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**Cevni sistemi iz polimernih materialov za odpadno vodo in kanalizacijo, ki delujejo po težnostnem principu in so položeni v zemljo - Nemehčan polivinilklorid (PVC-U) - 1. del: Specifikacije za cevi, fitinge in sistem (Vključuje dopolnilo A1)**

Plastics piping systems for non-pressure underground drainage and sewerage - Unplasticized poly(vinyl chloride) (PVC-U) - Part 1: Specifications for pipes, fittings and the system

Kunststoff-Rohrleitungssysteme für erdverlegte drucklose Abwasserkanäle und -leitungen - Weichmacherfreies Polyvinylchlorid (PVC-U) - Teil 1: Anforderungen an Rohre, Formstücke und das Rohrleitungssystem

Systèmes de canalisations en plastique pour les branchements et les collecteurs d'assainissement enterrés sans pression - Poly(chlorure de vinyle) non plastifié (PVC-U) - Partie 1 : Spécifications pour tubes, raccords et le système

**Ta slovenski standard je istoveten z: EN 1401-1:2019+A1:2023**

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## Plastics piping systems for non-pressure underground drainage and sewerage - Unplasticized poly(vinyl chloride) (PVC-U) - Part 1: Specifications for pipes, fittings and the system

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This European Standard was approved by CEN on 12 May 2019 and includes Amendment 1 approved by CEN on 21 January 2023.

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**EN 1401-1:2019+A1:2023 (E)****European foreword**

This document (EN 1401-1:2019+A1:2023) has been prepared by Technical Committee CEN/TC 155 "Plastics piping systems and ducting systems", the secretariat of which is held by NEN.

This European Standard shall be given the status of a national standard, either by publication of an identical text or by endorsement, at the latest by October 2023, and conflicting national standards shall be withdrawn at the latest by October 2023.

Attention is drawn to the possibility that some of the elements of this document may be the subject of patent rights. CEN shall not be held responsible for identifying any or all such patent rights.

This document includes Amendment 1 approved by CEN on 21 January 2023.

This document supersedes A1 EN 1401-1:2019 A1.

The start and finish of text introduced or altered by amendment is indicated in the text by tags A1 A1.

This revision of the EN 1401 series is proposed by CEN/TC155/WG6 members in order to improve the "level of sustainability" and the "environmental impact" of PVC piping systems, whilst improving the recommendations and safe use of recycled material. Recycled material is categorized as non-virgin material in this document.

Regarding this specific target, some superfluous requirements and inconsistencies existing in the old version of EN 1401-1 were deleted, and more focus was given to the control of applied formulation and to the final characteristics and performance of products.

Compared to the previous version, the main changes are listed below:

- a) clarification of product covered (Clause 1);
- b) introduction of a new pipe series SN 16 (SDR 27,6) (7.2.5 and 7.4.1.2);
- c) deletion of former clause on dimension of "o-ring type joints";
- d) complete review of non-virgin (recyclates) material use (Clause 5 and Annex A);
- e) addition of a footnote e) to Table 14 for DSC to lower the minimum B-onset temperature to 180 °C for formulation with CaZn stabilizers.

This document is a Part of a System Standard for plastics piping systems of a particular material for a specified application. There are a number of such System Standards.

System Standards are based on the results of the work undertaken in ISO/TC 138 "Plastics pipes, fittings and valves for the transport of fluids", which is a Technical Committee of the International Organization for Standardization (ISO).

They are supported by separate standards on test methods to which references are made throughout the System Standard.

The System Standards are consistent with general standards on functional requirements and on recommended practice for installation.

EN 1401 consists of the following parts, under the general title *Plastics piping systems for non-pressure underground drainage and sewerage — Unplasticized poly(vinyl chloride) (PVC-U)*:

- *Part 1: Specifications for pipes, fittings and the system* (this document);
- *Part 2: Guidance for assessment of conformity* (CEN/TS under revision).

Any feedback and questions on this document should be directed to the users' national standards body. A complete listing of these bodies can be found on the CEN website.

According to the CEN-CENELEC Internal Regulations, the national standards organizations of the following countries are bound to implement this European Standard: Austria, Belgium, Bulgaria, Croatia, Cyprus, Czech Republic, Denmark, Estonia, Finland, France, Germany, Greece, Hungary, Iceland, Ireland, Italy, Latvia, Lithuania, Luxembourg, Malta, Netherlands, Norway, Poland, Portugal, Republic of North Macedonia, Romania, Serbia, Slovakia, Slovenia, Spain, Sweden, Switzerland, Türkiye and the United Kingdom.

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[SIST EN 1401-1:2019+A1:2023](https://standards.iteh.ai/catalog/standards/sist/02d3e9b8-3494-47c5-9485-13a3b238033e/sist-en-1401-1-2019a1-2023)

<https://standards.iteh.ai/catalog/standards/sist/02d3e9b8-3494-47c5-9485-13a3b238033e/sist-en-1401-1-2019a1-2023>

**EN 1401-1:2019+A1:2023 (E)****1 Scope**

This document specifies the requirements for solid wall pipes with smooth internal and external surfaces, extruded from the same formulation throughout the wall, fittings and the system of unplasticized poly(vinyl chloride) (PVC-U) piping systems in the field of non-pressure underground drainage and sewerage:

- buried in ground outside the building structure (application area code "U"), and
- both buried in ground, within the building structure and outside the building (application area code "UD").

NOTE 1 The intended use is reflected in the marking of products by "U" or "UD".

It also specifies the test parameters for the test methods referred to in this document.

NOTE 2 Multilayer pipes with different formulations throughout the wall and foamed core pipes are covered by EN 13476-2 [1].

This document covers a range of nominal sizes, a range of pipes and fittings series and a range of stiffness classes and gives recommendations concerning colours.

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

It is applicable to PVC-U pipes and fittings, their joints and to joints with components of other plastics and non-plastics materials intended for buried piping systems for non-pressure underground drainage and sewerage.

NOTE 4 Pipes, fittings and other components conforming to any of the plastics product standards listed in Annex C can be used with pipes and fittings conforming to this document, provided they conform to the requirements for joint dimensions given in Clause 7 and to the requirements of Table 16.

**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.

EN 681-1, *Elastomeric seals — Material 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 14680, *Adhesives for non-pressure thermoplastics piping systems — Specifications*

EN 14814, *Adhesives for thermoplastic piping systems for fluids under pressure — Specifications*

EN ISO 472:2013, *Plastics — Vocabulary (ISO 472:2013)*

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



EN ISO 1043-1:2011, *Plastics — Symbols and abbreviated terms — Part 1: Basic polymers and their special characteristics (ISO 1043-1:2011)*

■<sup>A1</sup> EN ISO 1158, *Plastics - Vinyl chloride homopolymers and copolymers - Determination of chlorine content (ISO 1158)* <sup>A1</sup>

EN ISO 1167-1:2006, *Thermoplastics pipes, fittings and assemblies for the conveyance of fluids — Determination of the resistance to internal pressure — Part 1: General method (ISO 1167-1:2006)*

EN 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 1167-2)*

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

EN ISO 2505, *Thermoplastics pipes — Longitudinal reversion — Test method and parameters (ISO 2505)*

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

EN ISO 3126, *Plastics piping systems — Plastics components — Determination of dimensions (ISO 3126)*

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

EN ISO 3451-5, *Plastics — Determination of ash — Part 5: Poly(vinyl chloride) (ISO 3451-5)*

EN ISO 6259-1, *Thermoplastics pipes — Determination of tensile properties — Part 1: General test method (ISO 6259-1)*

■<sup>A1</sup> EN ISO 6259-2, *Thermoplastics pipes - Determination of tensile properties - Part 2: Pipes made of unplasticized poly(vinyl chloride) (PVC-U), oriented unplasticized poly(vinyl chloride) (PVC-O), chlorinated poly(vinyl chloride) (PVC-C) and high-impact poly(vinyl chloride) (PVC-HI) (ISO 6259-2)* <sup>A1</sup>

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

EN ISO 9969, *Thermoplastics pipes — Determination of ring stiffness (ISO 9969)*

EN ISO 11173, *Thermoplastics pipes — Determination of resistance to external blows — Staircase method (ISO 11173)*

EN ISO 13254, *Thermoplastics piping systems for non-pressure applications — Test method for watertightness (ISO 13254)*

EN ISO 13257, *Thermoplastics piping systems for non-pressure applications — Test method for resistance to elevated temperature cycling (ISO 13257)*

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EN ISO 13259, *Thermoplastics piping systems for underground non-pressure applications — Test method for leaktightness of elastomeric sealing ring type joints (ISO 13259)*

EN ISO 13263, *Thermoplastics piping systems for non-pressure underground drainage and sewerage — Thermoplastics fittings — Test method for impact strength (ISO 13263)*

EN ISO 13264, *Thermoplastics piping systems for non-pressure underground drainage and sewerage — Thermoplastics fittings — Test method for mechanical strength or flexibility of fabricated fittings (ISO 13264)*

ISO 18373-1, *Rigid PVC pipes — Differential scanning calorimetry (DSC) method — Part 1: Measurement of the processing temperature*

**3 Terms and definitions**

For the purposes of this document, the terms and definitions given in EN ISO 472:2013 and EN ISO 1043-1:2011 and the following apply.

ISO and IEC maintain terminology 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****application area code**

code used in the marking of pipes and fittings to indicate the application area(s) for which they are intended, as follows:

U: code for the area more than 1 m from the building to which the buried piping system is connected;

D: code for the area under and within 1 m from the building where the pipes and the fittings are buried in ground and are connected to the soil and waste discharge system of the building

Note 1 to entry: In "D" application areas, the existence of hot water discharge in addition to external forces from the surroundings is usual.

Note 2 to entry: Components intended for use for both code U and code D application areas are marked UD.

Note 3 to entry: Other application area codes B and BD not covered by this standard are defined elsewhere, e.g. in EN 1329-1 [2].

**3.2****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 (mm)

**3.3****nominal size, outside diameter related****DN/OD**

nominal size, related to the outside diameter

**3.4****nominal outside diameter** $d_n$ 

specified outside diameter, in millimetres, assigned to a nominal size DN/OD

**3.5****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

**3.6****mean outside diameter** $d_{em}$ 

value of the measurement of the outer circumference of a pipe or spigot end of a fitting in any cross section, divided by  $\pi$  ( $\approx 3,142$ ), rounded to the next greater 0,1 mm

**3.7****mean inside diameter of a socket** $d_{sm}$ 

arithmetical mean of a number of measurements of the inside diameter of a socket in the same cross-section

**3.8****out-of-roundness****ovality**

difference between the measured maximum and the measured minimum outside diameter in the same cross section of a component

**3.9****wall thickness** $e$ 

value of measurement of the wall thickness at any point around the circumference of a component

**3.10****mean wall thickness** $e_m$ 

arithmetical mean of a number of measurements of the wall thickness, regularly spaced around the circumference and in the same cross section of a component, including the measured minimum and the measured maximum values of the wall thickness in that cross section

**3.11****standard dimension ratio****SDR**

numerical designation of a pipe series, which is a convenient round number, approximately equal to the ratio of the nominal outside diameter  $d_n$  of a pipe to its nominal wall thickness  $e_n$

**EN 1401-1:2019+A1:2023 (E)****3.12****ring stiffness class****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

**3.13****solid wall pipe**

pipe with smooth internal and external surfaces extruded from the same formulation throughout the wall

Note 1 to entry: Pipes having more than one layer are considered as solid wall pipes, provided they are all made from the same formulation.

**3.14****fabricated fittings**

fittings produced from pipe and/or from injection-moulded fittings by thermoforming, adhesive joint or welding

Note 1 to entry: Fabricated fittings need an additional fabrication step.

**3.15****virgin material**

material in a form such as granules or powder that has not been subjected to use or processing other than that required for its manufacture

Note 1 to entry: Virgin material is a material to which no own and/or external reprocessed or recycled material has been added.

Note 2 to entry: It is understood that the addition of additives such as stabilizers and pigments is still resulting into a virgin material.

**3.16****non-virgin material**

all material which is not defined as virgin material

Note 1 to entry: It covers own reprocessed material, external reprocessed materials and recycled materials.

**3.16.1****own reprocessed material**

material prepared from rejected unused pipes, gutters, fittings and ancillaries, including trimmings from the production, that 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

**3.16.2****external reprocessed material**

material prepared from unused thermoplastics products regardless of where those products were manufactured

Note 1 to entry: External reprocessed material is often called post-industrial recyclate.

**3.16.3****recycled material**

material prepared from used thermoplastic products which have been cleaned and crushed or ground

Note 1 to entry: Recycled material is often called post-consumer recycle.

**3.17****agreed specification**

specification of the relevant material characteristics agreed between the supplier of the non-virgin material and the pipes and/or fittings manufacturer

**4 Symbols and abbreviations****4.1 Symbols**

|           |   |
|-----------|---|
| $A$       | length of engagement                          |
| $a_c$     | circumferential side cover of a saddle branch |
| $\alpha$  | nominal angle of a fitting                    |
| $C$       | depth of sealing zone                         |
| $d_e$     | outside diameter                              |
| $d_{em}$  | mean outside diameter                         |
| $d_n$     | nominal outside diameter                      |
| $d_s$     | inside diameter of a socket                   |
| $d_{sm}$  | mean inside diameter of a socket              |
| $e$       | wall thickness                                |
| $e_m$     | mean wall thickness                           |
| $e_{min}$ | minimum wall thickness                        |
| $e_2$     | wall thickness of a socket                    |
| $e_3$     | wall thickness in the groove area             |
| $H$       | length of chamfer                             |
| $L$       | axial cover of a saddle branch                |
| $L_1$     | length of spigot                              |
| $L_2$     | length of adhesive joint socket               |
| $l$       | effective length of a pipe                    |
| $M$       | length of spigot of a plug                    |
| $R$       | radius of swept fittings                      |
| $Z$       | design length of a fitting                    |