intended for human consumption".

4 Symbols and abbreviated terms

For the purposes of this document, the symbols and abbreviated terms given in ISO 4427-1 apply.

5 Material

5.1 Compound

The pipes shall be made from virgin material or own reprocessed material from the same PE compound or a mixture of both materials.

Own reprocessed material from the base pipe of peelable-layer pipes can be used. Reprocessed (both own and external) material from peelable layers shall not be used.

The compound(s) from which the pipes are made shall conform to ISO 4427-1.

NOTE Since PE 40 is not commonly used for pressure applications, it is the intention of ISO/TC 138/SC 2 to withdraw all references to this compound at the next revision of the ISO 4427 series (all parts).

5.2 Identification compound

The compound used for identification stripes and co-extruded layers (see 6.2) shall be manufactured from a PE base polymer, which is the same as for one of the material producer's pipe compounds for which fusion compatibility has been proven

The compound used for identification stripes shall comply with the fusion compatibility requirements in ISO 4427-1 and with the resistance to weathering as described in ISO 4427-1:2019, Table 2.

The resistance to weathering of the identification stripe compound shall be declared by the manufacturer of the compound, confirming whether either a cumulative radiant exposure of >3,5 GJ/m² or >7 GJ/m² related to the outdoor storage ability limit is applicable.

For co-extruded layers used for identification purposes, [Annex A](#) applies.

5.3 Reprocessed and recycled material

Clean, reprocessed material generated from a manufacturer's own production and works testing of products according to the ISO 4427 series may be used if it is derived from the same compound as used for the relevant production.

Reprocessed material obtained from external sources and recycled material shall not be used.

6 General characteristics

6.1 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 of the pipe to this document.

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

6.2 Colour

Blue pipes or black pipes with blue stripes are intended for the conveyance of water for human consumption only.

The outer coextruded layer of coextruded pipes (see Annex A) or the peelable layer of peelable layer pipes (see Annex B) for pipes intended for the conveyance of water for human consumption shall be either black or blue or black with blue stripes.

Pipes intended for drainage and sewerage under pressure shall be black or black with brown stripes or according to national preference.

For above-ground installations, all components with colours other than black should be protected from direct UV light.

NOTE Yellow and orange colours are only used for gas applications, in accordance with the ISO 4437 series (all parts).

6.3 Effect on water quality

For pipes to be used in contact with water intended for human consumption, see ISO 4427-1.

7 Geometrical characteristics

7.1 Measurements

The dimensions of the pipe shall be measured in accordance with ISO 3126. In case of dispute, the measurements of dimensions shall be made not less than 24 h after manufacture and after conditioning 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.



7.2 Mean outside diameter and out-of-roundness (ovality)

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The mean outside diameters, d_{em} , and the out-of-roundness (ovality) shall conform to Table 1. For coiled pipes, the maximum out-of-roundness shall be specified by agreement between the manufacturer and the end-user.

Pipe from PE 40 materials shall be limited to diameters up to and including 63 mm.

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

Dimensions in millimetres

Nominal size DN/OD	Nominal outside diameter	Mean outside diameter ^a		Maximum out-of-roundness (ovality) ^b
		$d_{em\ min}$	$d_{em\ max}$	
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

^a In accordance with ISO 11922-1:2018 , grade B, for sizes ≤630 and grade A for sizes ≥710. (See Reference [4] in the Bibliography).

^b In accordance with ISO 11922-1:2018 , grade N, for sizes ≤800, to be measured at the point of manufacture.

^c Tolerance calculated as 0,009 d_{em} and does not conform to grade A in ISO 11922-1:2018 .

^d For straight pipes with diameters ≥900, the maximum out-of-roundness shall be specified by an agreement between the manufacturer and the end-user.

Table 1 (continued)

Nominal size DN/OD	Nominal outside diameter	Mean outside diameter ^a		Maximum out-of-roundness (ovality) ^b
		d_n	$d_{em\ min}$	
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
710	710	710,0	716,4	24,9
800	800	800,0	807,2	28,0
900	900	900,0	908,1	— ^d
1 000	1 000	1 000,0	1 009,0	— ^d
1 200	1 200	1 200,0	1 210,8 ^c	— ^d
1 400	1 400	1 400,0	1 412,6 ^c	— ^d
1 600	1 600	1 600,0	1 614,4 ^c	— ^d
1 800	1 800	1 800,0	1 816,2 ^c	— ^d
2 000	2 000	2 000,0	2 018,0 ^c	— ^d
2 250	2 250	2 250,0	2 270,3 ^c	— ^d
2 500	2 500	2 500,0	2 522,5 ^c	— ^d
2 800	2 800	2 800,0	2 825,2 ^c	— ^d
3 000	3 000	3 000,0	3 027,0 ^c	— ^d

^a In accordance with ISO 11922-1:2018 , grade B, for sizes ≤630 and grade A for sizes ≥710. (See Reference [4] in the Bibliography).

^b In accordance with ISO 11922-1:2018 , grade N, for sizes ≤800, to be measured at the point of manufacture.

^c Tolerance calculated as 0,009 d_{em} and does not conform to grade A in ISO 11922-1:2018 .

^d For straight pipes with diameters ≥900, the maximum out-of-roundness shall be specified by an agreement between the manufacturer and the end-user.

NOTE Tolerance bands in accordance with ISO 11922-1:2018 , are calculated as follows, as applicable (see Reference [3] in the Bibliography):

- Grade A: 0,009 d_n rounded to the next greater 0,1 mm with a minimum value of 0,3 mm and a maximum value of 10,0 mm.
- Grade B: 0,006 d_n rounded up to the next greater 0,1 mm with a minimum value of 0,3 mm and a maximum value of 4,0 mm.