INTERNATIONAL STANDARD

ISO 21138-1

First edition
2007-10-15

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

Systèmes 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 1: Spécifications des matières et critères de performance des tubes, raccords et système

Reference number
ISO 21138-1:2007(E)

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Published in Switzerland

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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 21138-1 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.

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

1 Scope

This part of ISO 21138 specifies the definitions and requirements for pipes, fittings and the system based on unplasticized poly(vinyl chloride) (PVC-U), polypropylene (PP) and polyethylene (PE) structured-wall piping systems in the field of non-pressure underground systems for underground drainage and sewerage.

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

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

NOTE 2 Other thermoplastic materials can be added via an addendum.

This part of ISO 21138 covers a range of pipe and fitting sizes, materials, pipe constructions, 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 21138-2 and ISO 21138-3, 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 sewerage.

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 Pipes, fittings and other components conforming to any plastics product standards referred to in Clause 2 can be used with pipes and fittings conforming to this part of ISO 21138 when they conform to the requirements for joint dimensions given in Parts 2 and 3 of ISO 21138 and to the performance requirements given in Clause 9.

NOTE 5 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.

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 472, *Plastics — Vocabulary*

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

ISO 1043-1:2001, *Plastics — Symbols and abbreviated terms — Part 1: Basic polymers and their special characteristics*

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 method 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*

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

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

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

ISO 8773, *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, *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 11922-1:1997, *Thermoplastics pipes for the conveyance of fluids — Dimensions and tolerances — Part 1: Metric series*

ISO 12091:1995, *Structured-wall thermoplastics pipes — Oven test*

ISO 13967, *Thermoplastics fittings — Determination of ring stiffness*

ISO 21138-2:2007, *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*

ISO 21138-3:2007, *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 3: Pipes and fittings with non-smooth external surface, Type B*

EN 681-1, *Elastomeric seals — Materials requirements for pipe joint seals used in water and drainage applications — Part 1: Vulcanized rubber*

EN 681-2, *Elastomeric seals — Materials requirements for pipe joint seals used in water and drainage applications — Part 2: Thermoplastic elastomers*

EN 681-4, *Elastomeric seals — Materials requirements for pipe joint seals used in water and drainage applications — Part 4: Cast polyurethane sealing elements*

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

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

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

EN 1979, *Plastics piping and ducting systems — Thermoplastics spirally-formed structured-wall pipes — Determination of the tensile strength of a seam*

EN 12061, *Plastics piping systems — Thermoplastics fittings — Test method for impact resistance*

EN 12256, *Plastics piping systems — Thermoplastics fittings — Test method for mechanical strength or flexibility of fabricated fittings*

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*

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

In addition to the terms and definitions given below, the terms and definitions given in ISO 472, ISO 1043-1 and ISO 11922-1 apply.

3.1.1 General terms

3.1.1.1
structured-wall pipes and fittings
products that have an optimized design with regard to material usage to achieve the physical, mechanical and performance requirements of this part of ISO 21138

NOTE For a description of the particular designs covered by this part of ISO 21138, see ISO 21138-2 for Type A and ISO 21138-3 for Type B. Type A pipes have an internal and external plain surface. Type B pipes have an internal plain surface and a hollow spiral or annular ribbed external surface.

3.1.1.2
fabricated fitting
fitting manufactured by heat forming and/or joining more than one piece of pipe and/or moulded component

NOTE Sealing rings retaining components are not considered as a piece.

3.1.2 Geometrical terms

3.1.2.1
nominal size DN
numerical designation of the size of a component, other than a component designated by thread size, which is approximately equal to the manufacturing dimension in millimetres

3.1.2.2
nominal size DN/OD
nominal size, related to the outside diameter

3.1.2.3
nominal size DN/ID
nominal size, related to the inside diameter

3.1.2.4
nominal diameter
d_n
specified diameter, in millimetres, assigned to a nominal size (DN/OD or DN/ID)

3.1.2.5
outside diameter
d_e
value of the measurement of the outside diameter through its cross-section at any point of a pipe or spigot, rounded to the next greater 0,1 mm

NOTE For Type B constructions, see ISO 21138-3.

3.1.2.6
mean outside diameter
d_{em}
value of the measurement of the outer circumference of a pipe or spigot in any cross-section divided by π (= 3,142), rounded up to the nearest 0,1 mm

NOTE For Type B constructions, see ISO 21138-3.

3.1.2.7
mean inside diameter
d_{im}
average value of a number of equally spaced measurements of inside diameter in the same cross-section of a pipe or fitting

3.1.2.8
minimum mean inside diameter of a socket
$D_{im,min}$
average value of equally spaced measurements of inside diameter in the same cross-section of a socket

3.1.2.9
wall thickness
e
measured wall thickness at any point of the body of a component

3.1.2.10
construction height
e_c
radial distance between the top of ribs or corrugation or, in the case of Type A1 and Type A2 pipes and fittings, between the outside surface of the wall and the inside surface of the wall

3.1.2.11
wall thickness of the inside layer
waterway wall thickness
e_4
⟨Type A1⟩ thickness at any point of the inner layer of a pipe or fitting

See Figure 1 in ISO 21138-2:2007.

⟨Type B⟩ thickness at any point of the wall between the ribs or corrugations of the pipe or fitting

See Figure 4 in ISO 21138-3:2007.

3.1.2.12
wall thickness of the inside layer under a hollow section
e_5
thickness at any point of the inside wall between a hollow section and the inside surface of the Type A2 or Type B pipe or fitting

See Figure 2 in ISO 21138-2:2007 and Figure 4 in ISO 21138-3:2007.

3.1.2.13
minimum length of a spigot
$L_{1,min}$
minimum permitted value for the length of a spigot of a pipe or fitting

3.1.2.14
nominal ring stiffness
SN
numerical designation of the ring stiffness of the pipe or fitting, which is a convenient round number, indicating the minimum required ring stiffness of the pipe or stiffness of the fitting

3.1.2.15
fitting stiffness
mechanical characteristic of a fitting, which is a measure of the resistance to ring deflection under an external force as determined in accordance with ISO 13967

3.1.3 Material terms

3.1.3.1
virgin material
material in a form such as granules or powder, which has not been subjected to use or processing other than that required for its manufacture and to which no reprocessable or recyclable materials have been added

3.1.3.2
own reprocessable material
material prepared from rejected unused pipes or fittings, including trimmings from the production of pipes and fittings, which will be reprocessed in a manufacturer's plant after having been previously processed by the same manufacturer by a process such as moulding or extrusion and for which the complete formulation is known

3.1.3.3
external reprocessable material
material comprising either one of the following: