INTERNATIONAL STANDARD

**ISO 11298-3**

Second edition
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# Plastics piping systems for renovation of underground water supply networks —

## Part 3: Lining with close-fit pipes

*Systèmes de canalisations en plastique pour la rénovation des réseaux enterrés d'alimentation en eau —*

*Partie 3: Tubage par tuyau continu sans espace annulaire*

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.

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 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 the following URL: www.iso.org/iso/foreword.html.

This document was prepared by Technical Committee ISO/TC 138, *Plastics pipes, fittings and valves for the transport of fluids*, SC 8, *Rehabilitation of pipeline systems*.

This second edition cancels and replaces the first edition (ISO 11298-3:2010), which has been technically revised.

The main changes compared to the previous edition are as follows:

— Figure 1 and Clauses 1, 3.4, 3.6, 5.8, 8.4, 8.5 and 9.3 to 9.8 have been technically revised.

— New sub-clauses 5.9, 6.3 and 8.9 specifying regional requirements for pipes, fittings and the installed lining system respectively, have also been added in accordance with the Vienna Agreement, to allow reference to European standards in countries where these are mandated by law in place of ISO standards of identical scope.

A list of all parts in the ISO 11298 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.

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# Introduction

This document is a part of a System Standard for plastics piping systems of various materials used for the renovation of existing pipelines in a specified application area. System Standards for renovation deal with the following applications:

— ISO 11296, *Plastics piping systems for renovation of underground non-pressure drainage and sewerage networks*;

— ISO 11297, *Plastics piping systems for renovation of underground drainage and sewerage networks under pressure*;

— ISO 11298, *Plastics piping systems for renovation of underground water supply networks* (this document);

— ISO 11299, *Plastics piping systems for renovation of underground gas supply networks.*

These System Standards are distinguished from those for conventionally installed plastics piping systems by the requirement to verify certain characteristics in the "as-installed" condition, after site processing. This is in addition to specifying requirements for plastics piping systems components "as manufactured".

Each of the System Standards comprises a:

— *Part 1: General*

and all applicable renovation technique family-related parts, which for water supply networks include or potentially include the following:

— *Part 2: Lining with continuous pipes*

— *Part 3: Lining with close-fit pipes* (this document)

— *Part 4: Lining with cured-in-place pipes*

— *Part 5: Lining with discrete pipes*

— *Part 6: Lining with adhesive-backed hoses*

— *Part 10: Lining with sprayed polymeric materials*

— *Part 11: Lining with inserted hoses*

The requirements for any given renovation technique family are specified in Part 1, applied in conjunction with the relevant other part. For example, ISO 11298-1 and this document together specify the requirements relating to lining with close-fit pipes. For complementary information, see ISO 11295. Not all technique families are pertinent to every area of application and this is reflected in the part numbers included in each System Standard.

A consistent structure of clause headings has been adopted for all parts of ISO 11298, in order to facilitate direct comparisons across renovation technique families.

Figure 1 shows the common part and clause structure and the relationship between ISO 11298 and the System Standards for other application areas.


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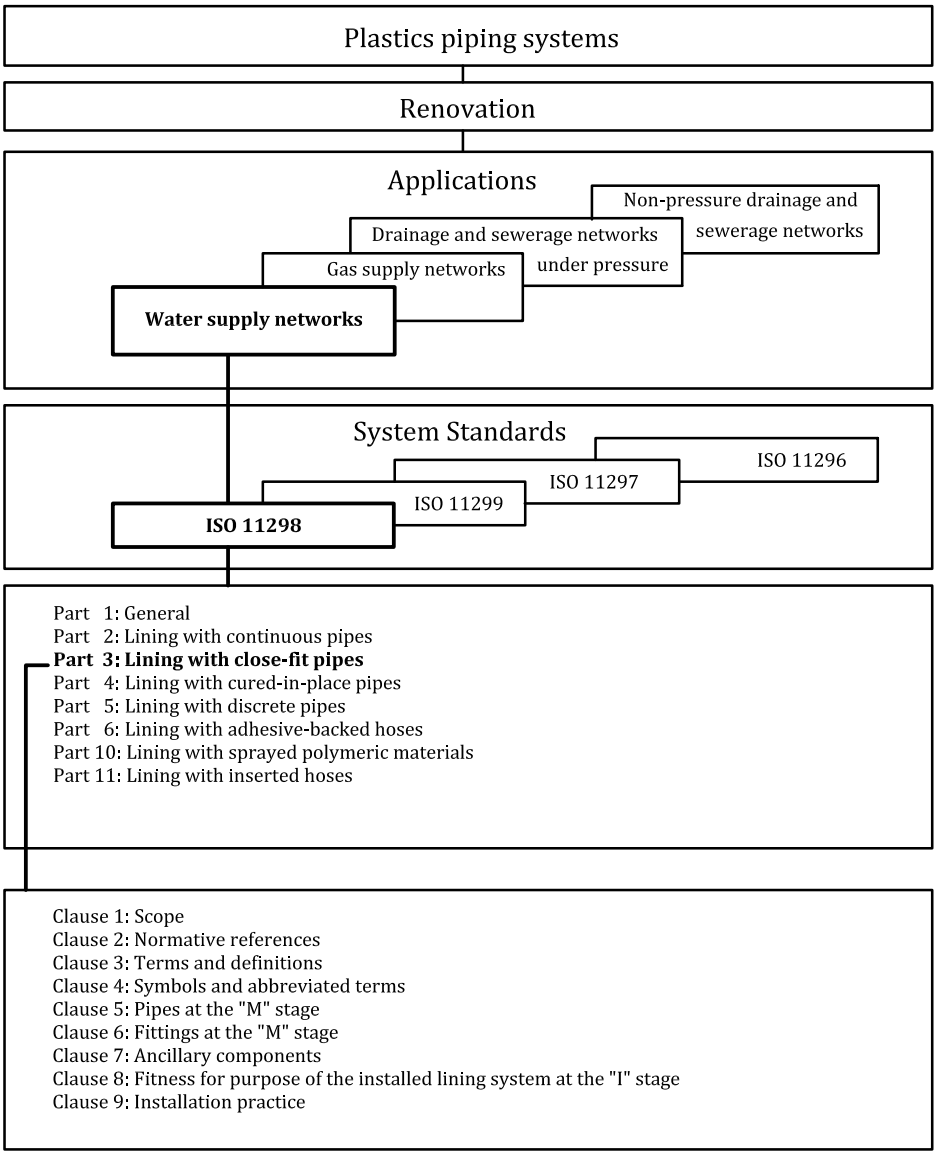



**Figure 1 — Format of the renovation system standards**

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# Plastics piping systems for renovation of underground water supply networks —

# Part 3: Lining with close-fit pipes

## 1 Scope

This document, in conjunction with ISO 11298-1, specifies requirements and test methods for close-fit lining systems intended to be used for the renovation of water supply networks, which transport water intended for human consumption, including raw water intake pipelines.

It applies to pipes and fittings, as manufactured, as well as to the installed lining system. It is applicable to polyethylene (PE) pipes of either solid wall single layer or co-extruded layer construction, which is reduced in the factory or on site to provide a close-fitting independent or interactive pressure pipe liner, as well as associated fittings and joints for the construction of the lining system. It is not applicable to PE coated pipes having a peelable, contiguous, thermoplastic additional layer on the outside of the pipe.

It is applicable to PE pipes, fittings and assemblies intended to be used at an operating temperature of 20 °C as the reference temperature.

NOTE For applications operating at constant temperatures greater than 20 °C and up to 40 °C, see ISO 4427-1:2007, Annex A.

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

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

ISO 4427-2:2007, *Plastics piping systems — Polyethylene (PE) pipes and fittings for water supply — Part 2: Pipes*

ISO 4427-3, *Plastics piping systems — Polyethylene (PE) pipes and fittings for water supply — Part 3: Fittings*

ISO 4427-5:2007, *Plastics piping systems — Polyethylene (PE) pipes and fittings for water supply — Part 5: Fitness for purpose of the system*

ISO 11298-1:2018, *Plastics piping systems for renovation of underground water supply networks — Part 1: General*

ISO 12176-1, *Plastics pipes and fittings — Equipment for fusion jointing polyethylene systems — Part 1: Butt fusion*

ISO 12176-2, *Plastics pipes and fittings — Equipment for fusion jointing polyethylene systems — Part 2: Electrofusion*

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EN 12201-1, *Plastics piping systems for water supply, and for drainage and sewerage under pressure — Polyethylene (PE) — Part 1: General*

EN 12201-2:2011, *Plastics piping systems for water supply, and for drainage and sewerage under pressure — Polyethylene (PE) — Part 2: Pipes*

EN 12201-3, *Plastics piping systems for water supply, and for drainage and sewerage under pressure — Polyethylene (PE) — Part 3: Fittings*

EN 12201-4, *Plastics piping systems for water supply — Polyethylene (PE) — Part 4: Valves*

EN 12201-5, *Plastics piping systems for water supply, and for drainage and sewerage under pressure — Polyethylene (PE) — Part 5: Fitness for purpose of the system*

## 3 Terms and definitions

For the purposes of this document, the terms and definitions given in ISO 11298-1:2018 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 https://www.iso.org/obp

### 3.1 General

**3.1.1**
**compound formulation**
clearly defined homogenous mixture of base polymer with additives, e.g. antioxidants, pigments, stabilizers and others, at a dosage level necessary for the processing and intended use of the final product

**3.1.2**
**solid wall single layered pipe**
pipe with smooth internal and external surface, extruded from the same *compound formulation* (3.1.1) throughout the wall

**3.1.3**
**pipe with co-extruded layers**
pipe with smooth internal and external surface, having co-extruded layers on either or both the outside and inside of the pipe, where all layers have the same MRS rating

**3.1.4**
**close fit**
situation of the outside of the installed liner relative to the inside of the existing pipeline, which can either be an interference fit or include a small annular gap resulting from shrinkage and tolerances only

**3.1.5**
**close-fit pipe**
continuous lining pipe of thermoplastic material reshaped or otherwise expanded after insertion to achieve a close fit to the existing pipeline

### 3.2 Techniques

No additional definitions apply.


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## 3.3 Characteristics

**3.3.1**
**MRS**
**minimum required strength**
value of $\sigma_{LPL}$ rounded down to the next smaller value of the R10 series or R20 series, depending on the value of $\sigma_{LPL}$

Note 1 to entry: R10 and R20 series are the Renard number series according to ISO 3 and ISO 497.

**3.3.2**
**MFR**
**melt mass-flow rate**
rate of extrusion of a molten resin through a die of specified length and diameter under prescribed conditions of temperature, load and piston position in the cylinder of an extrusion plastometer, the rate being determined as the mass extruded over a specified time

Note 1 to entry: MFR is expressed in units of grams per 10 min.

[SOURCE: ISO 1133-1:2011, 3.1, modified — The second sentence in the NOTE has been deleted.]

## 3.4 Materials

**3.4.1**
**crazing**
microstructural phenomenon associated with the short-term application of tensile bending strain exceeding the material-related critical yield strain

## 3.5 Product stages

No additional definitions apply.

## 3.6 Service conditions

**3.6.1**
**PN**
**nominal pressure**
numerical designation used for reference purposes related to the mechanical characteristics of the component of a piping system

Note 1 to entry: For thermoplastics piping systems conveying water, it corresponds to the allowable operating pressure (PFA) in bar[1)], which can be sustained with water at 20 °C with a design basis of 50 years, and based on the minimum design coefficient:

$$\mathrm{PN} = \frac{20 \times (\mathrm{MRS})}{C \times (\mathrm{SDR} - 1)}$$

Note 2 to entry: In the equation for PN, MRS represents the number corresponding to the value of minimum required strength in MPa.

**3.6.2**
**design coefficient**
*C*
coefficient with a value greater than 1, which takes into consideration service conditions as well as properties of the components of a piping system other than those represented in the lower confidence limit

1) 1 bar = 0,1 MPa = 0,1 N/mm$^2$ = $10^5$·N/m$^2$.

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## 3.7 Joints

**3.7.1**
**electrofusion joint**
joint between a PE socket or saddle electrofusion fitting and a pipe or fitting with spigotted ends, made by heating the electrofusion fittings by the Joule effect of the heating element incorporated at their jointing surfaces, causing the material adjacent to them to melt and pipe and fitting surfaces to fuse

**3.7.2**
**butt fusion joint**
joint made by heating the planed ends of matching surfaces by holding them against a flat heating plate until the PE material reaches fusion temperature, quickly removing the heating plate and pushing the two softened ends against one another

**3.7.3**
**mechanical joint**
joint made by assembling a PE pipe to another PE pipe, or any other element of the piping system, using a fitting that generally includes a compression part, to provide for pressure integrity, leaktightness and a gripping part to provide resistance to end loads

Note 1 to entry: A support sleeve inserted into the pipe bore can be used to provide a permanent support for the PE pipe to prevent creep in the pipe wall under radial compressive forces.

**3.7.4**
**fusion compatibility**
ability of two similar or dissimilar PE materials to be fused together to form a joint which conforms to the performance requirements of this document

# 4 Symbols and abbreviated terms

For the purpose of this document, the symbols and abbreviated terms given in ISO 11298-1 and the following apply.

## 4.1 Symbols

| | |
|---|---|
| $C$ | design coefficient |
| $d_e$ | outside diameter (at any point) |
| $d_{manuf}$ | original circular outside diameter of the pipe (before processing for insertion) |
| $e_{m,\,max}$ | maximum mean wall thickness |
| $\sigma_{LPL}$ | quantity with the dimensions of stress, which represents the 97,5 % lower confidence limit of the predicted hydrostatic strength at a temperature, $T$, and time $t$ |
| $T$ | temperature at which stress rupture data have been determined |
| $t$ | time to occurrence of a leak in the pipe |


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