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# Plastics piping systems for industrial applications — Polybutene (PB), polyethylene (PE), polyethylene of raised temperature resistance (PE-RT), crosslinked polyethylene (PE-X), polypropylene (PP) — Metric series for specifications for components and the system

*Systèmes de canalisations en matières plastiques pour les applications industrielles — Polybutène (PB), polyéthylène (PE), polyéthylène de meilleure résistance à la température (PE-RT), polyéthylène réticulé (PE-X), polypropylène (PP) — Séries métriques pour les spécifications pour les composants et le système*

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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 on the meaning of ISO specific terms and expressions related to conformity assessment, as well as information about ISO's adherence to the WTO principles in the Technical Barriers to Trade (TBT) see the following URL: Foreword - Supplementary information.

The committee responsible for this document is Technical Committee ISO/TC 138, *Plastics piping systems*, Subcommittee SC 3, *Plastics pipes and fittings for industrial applications*.

This second edition cancels and replaces the first edition (ISO 15494:2003), which has been technically revised.

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# Introduction

This International Standard specifies the characteristics and requirements for a piping system and its components made from polybutene (PB), polyethylene (PE), polyethylene of raised temperature resistance (PE-RT), crosslinked polyethylene (PE-X), or polypropylene (PP), as applicable, intended to be used for industrial applications above ground or below ground by authorities, design engineers, certification bodies, inspection bodies, testing laboratories, manufacturers, and users.

At the date of publication of this International Standard, standards for piping systems of other plastics used for industrial applications are the following:

ISO 10931, *Plastics piping systems for industrial applications — Poly(vinylidene fluoride) (PVDF) — Specifications for components and the system*

ISO 15493, *Plastics piping systems for industrial applications — Acrylonitrile-butadiene-styrene (ABS), unplasticized poly(vinyl chloride) (PVC-U), chlorinated poly(vinyl chloride) (PVC-C) — Specifications for components and the system — Metric series*


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# Plastics piping systems for industrial applications — Polybutene (PB), polyethylene (PE), polyethylene of raised temperature resistance (PE-RT), crosslinked polyethylene (PE-X), polypropylene (PP) — Metric series for specifications for components and the system

## 1 Scope

This International Standard specifies the characteristics and requirements for components such as pipes, fittings, and valves made from one of the following materials intended to be used for thermoplastics piping systems in the field of industrial applications above and below ground:

— polybutene (PB);

— polyethylene (PE);

— polyethylene of raised temperature resistance (PE-RT);

— crosslinked polyethylene (PE-X);

— polypropylene (PP).

NOTE 1 Requirements for industrial valves are given in this International Standard and/or in other standards. Valves are to be used with components conforming to this International Standard provided that they conform additionally to the relevant requirements of this International Standard.

This International Standard is applicable to either PB, PE, PE-RT, PE-X, or PP pipes, fittings, valves, and their joints and to joints with components of other plastics and non-plastic materials, depending on their suitability, intended to be used for the conveyance of liquid and gaseous fluids as well as solid matter in fluids for industrial applications such as the following:

— chemical plants;

— industrial sewerage engineering;

— power engineering (cooling and general purpose water);

— mining;

— electroplating and pickling plants;

— semiconductor industry;

— agricultural production plants;

— fire fighting;

— water treatment;

— geothermal.

NOTE 2 Where relevant, national regulations (e.g. water treatment) are applicable.

Other application areas are permitted if the requirements of this International Standard and/or applicable national requirements are fulfilled.

National regulations in respect of fire behaviour and explosion risk are applicable.

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The components have to withstand the mechanical, thermal, and chemical demands to be expected and have to be resistant to the fluids to be conveyed.

Characteristics and requirements which are applicable for all materials (PB, PE, PE-RT, PE-X, or PP) are covered by the relevant clauses of this International Standard. Those characteristics and requirements which are dependent on the material are given in the relevant normative annex for each material (see Table 1).

**Table 1 — Material-specific annexes**

| Material | Annex |
|---|---|
| Polybutene (PB) | A |
| Polyethylene (PE) | B |
| Polyethylene of raised temperature resistance (PE-RT) | C |
| Crosslinked polyethylene (PE-X) | D |
| Polypropylene (PP) | E |

Components conforming to any of the product standards listed in the bibliography or with national standards, as applicable, may be used with components conforming to this International Standard, provided that they conform to the requirements for joint dimensions and to the relevant requirements of this International Standard.

## 2 Normative references

The following documents, in whole or in part, are normatively referenced in this document and are indispensable for its application. For dated references, only the edition cited applies. For undated references, the latest edition of the referenced document (including any amendments) applies.

ISO 7-1, *Pipe threads where pressure-tight joints are made on the threads — Part 1: Dimensions, tolerances and designation*

ISO 179-2, *Plastics — Determination of Charpy impact properties — Part 2: Instrumented impact test*

ISO 228-1, *Pipe threads where pressure-tight joints are not made on the threads — Part 1: Dimensions, tolerances and designation.*

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 1167-3, *Thermoplastics pipes, fittings and assemblies for the conveyance of fluids — Determination of the resistance to internal pressure — Part 3: Preparation of components*

ISO 1167-4, *Thermoplastics pipes, fittings and assemblies for the conveyance of fluids — Determination of the resistance to internal pressure — Part 4: Preparation of assemblies*

ISO 1183-1, *Plastics — Methods for determining the density of non-cellular plastics — Part 1: Immersion method, liquid pyknometer method and titration method*


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

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 4427-1:2007, *Plastics piping systems — Polyethylene (PE) pipes and fittings for water supply — Part 1: General*

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

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

ISO 9080:2012, *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 11357-6, *Plastics — Differential scanning calorimetry (DSC) — Part 6: Determination of oxidation induction time (isothermal OIT) and oxidation induction temperature (dynamic OIT)*

ISO 11922-1, *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, 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 13760, *Plastics pipes for the conveyance of fluids under pressure — Miner's rule — Calculation method for cumulative damage*

ISO 14531-1, *Plastics pipes and fittings — Crosslinked polyethylene (PE-X) pipe systems for the conveyance of gaseous fuels — Metric series — Specifications — Part 1: Pipes*

ISO 15512, *Plastics — Determination of water content*

ISO 15853, *Thermoplastics materials — Preparation of tubular test pieces for the determination of the hydrostatic strength of materials used for injection moulding.*

ISO 16135, *Industrial valves — Ball valves of thermoplastics materials*

ISO 16136, *Industrial valves — Butterfly valves of thermoplastics materials*

ISO 16137, *Industrial valves — Check valves of thermoplastics materials*

ISO 16138, *Industrial valves — Diaphragm valves of thermoplastics materials*

ISO 16139, *Industrial valves — Gate valves of thermoplastics materials*

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*

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ISO 21787, *Industrial valves — Globe valves of thermoplastics materials*

IEC 60529, *Degrees of protection provided by enclosures (IP-code)*

EN 712, *Thermoplastics piping systems — End-load bearing mechanical joints between pressure pipes and fittings — Test method for resistance to pull-out under constant longitudinal force*

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.

### 3.1 Geometrical definitions

NOTE The symbols $d_e$ and $e$ correspond to $d_{ey}$ and $e_y$, given in other International Standards such as ISO 11922-1.

**3.1.1**
**nominal outside diameter**
$d_n$
specified outside diameter assigned to a nominal size DN/OD

Note 1 to entry: The nominal inside diameter of a socket is equal to the nominal outside diameter of the corresponding pipe.

Note 2 to entry: It is expressed in millimetres.

**3.1.2**
**outside diameter at any point**
$d_e$
value of the measurement of the outside diameter through its cross-section at any point of the pipe, rounded to the next greater 0,1 mm

**3.1.3**
**mean outside diameter**
$d_{em}$
value of the measurement of the outer circumference of the pipe or spigot end of a fitting in any cross-section divided by π (= 3,142), rounded to the next greater 0,1 mm

**3.1.4**
**mean inside diameter of a socket**
arithmetical mean of two measured inside diameters perpendicular to each other

**3.1.5**
**nominal size**
DN/OD
numerical designation of the size of a component, other than a component designated by thread size, which is a convenient round number, approximately equal to the manufacturing dimension in millimetres (mm) and related to the outside diameter

**3.1.6**
**nominal size of flange**
DN
numerical designation of the size of a flange for reference purposes and related to the manufacturing dimension in millimetres

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