
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, fiteinge in sistem

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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**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**

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

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

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EUROPEAN COMMITTEE FOR STANDARDIZATION
COMITÉ EUROPÉEN DE NORMALISATION
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Foreword

This document (prEN 1401-1:2006) has been prepared by Technical Committee CEN/TC 155 "Plastics piping systems and ducting systems", the secretariat of which is held by NEN.

This document is submitted to CEN enquiry.

This document will supersede EN 1401-1:1998.

It has been prepared in liaison with CEN/TC 165 "Waste water engineering".

It is a revision of EN 1401-1:1998 with the following modifications:

- a) inclusion of the solid multilayer pipes that are generally considered in prEN 13476 (Clause 1, definitions 3.1.14 and 3.1.15, in 4.2, and in 5.2);
- b) updating of the normative references (2);
- c) pipe wall thicknesses (6.2.5);
- d) additional mechanical requirements of pipes (7.1.2 – Table 10);
- e) physical characteristics of pipes (8.1 – Table 12 – resistance to dichlorometane);
- f) physical characteristics of fittings (Table 13 – note 1);
- g) performance requirements (Clause 9 – first row);
- h) deletion of Long Term Performance of TPE seals (Clause 2 and Clause 9)

This standard 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: Requirements for pipes, fittings and the system (the present standard)*
- *Part 2: Guidance for the assessment of conformity (under revision)*
- *Part 3: Guidance for installation*

1 Scope

This Part of EN 1401 specifies the requirements for pipes, fittings and the system of unplasticized poly(vinyl chloride) (PVC-U) piping systems in the field of non-pressure underground drainage and sewerage

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

This is reflected in the marking of products by "U" and "UD".

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

This standard 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 1 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.

In conjunction with prCEN/TS 1401-2 [1] and ENV 1401-3 [2] it is applicable to PVC-U pipes and fittings, their joints and to joints with components of other plastics and non-plastics materials intended to be used for buried piping systems for non-pressure underground drainage and sewerage.

This standard is applicable to PVC-U pipes without a socket as well as pipes with an integral socket.

The pipes can be manufactured by monolayer (see 3.1.13) or multilayer process (see 3.1.14)

The fittings can be manufactured by injection-moulding or be fabricated from pipes and/or mouldings.

Requirements and limiting values for application area code "D" are given in Table 4, Table 6, Table 13 and Table 15.

NOTE 2 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 standard, provided they conform to the requirements for joint dimensions given in Clause 6 and to the requirements of Table 15.

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.

EN 580, *Plastics piping systems — Unplasticized poly(vinyl chloride)(PVC-U) pipes — Test method for the resistance to dichloromethane at a specified temperature (DCMT)*

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 — Material requirements for pipe joint seals used in water and drainage applications — Part 2: Thermoplastics elastomers*

EN 727, *Plastics piping and ducting systems - Thermoplastics pipes and fittings — Determination of Vicat softening temperature (VST)*

EN 744, *Plastics piping and ducting systems — Thermoplastics pipes — Test method for resistance to external blows by the round-the-clock 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 1055, *Plastics piping systems — Thermoplastics piping systems for soil and waste discharge inside buildings — Test method for resistance to elevated temperature cycling*

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

EN 1411, *Plastics piping and ducting systems — Thermoplastics pipes — Determination of resistance to external blows by the staircase method*

EN 1905, *Plastics piping systems — Unplasticized poly(vinylchloride) (PVC-U) pipes and fittings and material — Method for assessment of the PVC content based on total chlorine content*

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

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

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

EN ISO 472:2001, *Plastics — Vocabulary*

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

EN ISO 1043-1:2005, *Plastics — Symbols - Part 1: Basic polymers and their special characteristics*

prEN ISO 1167-1, *Thermoplastics pipes, fittings and assemblies for the transport of fluids — Resistance to internal pressure — Part 1: Test method (ISO/FDIS 1167:2005)*

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 1183-1:2004)*

EN ISO 2505, *Thermoplastics pipes — Longitudinal reversion — Test methods and parameters (ISO 2505:2005)*

EN ISO 3126, *Plastics piping systems — Plastics components — Determination of dimensions (ISO 3126:2005)*

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3 Definitions, symbols and abbreviations

3.1 Definitions

For the purpose of this standard, the following definitions and those given in EN ISO 472:2001 and EN ISO 1043-1:2005 apply.

3.1.1

application area code

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

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

D: application area 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 In code D application areas, the existence of hot water discharge in addition to the external forces from the surroundings is usual.

3.1.2

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)

3.1.3

nominal size

DN/OD

nominal size, related to the outside diameter

3.1.4

nominal outside diameter

d_n

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

3.1.5

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

3.1.6

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 π ($\approx 3,142$), rounded to the next greater 0,1 mm

3.1.7

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

3.1.8

out-of-roundness

ovality

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

3.1.9

wall thickness

e

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

3.1.10

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

3.1.11

standard dimension ratio

SDR

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

3.1.12

nominal ring stiffness SN

numerical designation, of the ring stiffness of a pipe or fitting, which is a convenient round number, relative to the determined stiffness in kilonewtons per square metre (kN/m^2), indicating the minimum ring stiffness of a pipe or fitting

3.1.13

solid wall monolayer

pipe or fitting with smooth internal and external surface having the same formulation through the wall

3.1.14

solid wall multilayer

pipe or fitting comprising two or more layers of different formulation which contains a substantial mass of polymer. Each layer contributes to the characteristics of the product.

3.2 Symbols

A : length of engagement

a : circumferential side cover of a saddle branch

B : length of lead-in

C : depth of sealing zone

d_e : outside diameter

d_{em} : mean outside diameter

d_n : nominal outside diameter

d_{sm} : mean inside diameter of a socket

d_3	: internal diameter of the groove
e	: wall thickness
e_m	: mean wall thickness
e_2	: wall thickness of a socket
e_3	: wall thickness in the groove area
f	: groove width
H	: length of chamfer
L	: axial cover of a saddle branch
l	: effective length of a pipe
L_1	: length of spigot
L_2	: length of the solvent cement socket
M	: length of spigot of a plug
R	: radius of swept fittings
Z	: design length of a fitting
α	: nominal angle of a fitting

3.3 Abbreviations

DN	: nominal size
DN/OD	: nominal size, outside diameter related
PVC-U	: Unplasticized poly(vinyl chloride)
SDR	: Standard dimension ratio
SN	: Nominal ring stiffness
TIR	: True impact rate

4 Material

4.1 Raw material

The raw material shall be PVC-U to which are added those additives that are needed to facilitate the manufacture of components conforming to the requirements of this standard.

When calculated on the basis of a known formulation, or in case of dispute or unknown formulation, determined in accordance with EN 1905, the PVC-content shall be at least 80 % by mass for pipes and 85 % by mass for injection-moulded fittings.

4.2 Pipe material

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

The pipe material shall be tested in the form of a pipe.

Table 1 — Material characteristics of pipes

Characteristic	Requirements	Test parameters		Test method
Resistance to internal pressure	No failure during the test period	End caps Test temperature Orientation Number of test pieces Circumferential (hoop) stress Conditioning period Type of test Test period	Type A or B 60 °C Free 3 10 MPa 1 h Water-in-water 1000 h	prEN ISO 1167-1

In case of multilayer pipe, the material of each of the individual layers shall conform to the requirements given in 4.1 and Table 1.

When measured in accordance with EN ISO 1183-1 the density of each layer shall be at least 1400 kg/m³.

4.3 Fitting material

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

The fitting material shall be tested, in the actual formulation, in the form of an extruded or injection-moulded pipe.

Fabricated fittings or parts of fabricated fittings shall be made from pipes conforming to this standard, except for the requirements for the wall thickness, and/or mouldings from PVC-U which conform to material, mechanical and physical characteristics as required in this standard.

Table 2 — Material characteristics of fittings

Characteristic	Requirements	Test parameters		Test method
Resistance to internal pressure	No failure during the test period	End caps Dimensions Free length for injection-moulded pipe Test temperature Orientation Number of test pieces Circumferential (hoop) stress Conditioning period Type of test Test period	Type a or b $50 \text{ mm} \leq d_n \leq 110 \text{ mm}$ $3 \text{ mm} \leq e \leq 5 \text{ mm}$ $\geq 140 \text{ mm}$ 60 °C Free 3 6,3 MPa 1 h Water-in-water 1000 h	prEN ISO 1167-1

4.4 Utilisation of non-virgin materials

Conditions and requirements for the utilisation of non-virgin materials are given in Annex A.

4.5 Sealing ring retaining means

It is permitted that sealing rings are retained using means made from polymers other than PVC-U.

5 General characteristics

5.1 Appearance

When viewed without magnification, the following requirements apply:

- the internal and external surfaces of pipes and fittings shall be smooth, clean and free from grooving, blistering, impurities and pores and any other surface irregularity likely to prevent their conformity to this standard;
- pipe ends shall be cleanly cut and the ends of pipes and fittings shall be square to their axis.

5.2 Colour

The external colour should preferably be orange-brown (approximately RAL 8023 ¹⁾) or dusty grey (approximately RAL 7037 ¹⁾). Other colours may be used.

1) According to RAL 840-HR, *Colour register*.