INTERNATIONAL STANDARD

ISO 21138-2

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Plastics piping systems for non-pressure underground drainage and sewerage — Structured-wall piping systems of unplasticized poly(vinyl chloride) (PVC-U), polypropylene (PP) and polyethylene (PE) —

iTeh STPANDARD PREVIEW

(stPipes and fittings with smooth external surface, Type A

https://standards.iteh.ai/catalog/standards/sist/7c2b27b9-a8b7-418a-bf89-Systemes de canalisations en plastique pour les branchements

et les collecteurs d'assainissement sans pression enterrés — Systèmes de canalisations à parois structurées en poly(chlorure de vinyle) non plastifié (PVC-U), polypropylène (PP) et polyéthylène (PE) —

Partie 2: Tubes et raccords avec une surface externe lisse, type A



Reference number ISO 21138-2:2007(E)

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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 2.

The main task of technical committees is to prepare International Standards. 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 document may be the subject of patent rights. ISO shall not be held responsible for identifying any or all such patent rights.

ISO 21138-2 was prepared by Technical Committee ISO/TC 138, *Plastics pipes, fittings and valves for the transport of fluids*, Subcommittee SC 1, *Plastics pipes and fittings for soil, waste and drainage (including land drainage)*.

ISO 21138 consists of the following parts, under the general title *Plastics* piping systems for non-pressure underground drainage and sewerage — Structured-wall piping systems of unplasticized poly(vinyl chloride) (PVC-U), polypropylene (PP) and polyethylene (PE):

— Part 1: Material specifications and performance criteria for pipes, fittings and system

— Part 2: Pipes and fittings with smooth external surface, Type A

— Part 3: Pipes and fittings with non-smooth external surface, Type B

Introduction

ISO 21138 is the system standard covering the plastics piping systems for non-pressure underground drainage and sewerage, in particular thermoplastics structured-wall piping systems.

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Plastics piping systems for non-pressure underground drainage and sewerage — Structured-wall piping systems of unplasticized poly(vinyl chloride) (PVC-U), polypropylene (PP) and polyethylene (PE) —

Part 2: Pipes and fittings with smooth external surface, Type A

1 Scope

This part of ISO 21138, together with ISO 21138-1, specifies the definitions and requirements for pipes with a smooth external surface (Type A), fittings and systems based on unplasticized poly(vinyl chloride) (PVC-U), polypropylene (PP) and polyethylene (PE) structured-wall piping in the field of non-pressure systems for underground drainage and sewerage

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NOTE 1 These pipes, fittings and the system can be used for highway drainage and surface water.

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This part of ISO 21138 specifically refers to PVC, PP and PE materials.

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NOTE 2 Other thermoplastic materials can be added via an addendum-a8b7-418a-bf89-

4a01e39a3b05/iso-21138-2-2007 This part of ISO 21138 specifies test methods and test parameters.

This part of ISO 21138 covers a range of pipe and fitting sizes, materials, pipe constructions and nominal ring stiffnesses, and gives recommendations concerning colours.

NOTE 3 It is the responsibility of the purchaser or specifier to make the appropriate selections from these aspects, taking into account their particular requirements and any relevant national regulations and installation practices or codes.

In conjunction with ISO 21138-1, it is applicable to PVC-U, PP and PE structured-wall pipes and fittings, to their joints and to joints with components of other plastics and non-plastics materials intended to be used for buried piping systems for the transport of drainage and sewage.

It is applicable to PVC-U, PP and PE structured-wall pipes and fittings with or without an integral socket with elastomeric ring seal joints as well as welded and fused joints.

NOTE 4 For dimensions larger than DN/OD 1200, or DN/ID 1200, this part of ISO 21138 can serve as a general guide regarding appearance, colour, physical and mechanical characteristics as well as performance requirements.

Test methods are not included in this document.

2 Normative references

The following referenced documents are indispensable for the application 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 178, Plastics — Determination of flexural properties

ISO 306:1994, Plastics — Thermoplastic materials — Determination of Vicat softening temperature (VST)

ISO 527-2:1993, Plastics — Determination of tensile properties — Part 2: Test conditions for moulding and extrusion plastics

ISO 580:2005, Plastics piping and ducting systems — Injection-moulded thermoplastics fittings — Methods for visually assessing the effects of heating

ISO 1133:2005, *Plastics* — *Determination of the melt mass-flow rate (MFR) and the melt volume-flow rate (MVR) of thermoplastics*

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

ISO 2505, Thermoplastics pipes — Longitudinal reversion — Test methods and parameters

ISO 2507-1, Thermoplastics pipes and fittings — Vicat softening temperature — Part 1: General test method

ISO 2507-2, Thermoplastics pipes and fittings — Vicat softening temperature — Part 2: Test conditions for unplasticized poly(vinyl chloride) (PVC-U) or chlorinated poly(vinyl chloride) (PVC-C) pipes and fittings and for high impact resistance poly(vinyl chloride) (PVC-Hi) pipes

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

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ISO 3127:1994, Thermoplastics pipes — Determination of resistance to external blows — Round-the-clock method

ISO 3451-1:1997, Plastics — Determination of ash — Part 1: General methods

ISO 4435:2003, *Plastics piping systems for non-pressure underground drainage and sewerage — Unplasticized poly(vinyl chloride) (PVC-U)*

ISO 8772:2006, *Plastics piping systems for non-pressure underground drainage and sewerage — Polyethylene (PE)*

ISO 8773:2006, *Plastics piping systems for non-pressure underground drainage and sewerage — Polypropylene (PP)*

ISO 9852, Unplasticized poly(vinyl chloride) (PVC-U) pipes — Dichloromethane resistance at specified temperature (DCMT) — Test method

ISO 9967, Thermoplastics pipes — Determination of creep ratio

ISO 9969, Thermoplastics pipes — Determination of ring stiffness

ISO 11173:1994, Thermoplastics pipes — Determination of resistance to external blows — Staircase method

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

ISO 21138-1, Plastics piping systems for non-pressure underground drainage and sewerage — Structuredwall piping systems of unplasticized poly(vinyl chloride) (PVC-U), polypropylene (PP) and polyethylene (PE) — Part 1: Material specifications and performance criteria for pipes, fittings and the system

ISO 21138-3, Plastics piping systems for non-pressure underground drainage and sewerage — Structuredwall piping systems of unplasticized poly(vinyl chloride) (PVC-U), polypropylene (PP) and polyethylene (PE) — Part 3: Pipes and fittings with a non-smooth external surface, Type B

ISO 22088-3, Plastics — Determination of resistance to environmental stress cracking (ESC) — Part 3: Bent strip method

EN 922, Plastics piping and ducting systems — Pipes and fittings of unplasticized poly(vinyl chloride) (PVC-U) — Specimen preparation for determination of the viscosity number and calculation of the K-value

EN 1053, *Plastics piping systems* — Thermoplastics piping systems for non-pressure applications — Test method for watertightness

EN 1277:2003, Plastics piping systems — Thermoplastics piping systems for buried non-pressure applications — Test methods for leaktightness of elastomeric sealing ring type joints

EN 1437:2002, Plastics piping systems — Piping systems for underground drainage and sewerage — Test method for resistance to combined temperature cycling and external loading

EN 1446, Plastics piping and ducting systems — Thermoplastics pipes — Determination of ring flexibility

EN 1905, Plastics piping systems — Unplasticized poly(vinyl chloride) (PVC-U) pipes, fittings and material — Method for assessment of the PVC content based on total chlorine content (standards.iten.ai)

EN 1979, Plastics piping and ducting systems — Thermoplastics spirally-formed structured-wall pipes — Determination of the tensile strength of a seam $_{21138-22007}$

EN 10204:2004, Metallic products — Types of inspection, documents

EN 12099, Plastics piping systems — Polyethylene piping materials and components — Determination of volatile content

EN 14741, Thermoplastics piping and ducting systems — Joints for buried non-pressure applications — Test method for the long-term sealing performance of joints with elastomeric seals by estimating the sealing pressure

EN 15344:—¹⁾, Plastics — Recycled plastics — Characterisation of polyethylene) (PE) recyclates

EN 15345:—¹⁾, Plastics — Recycled plastics — Characterisation of polypropylene) (PP) recyclates

EN 15346:—¹⁾, Plastics — Recycled plastics — Characterisation of poly(vinyl chloride) (PVC) recyclates

3 Terms, definitions, symbols and abbreviated terms

For the purposes of this document, the following terms, definitions, symbols and abbreviated terms apply.

3.1 Terms and definitions

The terms and definitions given in ISO 21138-1 apply.

¹⁾ To be published.

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3.2 Symbols

- A length of engagement, or maximum pull-out whilst maintaining tightness
- C depth of sealing zone
- *D*_i socket inside diameter
- *d*_e outside diameter
- *d*_{em} mean outside diameter
- *d*_i inside diameter
- *d*_{im} mean inside diameter
- d_{sm.min} minimum mean inside diameter of a socket
- *e* wall thickness (at any point)
- *e*_c construction height
- *e*₂ wall thickness of the socket
- *e*₃ wall thickness of the groove **STANDARD PREVIEW**
- *e*₄ wall thickness of the inside layer (waterway wall thickness)
- *e*₅ wall thickness of the inside layer under a hollow section
- <u>ISO 21138-2:2007</u>
- L₁ minimum length of spigot standards.iteh.ai/catalog/standards/sist/7c2b27b9-a8b7-418a-bf89-4a01e39a3b05/iso-21138-2-2007
- *l* effective length of a pipe

3.3 Abbreviated terms

- CaCO₃ calcium carbonate
- CT close tolerance
- DN nominal size
- DN/ID nominal size related to inside diameter
- DN/OD nominal size related to outside diameter
- ID inside diameter
- MgCO₃ magnesium carbonate
- MFR melt mass-flow rate
- OD outside diameter
- OIT oxidation induction time
- PE polyethylene

PPpolypropylenePVC-Uunplasticized poly(vinyl chloride)Spipe series SSDRstandard dimension ratioSNnominal ring stiffnessTIRtrue impact rateTPEthermoplastic elastomerVSTVicat softening temperature

4 Material

4.1 General

The material shall be one of the following: unplasticized poly(vinyl chloride) (PVC-U), polypropylene (PP) or polyethylene (PE) to which are added those additives that are needed to facilitate the manufacture of components conforming to this part of ISO 21138, including the relevant annexes.

4.2 Unplasticized poly(vinyl chloride) (PVC-U)

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4.2.1 General

<u>ISO 21138-2:2007</u>

The raw material shalls:bearPVC+Utoi/which/sareaadded/those/sadditives/athat/are needed to facilitate the manufacture of components conforming to the requirements of this ISO 21138 (see also Annex A).

NOTE Additional information of the characteristics of PVC-U material or components made thereof is given in ISO 21138-1:2007, Annex A.

4.2.2 Pipe and fitting material characteristics

When tested in accordance with the test method specified in Table 1, using the indicated parameters, the material shall have characteristics conforming to the requirements given in Table 1.

Characteristic	Requirements	Test parameters		Test method
Resistance to	No failure during the test period	End caps	Type A or B	ISO 1167-1
internal pressure		Orientation	Free	ISO 1167-2
a, b, c		Number of test pieces	3	
		Test temperature	60 °C	
		Circumferential stress		
		— pipe material	10 MPa	
		— fitting material	6,3 MPa	
		Conditioning period	In accordance with ISO 1167-1	
		Type of test	Water-in-water	
		Test period	1 000 h	

Table 1 — Material characteristics of PVC-U pipes and injection-moulded fittings

^a For extrusion compounds, this test shall be carried out in the form of a solid-wall pipe made from the relevant extrusion material.

^b For injection-moulding compounds, this test shall be carried out in the form of an injection-moulded or extruded sample in solid-wall pipe form made from the relevant material.

Not required for the intermediate layer of Type A1 pipes.

4.2.3 Utilization of non-virgin materials TANDARD PREVIEW

For the utilization of non-virgin PVC-U materials, conditions and requirements are given in Annex B, and the PVC recyclates shall conform to the characterization specified in EN 15346.

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NOTE Annex G gives a survey of the possible use of geprocessable and recyclable materials-

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4.3 Polypropylene (PP)

4.3.1 General

С

The compound for pipes and fittings shall be PP base material to which are added those additives that are needed to facilitate the manufacture of components conforming to the requirements of this part of ISO 21138. See also Annex C.

NOTE Additional information on the characteristics of PP material or components made thereof is given in ISO 21138-1:2007 Annex A.

4.3.2 Pipe and fitting material characteristics

When tested in accordance with the test methods specified in Table 2, using the indicated parameters, the material shall have characteristics conforming to the requirements given in Table 2.

Characteristic	Requirements	Test parameters		Test method		
Resistance to	No failure during the test period	End caps	Type A or B	ISO 1167-1		
internal pressure 140 h ^{a, b, d}		Test temperature	80 °C			
-		Orientation	Free	ISO 1167-2		
		Number of test pieces	3			
		Circumferential stress	4,2 MPa			
		Conditioning period	In accordance with ISO 1167-1			
		Type of test	Water-in-water			
		Test period	140 h			
Resistance to	No failure during the test period	End caps	Type A or B	ISO 1167-1		
Internal pressure 1 000 h ^{a, b, d}		Test temperature	95 °C			
		Orientation	Free	ISO 1167-2		
		Number of test pieces	3			
		Circumferential stress	2,5 MPa			
		Conditioning period	In accordance with ISO 1167-1			
	iTeh S7	Type of testARD PRF	Water-in-water			
	(\$	Test period	1 000 h			
Melt mass-flow	≤ 1,5 g/10 min	Temperature	230 °C	ISO 1133		
Tale		Loading mass 38-2:2007	2,16 kg	Condition M		
Thermal stability, OIT ^c	https://standards.iteh ≥ 8 min	a/catalog/standards/sist//c2b2/b9 Temperature a01e39a3b05/iso-21138-2-2007	-200°°C	ISO 11357-6		
^a For extrusion compounds, this test shall be carried out in the form of a solid-wall pipe made from the relevant extrusion material						

Table 2 — Material characteristics of PP pipes and injection-moulded fittings

^a For extrusion compounds, this test shall be carried out in the form of a solid-wall pipe made from the relevant extrusion material.

^b For injection-moulding compounds, this test shall be carried out in the form of an injection-moulded or extruded sample in solid-wall pipe form made from the relevant material.

^c This requirement is only valid for pipes and fittings intended to be jointed in the field by fusing or welding.

^d Not required for the intermediate layer of Type A1 pipes.

4.3.3 Melt mass-flow rate classification

Materials for pipes and fittings intended for jointing in the field by fusion or welding shall be designated by the following MFR classes:

- Class A: MFR \leq 0,3 g/10 min
- Class B: 0,3 g/10 min < MFR \leq 0,6 g/10 min
- Class C: 0,6 g/10 min < MFR \leqslant 0,9 g/10 min
- Class D: 0,9 g/10 min < MFR \leq 1,5 g/10 min