



BSI Standards Publication

**Plastics piping systems for industrial applications —
Acrylonitrile-butadiene-styrene (ABS), unplasticized
poly(vinyl chloride) (PVC-U) and chlorinated
poly(vinyl chloride) (PVC-C) — Specifications for
components and the system — Metric series**

National foreword

This British Standard is the UK implementation of EN ISO 15493:2003+A11:2025. It is derived from ISO 15493:2003, incorporating corrigendum May 2004 and amendment 1:2016. It supersedes BS EN ISO 15493:2003+A1:2017, which is withdrawn.

The start and finish of text introduced or altered by amendment is indicated in the text by tags. Tags indicating changes to ISO text carry the number of the ISO amendment. For example, text altered by ISO amendment 1 is indicated by A1 A1.

The UK participation in its preparation was entrusted to Technical Committee PRI/88, Plastics piping systems.

A list of organizations represented on this committee can be obtained on request to its committee manager.

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UK Government is responsible for legislation. For information on legislation and policies relating to that legislation, consult the relevant pages of www.gov.uk.

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28 February 2017	Implementation of ISO amendment 1:2016 with CEN endorsement A1:2017
31 October 2022	Implementation of ISO corrigendum May 2004
31 October 2022	Correction to supersession details in national foreword
30 June 2025	Implementation of CEN amendment A11:2025: Annex ZA replaced and Annex ZB deleted

English version

Plastics piping systems for industrial applications - Acrylonitrile-butadiene-styrene (ABS), unplasticized poly(vinyl chloride) (PVC-U) and chlorinated poly(vinyl chloride) (PVC-C) - Specifications for components and the system - Metric series (ISO 15493:2003)

Systèmes de canalisations en matières plastiques pour les applications industrielles - Acrylonitrile-butadiène-styrène (ABS) poly(chlorure de vinyle) non plastifié (PVC-U) et poly(chlorure de vinyle) chloré (PVC-C) - Spécifications pour les composants et le système - Série métrique (ISO 15493:2003)

Kunststoff-Rohrleitungssysteme für industrielle Anwendungen - Acrylnitril-Butadien-Styrol (ABS), weichmacherfreies Polyvinylchlorid (PVC-U) und chloriertes Polyvinylchlorid (PVC-C) - Anforderungen an Rohrleitungsteile und das Rohrleitungssystem - Metrische Reihen (ISO 15493:2003)

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European foreword

This document (EN ISO 15493:2003) has been prepared by Technical Committee ISO/TC 138 “Plastics pipes, fittings and valves for the transport of fluids” in collaboration with 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 2003, and conflicting national standards shall be withdrawn at the latest by October 2003.

This document has been prepared under a mandate given to CEN by the European Commission and the European Free Trade Association, and supports essential requirements of EU Directive(s).

For relationship with EU Directive(s), see informative Annex ZB, which is an integral part of this document.

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Endorsement notice

The text of ISO 15493:2003 has been approved by CEN as EN ISO 15493:2003 without any modifications.

NOTE Normative references to International Standards are listed in annex ZA (normative).

European foreword to amendment A1

This document (EN ISO 15493:2003/A1:2017) has been prepared by Technical Committee ISO/TC 138 “Plastics pipes, fittings and valves for the transport of fluids” in collaboration with Technical Committee CEN/TC 155 “Plastics piping systems and ducting systems” the secretariat of which is held by NEN.

This Amendment to the European Standard EN ISO 15493:2003 shall be given the status of a national standard, either by publication of an identical text or by endorsement, at the latest by July 2017, and conflicting national standards shall be withdrawn at the latest by July 2017.

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Endorsement notice

The text of ISO 15493:2003/Amd 1:2016 + Cor 1:2004 has been approved by CEN as EN ISO 15493:2003/A1:2017 without any modification.

European foreword to amendment A11

This document (EN ISO 15493:2003/A11:2025) has been prepared by Technical Committee CEN/TC 155 “Plastics piping systems and ducting systems”, the secretariat of which is held by NEN.

This Amendment to the European Standard EN ISO 15493:2003 shall be given the status of a national standard, either by publication of an identical text or by endorsement, at the latest by November 2025, and conflicting national standards shall be withdrawn at the latest by November 2025.

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This document has been prepared under a standardization request addressed to CEN by the European Commission. The Standing Committee of the EFTA States subsequently approves these requests for its Member States.

For the relationship with EU Legislation, see informative Annex ZA, which is an integral part of this document.

Any feedback and questions on this document should be directed to the users’ national standards body/national committee. A complete listing of these bodies can be found on the CEN and CENELEC websites.

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Annex ZA (informative)

Relationship between this European Standard and the essential requirements of Directive 2014/68/EU for pressure equipment aimed to be covered

This European Standard has been prepared under a Commission's standardization request M/601 "Mandate to CEN for standardization in the field of Pressure equipment" to provide one voluntary means of conforming to Essential Requirements of the New Approach Pressure Equipment Directive 2014/68/EU.

Once this standard is cited in the Official Journal of the European Union under that Directive, compliance with the normative clauses of this standard given in Table ZA.1 confers, within the limits of the scope of this standard, a presumption of conformity with the corresponding Essential Requirements of that Directive and associated EFTA regulations.

Table ZA.1 — Correspondence between this European Standard and Annex I of the Directive 2014/68/EU

Essential Requirements of Directive 2014/68/EU	Clause(s)/sub-clause(s) of this EN	Remarks/Notes
2.2.4	A.4.1.1, A.4.1.2, A.4.2, A.6 B.4.1.1, B.4.1.2, B.4.2, B.6 C.4.1.1, C.4.1.2, C.4.2, C.4.3, C.6	Experimental design method
3.2.2	8, 12.2.1	Proof testing
7.4	8, 12.2.1	Hydrostatic test pressure
4.1	5.2, 5.5 A.1.1, A.1.2 B.1.1, B.1.2 C.1.1, C.1.2, C.1.3, C.1.4	Materials properties

Table ZA.2 — Normative references from Clause 2 of this document and their corresponding European publications

Column 1 Reference in Clause 2	Column 2 International Standard Edition	Column 3 Title	Column 4 Corresponding European Standard Edition
ISO 7-1	ISO 7-1:1994 ISO 7 1:1994/Cor 1:2007	<i>Pipe threads where pressure-tight joints are made on the threads — Part 1: Dimensions, tolerances and designation</i>	For applicable standard edition see Column 2—
ISO 228-1	ISO 228-1:2000	<i>Pipe threads where pressure-tight joints are not made on the threads — Part 1: Dimensions, tolerances and designation</i>	EN ISO 228-1:2003
ISO 265-1	ISO 265-1:1988	<i>Pipes and fittings of plastics materials — Fittings for domestic and industrial waste pipes - Basic dimensions: Metric series — Part 1: Unplasticized poly(vinyl chloride) (PVC-U)</i>	For applicable standard edition see Column 2—
ISO 580	ISO 580:2005	<i>Plastics piping and ducting systems — Injection-moulded thermoplastics fittings — Methods for visually assessing the effects of heating</i>	EN ISO 580:2005
ISO 727-1	ISO 727-1:2002	<i>Fittings made from unplasticized poly(vinyl chloride) (PVC-U), chlorinated poly(vinyl chloride) (PVC-C) or acrylonitrile/butadiene/styrene (ABS) with plain sockets for pipes under pressure — Part 1: Metric series</i>	For applicable standard edition see Column 2—
ISO 1167-1	ISO 1167-1:2006	<i>Thermoplastics pipes, fittings and assemblies for the conveyance of fluids — Determination of the resistance to internal pressure — Part 1: General method</i>	EN ISO 1167-1:2006
ISO 1167-2	ISO 1167-2:2006	<i>Thermoplastics pipes, fittings and assemblies for the conveyance of fluids — Determination of the resistance to internal</i>	EN ISO 1167-2:2006

		<i>Pressure — Part 2: Preparation of test pieces</i>	
ISO 1183-1	ISO 1183-1:2019	<i>Plastics — Methods for determining the density of non-cellular plastics — Part 1: Immersion method, liquid pycnometer method and titration method</i>	EN ISO 1183-1:2019
ISO 1183-2	ISO 1183-2:2019	<i>Plastics — Methods for determining the density of non-cellular plastics — Part 2: Density gradient column method</i>	EN ISO 1183-2:2019
ISO 1183-3	ISO 1183-3:1999	<i>Plastics — Methods for determining the density of non-cellular plastics — Part 3: Gas pycnometer method</i>	EN ISO 1183-3:1999
ISO 2505-1:1994	ISO 2505-1:1994	<i>Thermoplastics pipes — Longitudinal reversion — Test methods and parameters</i>	EN ISO 2505:2023
ISO 2505-2:1994	ISO 2505-2:1994	<i>Thermoplastics pipes — Longitudinal reversion — Test methods and parameters</i>	EN ISO 2505:2023
ISO 2507-1	ISO 2507-1:1995	<i>Thermoplastics pipes and fittings — Vicat softening temperature — Part 1: General test method</i>	EN ISO 2507-1:2017
ISO 2507-2	ISO 2507-2:1995	<i>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</i>	EN ISO 2507-2:2017
ISO 3127	ISO 3127:1994	<i>Thermoplastics pipes — Determination of resistance to external blows — Round-the-clock method</i>	EN ISO 3127:2017
ISO 3514	ISO 3514:1976	<i>Chlorinated polyvinyl chloride (CPVC) pipes and fittings — Specification and determination of density</i>	For applicable standard edition see Column 2—

ISO 4065	ISO 4065:2018	<i>Thermoplastics pipes — Universal wall thickness table</i>	For applicable standard edition see Column 2—
ISO 9852	ISO 9852:2007	<i>Unplasticized poly(vinyl chloride) (PVC-U) pipes — Dichloromethane resistance at specified temperature (DCMT) — Test method</i>	EN ISO 9852:2017
ISO 9853	ISO 9853:1991	<i>Injection-moulded unplasticized poly(vinyl chloride) (PVC-U) fittings for pressure pipe systems — Crushing test</i>	—
ISO 11922-1	ISO 11922-1:2018	<i>Thermoplastics pipes for the conveyance of fluids — Dimensions and tolerances — Part 1: Metric series</i>	—
ISO 1167:1996	ISO 1167:1996	<i>Thermoplastics pipes for the conveyance of fluids — Resistance to internal pressure — Test method</i>	EN ISO 1167-1:2006
	ISO 1167:1996	<i>Thermoplastics pipes for the conveyance of fluids — Resistance to internal pressure — Test method</i>	EN ISO 1167-2:2006
ISO 15853	ISO 15853:1999	<i>Thermoplastics materials — Preparation of tubular test pieces for the determination of the hydrostatic strength of materials used for injection moulding</i>	—

The documents listed in the Column 1 of Table ZA.2, in whole or in part, are normatively referenced in this document, i.e. are indispensable for its application. The achievement of the presumption of conformity is subject to the application of the edition of Standards as listed in Column 4 or, if no European Standard Edition exists, the International Standard Edition given in Column 2 of Table ZA.2.

WARNING 1 — Presumption of conformity stays valid only as long as a reference to this European Standard is maintained in the list published in the Official Journal of the European Union. Users of this standard should consult frequently the latest list published in the Official Journal of the European Union.

WARNING 2 — Other European Union legislation may be applicable to the product(s) falling within the scope of this standard.

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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 3.

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 International Standard may be the subject of patent rights. ISO shall not be held responsible for identifying any or all such patent rights.

ISO 15493 was prepared by Technical Committee ISO/TC 138, *Plastics pipes, fittings and valves for the transport of fluids*, Subcommittee SC 3, *Plastics pipes and fittings for industrial applications*.

This document has been prepared under a mandate given by the European Commission and the European Free Trade Association and supports essential requirements of EU Directives.

At the date of publication of this International Standard, the following standards had been published for piping systems, used for industrial applications, made from other types of plastic:

ISO 10931 (all parts), *Plastics piping systems for industrial applications — Poly(vinylidene fluoride) (PVDF)*

ISO 15494, *Plastics piping systems for industrial applications — Polybutene (PB), polyethylene (PE) and polypropylene (PP) — Specifications for components and the system — Metric series*.

Annexes A, B and C form a normative part of this International Standard.

Introduction

This International Standard specifies the characteristics and requirements for a piping system and its components made from acrylonitrile-butadiene-styrene (ABS), unplasticized poly(vinyl chloride) (PVC-U) or chlorinated poly(vinyl chloride) (PVC-C), as applicable, intended to be used for industrial applications above ground by authorities, design engineers, certification bodies, inspection bodies, test laboratories, manufacturers and users.

Plastics piping systems for industrial applications — Acrylonitrile-butadiene-styrene (ABS), unplasticized poly(vinyl chloride) (PVC-U) and chlorinated poly(vinyl chloride) (PVC-C) — Specifications for components and the system — Metric series

1 Scope

This International Standard specifies the characteristics and requirements for components such as pipes, fittings and valves made from one of the following materials:

- acrylonitrile-butadiene-styrene (ABS);
- unplasticized poly(vinyl chloride) (PVC-U);
- chlorinated poly(vinyl chloride) (PVC-C);

intended to be used for thermoplastics piping systems in above-ground industrial applications.

This International Standard is applicable to ABS, PVC-U or PVC-C pipes, fittings, valves and ancillary equipment, to their joints and to joints with components made of other plastics and non-plastics materials, depending on their suitability, intended to be used for the conveyance of liquid and gaseous fluids as well as of solid matter in fluids for industrial applications such as:

- chemical plants;
- industrial sewerage engineering;
- power engineering (cooling and general-purpose water supply);
- electroplating and pickling plants;
- the semiconductor industry;
- agricultural production plants;
- water treatment.

NOTE 1 Where relevant, national regulations for specific applications (e.g. water treatment) apply.

Other application areas are permitted if the requirements of this International Standard and/or applicable national requirements are fulfilled.

Relevant regulations in respect of fire behaviour and explosion risk are applicable if applications are envisaged for inflammable media.

The components have to withstand the mechanical, thermal and chemical demands to be expected and have to be resistant to the fluids to be conveyed.

Characteristics and requirements which are applicable to all three materials (ABS, PVC-U and PVC-C) are covered by the relevant clauses of this International Standard. Those characteristics and requirements which are dependent on the material are given for each material in the relevant annex (see Table 1).

Table 1 — Material-specific annexes

Material	Annex
Acrylonitrile-butadiene-styrene (ABS)	A
Unplasticized poly(vinyl chloride) (PVC-U)	B
Chlorinated poly(vinyl chloride) (PVC-C)	C

NOTE 2 Components conforming to any of the product standards listed in the bibliography or to national standards, as applicable, may be used with components conforming to this International Standard provided they conform to the requirements for joint dimensions and to the other relevant requirements of this standard.

2 Normative references

The following normative documents contain provisions which, through reference in this text, constitute provisions of this International Standard. For dated references, subsequent amendments to, or revisions of, any of these publications do not apply. However, parties to agreements based on this International Standard are encouraged to investigate the possibility of applying the most recent editions of the normative documents indicated below. For undated references, the latest edition of the normative document referred to applies. Members of ISO and IEC maintain registers of currently valid International Standards.

ISO 7-1, *Pipe threads where pressure-tight joints are made on the threads — Part 1: Dimensions, tolerances and designation*

ISO 228-1, *Pipe threads where pressure-tight joints are not made on the threads — Part 1: Dimensions, tolerances and designation*

ISO 265-1, *Pipes and fittings of plastics materials — Fittings for domestic and industrial waste pipes — Basic dimensions: Metric series — Part 1: Unplasticized poly(vinyl chloride) (PVC-U)*

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

ISO 472, *Plastics — Vocabulary*

ISO 580:—¹⁾, *Injection-moulded unplasticized poly(vinyl chloride) (PVC-U) fittings — Oven test — Test method and basic specifications*

ISO 727-1, *Fittings made from unplasticized poly(vinyl chloride) (PVC-U), chlorinated poly(vinyl chloride) (PVC-C) or acrylonitrile/butadiene/styrene (ABS) with plain sockets for pipes under pressure — Part 1: Metric series*

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

ISO 1158, *Plastics — Vinyl chloride homopolymers and copolymers — Determination of chlorine content*

^{A1} ISO 1167-1, *Thermoplastics pipes, fittings and assemblies for the conveyance of fluids — Determination of the resistance to internal pressure — Part 1: General method* ^{A1}

1) To be published. (Revision of ISO 580:1990)

- ISO 1183-2, *Plastics — Methods for determining the density of non-cellular plastics — Part 2: Density gradient column method*
- ISO 2505-1:1994, *Thermoplastics pipes — Longitudinal reversion — Part 1: Determination methods*
- ISO 2505-2:1994, *Thermoplastics pipes — Longitudinal reversion — Part 2: Determination 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 piping components — Measurement and determination of dimensions*
- ISO 3127, *Thermoplastics pipes — Determination of resistance to external blows — Round-the-clock method*
- ISO 3514, *Chlorinated polyvinyl chloride (CPVC) pipes and fittings — Specification and determination of density*
- ISO 4065, *Thermoplastics pipes — Universal wall thickness table*
- ISO 9080, *Plastics piping and ducting systems — Determination of the long-term hydrostatic strength of thermoplastics materials in pipe form by extrapolation*
- ISO 9311-1, *Adhesives for thermoplastics piping systems — Part 1: Determination of film properties*
- ISO 9852, *Unplasticized poly(vinyl chloride) (PVC-U) pipes — Dichloromethane resistance at specified temperature (DCMT) — Test method*
- ISO 9853, *Injection-moulded unplasticized poly(vinyl chloride) (PVC-U) fittings for pressure pipe systems — Crushing test*
- ISO/TR 10358, *Plastics pipes and fittings — Combined chemical-resistance classification table*
- ISO 11922-1:1997, *Thermoplastics pipes for the conveyance of fluids — Dimensions and tolerances — Part 1: Metric series*
-  Text deleted 
- ISO 12162, *Thermoplastics materials for pipes and fittings for pressure applications — Classification and designation — Overall service (design) coefficient*
- ISO 15853, *Thermoplastics materials — Preparation of tubular test pieces for the determination of the hydrostatic strength of materials used for injection moulding*
- ISO 16135:—²⁾, *Industrial valves — Ball valves of thermoplastics materials*
- ISO 16136:—²⁾, *Industrial valves — Butterfly valves of thermoplastics materials*
- ISO 16137:—²⁾, *Industrial valves — Check valves of thermoplastics materials*
- ISO 16138:—²⁾, *Industrial valves — Diaphragm valves of thermoplastics materials*
- ISO 16139:—²⁾, *Industrial valves — Gate valves of thermoplastics materials*
- ISO 21787:—²⁾, *Industrial valves — Globe valves of thermoplastics materials*

2) To be published.

3 Terms and definitions

For the purposes of this International Standard, the terms and definitions given in ISO 472 and ISO 1043-1 and the following apply.

3.1 Geometrical definitions

NOTE The symbols d_e and e correspond to d_{ey} and e_y given in other International Standards such as ISO 11922-1.

3.1.1 nominal outside diameter

d_n
specified outside diameter of a component, which is identical to the minimum mean outside diameter, $d_{em,min}$, in millimetres

NOTE The nominal inside diameter of a socket is equal to the nominal outside diameter of the corresponding pipe.

3.1.2 outside diameter at any point

d_e
outside diameter measured through the cross-section at any point on a pipe, or the spigot end of a fitting, rounded up to the nearest 0,1 mm

3.1.3 mean outside diameter

d_{em}
measured length of the outer circumference of a pipe, or the spigot end of a fitting, divided by π ($\approx 3,142$), rounded up to the nearest 0,1 mm

3.1.4 mean inside diameter of a socket

d_{im}
arithmetic mean of two measured inside diameters perpendicular to each other

3.1.5 nominal size of flange DN

numerical designation for the size of a flange for reference purposes, related to the manufactured dimension in millimetres

3.1.6 out-of-roundness

difference between the measured maximum outside diameter and the measured minimum outside diameter in the same cross-sectional plane of a pipe, or the spigot end of a fitting, or the difference between the measured maximum inside diameter and the measured minimum inside diameter in the same cross-sectional plane of a socket

3.1.7 nominal wall thickness

e_n
wall thickness, in millimetres, corresponding to the minimum wall thickness, e_{min}

3.1.8 wall thickness at any point

e
measured wall thickness at any point around the circumference of a component, rounded up to the nearest 0,1 mm

3.1.9**pipe series****S**

dimensionless number related to the nominal outside diameter, d_n , and the nominal wall thickness, e_n

NOTE 1 The pipe series S is related to the pipe geometry as shown in equation (1):

$$S = \frac{d_n - e_n}{2e_n} \quad (1)$$

NOTE 2 Flanges are designated on the basis of PN.

3.1.10**standard dimension ratio****SDR**

ratio of the nominal outside diameter, d_n , of a pipe to its nominal wall thickness, e_n

NOTE In accordance with ISO 4065, the standard dimension ratio SDR and the pipe series S are related as shown in equation (2):

$$SDR = 2S + 1 \quad (2)$$

3.2 Definitions of materials**3.2.1****virgin material**

material in a form such as granules or powder that has not been previously processed other than for compounding and to which no reprocessable or recyclable materials have been added

3.2.2**reprocessable material**

material prepared from clean unused rejected pipes, fittings or valves, produced in a manufacturer's plant by a process such as moulding or extrusion, which will be reprocessed in the same plant and for which the complete formulation or material specification is known

NOTE 1 Such material may include trimmings from the production of such pipes, fittings and valves.

NOTE 2 In the case of valves, only those thermoplastics parts which are made from material conforming to this International Standard may be considered as reprocessable material.

3.3 Definitions related to material characteristics**3.3.1****lower confidence limit** σ_{LCL}

quantity with the dimensions of stress, expressed in megapascals, which can be considered as a property of the material and represents the 97,5 % lower confidence limit of the predicted long-term hydrostatic strength at a given temperature, T , and time, t , determined by pressurizing internally with water

3.3.2**minimum required strength****MRS**

value of σ_{LCL} at 20 °C and 50 years, rounded down to the next lower value in the R 10 series when σ_{LCL} is less than 10 MPa, or to the next lower value in the R 20 series when σ_{LCL} is greater than or equal to 10 MPa

NOTE The R 10 and R 20 series are the Renard number series as defined in ISO 3 and ISO 497.

3.3.3 design stress

σ_s
allowable stress, in megapascals, for a given application or set of service conditions

NOTE It is derived by dividing the MRS by the coefficient C , as in equation (3), then rounding to the next lower value in the R 10 or R 20 series, as applicable:

$$\sigma_s = \frac{\text{MRS}}{C} \quad (3)$$

3.3.4 overall service (design) coefficient

C
overall coefficient, with a value greater than one, which takes into consideration service conditions as well as the properties of the components of a piping system other than those represented in the lower confidence limit, σ_{LCL}

3.4 Definitions related to service conditions

3.4.1 nominal pressure PN

numerical designation used for reference purposes and related to the mechanical characteristics of the components of a piping system

NOTE 1 A pressure, in bars, numerically equal to PN is identical to the maximum allowable pressure, PS, as defined by EU Directive 97/23/ECC (PED), if both pressures are taken at 20 °C.

NOTE 2 For plastics piping systems conveying water, PN corresponds to the maximum continuous operating pressure in bars which can be sustained for water at 20 °C for 50 years, based on the minimum overall service (design) coefficient and calculated using the following equation:

$$\text{PN} = \frac{10\sigma_s}{S} = \frac{20\sigma_s}{\text{SDR} - 1} \quad (4)$$

where

σ_s is expressed in N/mm²;

PN is expressed in bars ³⁾.

3.4.2 hydrostatic stress

σ
stress induced in the wall of a pipe when an internal hydrostatic pressure is applied

NOTE 1 The hydrostatic stress, in megapascals, is related to the applied internal hydrostatic pressure, p , the wall thickness, e , at any point and the mean outside diameter, d_{em} , of a pipe and calculated using the following equation:

$$\sigma = p \times \frac{d_{\text{em}} - e}{2e} \quad (5)$$

NOTE 2 Equation (5) is applicable to pipes only.

3) A1 1 bar = 0,1 MPa = 10⁵ Pa; 1 MPa = 1 N/mm². A1

3.4.3**long-term hydrostatic stress**

constant hydrostatic stress that is maintained in a component for a sustained period of time

4 Symbols and abbreviated terms**4.1 Symbols**

C	overall service (design) coefficient (design factor)
d_e	outside diameter (at any point)
d_{em}	mean outside diameter
d_{im}	mean inside diameter of socket
d_n	nominal outside diameter
DN	nominal size of flange
e	wall thickness (at any point)
e_n	nominal wall thickness
l_0	free length
p	internal hydrostatic pressure
t	time
T	temperature
ρ	density of material
σ	hydrostatic stress
σ_{LCL}	lower confidence limit
σ_s	design stress

4.2 Abbreviations

ABS	acrylonitrile-butadiene-styrene
MRS	minimum required strength
PVC-C	chlorinated poly(vinyl chloride)
PVC-U	unplasticized poly(vinyl chloride)
PN	nominal pressure
PS	maximum allowable pressure
PT	test pressure (corresponds to the symbol p usually used)
S	pipe series
SDR	standard dimension ratio
TIR	true impact rate

5 Material

5.1 General

 The material from which the components are made shall be ABS, PVC-U or PVC-C, as applicable, to which are added those additives that are needed to facilitate the manufacture of pipes, fittings, valves, appurtenances and assemblies conforming to this document. 

If additives are used, they shall be uniformly dispersed.

Additives shall not be used, separately or together, in quantities sufficient to impair the fabrication or solvent-cementing characteristics of the components or to impair the chemical, physical or mechanical characteristics as specified in this International Standard.

5.2 Hydrostatic strength properties

The material shall be evaluated in accordance with ISO 9080 where a pressure test is carried out in accordance with ISO 1167 to find the MRS-value in accordance with ISO 12162. The test shall be carried out using test pieces of pipe series S ≤ 12,5.

Conformity of the relevant material to the reference curves given for ABS (see Annex A), PVC-U (see Annex B) and PVC-C (see Annex C) shall be demonstrated in accordance with the applicable annex to this International Standard. At least 97,5 % of the data points shall be on or above the reference curves.

The material shall be as classified by the raw-material producer.

 NOTE In some cases, the component manufacturer may be regarded as the raw material producer. 

Where fittings and valves are manufactured from the same material as pipes, the material classification shall be the same as for pipes.

For the classification of a material intended only for the manufacture of fittings and valves, an injection-moulded or extruded test piece in the form of a pipe shall be used (see Figure 1) and the test pressure applied in accordance with ISO 1167. The free length l_0 shall be $3d_n$, as defined in ISO 15853.

5.3 Other characteristics of material

Details of requirements on other characteristics of ABS, PVC-U and PVC-C material are given in the applicable annex to this International Standard.

5.4 Reprocessable and recyclable material

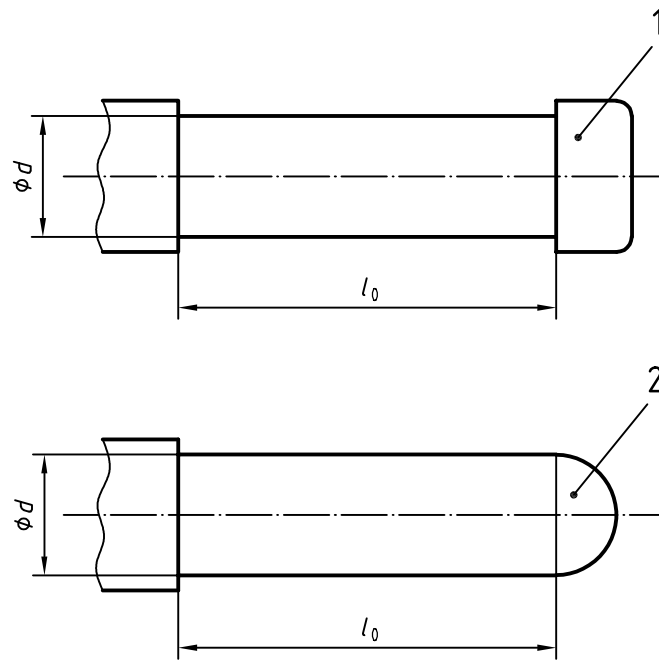
The use of reprocessible material obtained during the production and testing of components in accordance with this International Standard is permitted in addition to virgin material, provided that the requirements of this International Standard are fulfilled.

Reprocessible material obtained from external sources and recyclable material shall not be used.

5.5 Parts not made from ABS, PVC-U or PVC-C

5.5.1 General

All components shall conform to the relevant International Standards. Alternative standards may be used in cases where suitable International Standards do not exist. In all cases, the fitness for purpose of the components shall be demonstrated.

**Key**

- 1 End cap
- 2 Injection-moulded end

Figure 1 — Free length, l_0 , of test piece

Materials and constituent elements used in making a particular component (including rubber, greases and any metal parts that may be used) shall have resistance to the external and internal environments which is comparable to that of all other elements of the piping system.

Materials other than ABS, PVC-U or PVC-C in contact with components conforming to this International Standard shall not adversely effect the performance of the components or initiate stress cracking.

5.5.2 Metallic materials

All metal parts susceptible to corrosion shall be adequately protected.

When dissimilar metallic materials are used which can be in contact with moisture, steps shall be taken to avoid galvanic corrosion.

5.5.3 Sealing materials

Sealing materials shall have no detrimental effects on the properties of the components, joints and assemblies.

5.5.4 Other materials

Greases or lubricants shall not exude onto solvent cement areas and shall not affect the long-term performance of materials conforming to this International Standard.