
**Polyethylene (PE) pipes for irrigation
laterals — Specifications**

*Tubes en polyéthylène (PE) pour branchements d'irrigation —
Spécifications*



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ISO copyright office
Case postale 56 • CH-1211 Geneva 20
Tel. + 41 22 749 01 11
Fax + 41 22 749 09 47
E-mail copyright@iso.ch
Web www.iso.ch

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

International Standard ISO 8779 was prepared by Technical Committee ISO/TC 138, *Plastics pipes, fittings 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 8779:1992), which has been technically revised.

Annex A forms a normative part of this International Standard.

Polyethylene (PE) pipes for irrigation laterals — Specifications

1 Scope

This International Standard specifies the test methods and required properties for pipes made from polyethylene (PE), and intended to be used for irrigation laterals.

This International Standard is applicable to pipes designated as PE 32, PE 40 and PE 63 in accordance with ISO 12162:1995, having a nominal pressure of PN 2,5, PN 4, PN 6 and PN 10, a nominal outside diameter from 12 to 32 inclusive and intended to be used for the conveyance of water under pressure at temperatures up to 45 °C for irrigation purposes, as specified in A.1 of annex A.

2 Normative references

The following normative documents contain provisions which, through reference in this text, constitute provisions of this International Standard. For dated references, subsequent amendments to, or revisions of, any of these publications do not apply. However, parties to agreements based on this International Standard 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 161-1:1996, *Thermoplastics pipes for the conveyance of fluids — Nominal outside diameters and nominal pressures — Part 1: Metric series*.

ISO 1133:1997, *Plastics — Determination of the melt mass-flow rate (MFR) and the melt volume-flow rate (MVR) of thermoplastics*.

ISO 1167:1996, *Thermoplastics pipes for the conveyance of fluids — Resistance to internal pressure — Test method*.

ISO 2505-1:1994, *Thermoplastics pipes — Longitudinal reversion — Part 1: Determination methods*.

ISO 2505-2:1994, *Thermoplastics pipes — Longitudinal reversion — Part 2: Determination parameters*.

ISO 3126:—¹⁾, *Plastics piping systems — Plastics piping components — Measurement and determination of dimensions*.

ISO 4065:1996, *Thermoplastics pipes — Universal wall thickness table*.

ISO 4427:1996, *Polyethylene (PE) pipes for water supply — Specifications*.

ISO 6964:1986, *Polyolefin pipes and fittings — Determination of carbon black content by calcination and pyrolysis — Test method and basic specification*.

ISO 8796:—²⁾, *Polyethylene (PE) 32 pipes for irrigation laterals — Susceptibility to environmental stress-cracking induced by insert-type fittings — Test method and specification*.

1) To be published. (Revision of ISO 3126:1974)

2) To be published. (Revision of ISO 8796:1986)

ISO 11420:1996, *Method for the assessment of the degree of carbon black dispersion in polyolefin pipes, fittings and compounds*.

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*.

3 Term and definition

For the purposes of this International Standard, the following term and definition applies.

3.1 irrigation lateral

branch supply line within an irrigation system on which water-distribution devices, e.g. sprinklers, emitters, drippers, are mounted directly or by means of fittings, risers or tubes

4 Material

4.1 General

The pipes shall be manufactured from polyethylene containing only those antioxidants and carbon black necessary for the manufacture of pipes conforming to this specification and for their end use. The pipes shall be black.

4.2 Carbon black content

The carbon black content in the compound shall be $(2,25 \pm 0,25)$ % by mass, when measured in accordance with ISO 6964. The average particle size of the carbon black shall be 0,010 μm to 0,025 μm .

4.3 Degree of dispersion of carbon black

When determined in accordance with ISO 11420, the degree of dispersion of the carbon black shall be equal to or less than Grade 3.

4.4 Reworked material

Clean reworked material generated from a manufacturer's own production of pipe in accordance with this specification may be used if it is derived from the same resin as used for the relevant production.

4.5 Designation and classification

The compound shall be designated by the material type (e.g. PE 32) conforming to 3.6 of ISO 4427:1996.

4.6 Melt flow rate and density

The pipe manufacturer shall provide evidence of the density and the melt flow rate of the raw compound. When measured in accordance with ISO 1133, the melt flow rate shall conform to the following conditions:

- the melt flow rate of the compound shall not deviate by more than ± 30 % from the value specified by the manufacturer;
- the change in MFR caused by processing, i.e. the difference between the measured value for material from the pipe and the measured value for the compound, shall not be more than 25 %.

5 Dimensions and pressures (outside diameters, nominal pressures and wall thicknesses)

5.1 The dimensions of pipes shall be measured in accordance with ISO 3126.

5.2 The nominal outside diameters and the nominal pressures shall be in accordance with ISO 161-1. The selected nominal outside diameters, and the wall thicknesses corresponding to the selected nominal pressures, are given in Table 1.

Table 1 — Nominal wall thicknesses, e_n

Dimensions in millimetres

Nominal outside diameter d_n	PE 32			PE 40			PE 63 ^a
	Pipe series ^b						
	S10	S6,3	S4	S12,5	S8	S5	S5
	Nominal wall thickness, e_n						
12	1	1,1	1,4	—	1	1,1	1,1
16	1,2	1,4	1,8	1	1,2	1,5	1,5
20	1,3	1,5	2,3	1,2	1,5	1,9	1,9
25	1,4	1,9	2,8	1,2	1,5	2,3	2,3
32	1,6	2,4	3,6	1,5	1,9	2,9	2,9
Nominal pressure PN	2,5	4	6	2,5	4	6	10

^a PE 63 used only occasionally.

^b The pipe series (S) is defined as the ratio σ/PN , where σ is the recommended induced stress at 20 °C (see also ISO 4065).

5.3 The tolerances on the outside diameters shall be in accordance with Grade A of ISO 11922-1:1997.

5.4 The nominal wall thicknesses e_n shall be in accordance with ISO 4065, corresponding to the selected nominal pressures given in Table 1.

NOTE The values in Table 1 have been selected, with certain modifications based on experimental data, from those specified in ISO 4065. Thus, the wall thickness of some of the smaller-diameter pipes has been increased so that the pipes will meet the requirements for handling.

5.5 The tolerance on the minimum wall thickness permitted at any point $e_{y, \min}$, corresponding to the nominal wall thickness e_n , shall conform to ISO 11922-1:1997:

- Grade T for $e_{y, \min} \leq 16 \text{ mm}$;
- Grade U for $e_{y, \min} > 16 \text{ mm}$.

5.6 The effect of water temperatures up to 45 °C shall be allowed for as specified in clause A.3.

5.7 The length of straight pipes and coils shall be at least that agreed between manufacturer and purchaser.

6 Mechanical characteristics

6.1 Hydrostatic strength

When tested in accordance with ISO 1167 with closure fittings of Type A, the pipes shall conform to the requirements given in Table 2.

Table 2 — Hydrostatic strength of pipes — Test parameters

Material of pipe (designation)	Low-temperature test	High-temperature test	
		Production test	Type test
	100 h at 20 °C	165 h at 80 °C ^a	1 000 h at 80 °C
	Test stress MPa	Test stress MPa	Test stress MPa
PE 32	6,5	2,0	1,5
PE 40	7,0	2,5	2,0
PE 63	8,0	3,5	3,2

^a Only brittle failures are taken into account (see 6.2).

6.2 Retest in cases of failure at 80 °C

A brittle fracture in less than 165 h shall constitute a failure. If, in the 165 h test, a test piece fails in a ductile mode in less than 165 h, a retest shall be performed at a lower stress. The new test stress, and the new minimum failure time, shall be selected from the line through the stress/time points given in Table 3.

Table 3 — Hydrostatic strength at 80 °C — Retest requirements

PE 32		PE 40		PE 63	
Stress MPa	Minimum failure time h	Stress MPa	Minimum failure time h	Stress MPa	Minimum failure time h
2,0	165	2,5	165	3,5	165
1,9	227	2,4	230	3,4	285
1,8	319	2,3	323	3,3	538
1,7	456	2,2	463	3,2	1 000
1,6	667	2,1	675		
1,5	1 000	2,0	1 000		

7 Other physical characteristics

7.1 Longitudinal reversion

When determined in accordance with method A or B of ISO 2505-1:1994, using one of the following temperatures, as applicable:

(110 ± 2) °C for PE 63

or

(100 ± 2) °C for PE 32 and PE 40,

and the test times given in ISO 2505-2:1994, the value of the longitudinal reversion shall not be greater than 3 %.

7.2 Susceptibility to environmental stress cracking

This test is only for PE 32 pipes intended for connection to insert-type fittings. The susceptibility of PE 32 pipe to environmental stress cracking shall be tested in accordance with the test method specified in ISO 8796 and the test results shall conform to the requirements of that standard.

8 Marking

All pipes shall be indelibly marked at maximum intervals of 1 m. The marking shall indicate at least the following information:

- the manufacturer's name and/or trade mark;
- the dimensions (nominal outside diameter × nominal wall thickness);
- the designation of the pipe material (PE 63, PE 40 or PE 32);
- the nominal pressure (PN);
- the production period (date or code);
- the word "IRRIGATION".

EXAMPLE (Name) - 25 × 2,8 - PE 32 - PN 6 - 97 - IRRIGATION

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