PD CEN/TS 1452-7:2014

BSI Standards Publication

Plastics piping systems for water supply and for buried and above-ground drainage and sewerage under pressure — Unplasticized poly(vinyl chloride) (PVC-U)

Part 7: Guidance for the assessment of conformity

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National foreword

This Published Document is the UK implementation of CEN/TS 1452-7:2014. It supersedes DD ENV 1452-7:2001 and DD CEN/TS 1456-2:2003 which are withdrawn

The UK participation in its preparation was entrusted to Technical Committee PRI/88/2, Plastics piping for pressure applications.

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

This publication does not purport to include all the necessary provisions of a contract. Users are responsible for its correct application.

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Compliance with a British Standard cannot confer immunity from legal obligations.

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Plastics piping systems for water supply and for buried and above-ground drainage and sewerage under pressure - Unplasticized poly(vinyl chloride) (PVC-U) - Part 7: Guidance for the assessment of conformity

Systèmes de canalisations en plastique pour l'alimentation en eau, pour branchements et collecteurs d'assainissement enterrés et aériens avec pression - Poly(chlorure de vinyle) non plastifié (PVC-U) - Partie 7: Guide pour l'évaluation de la conformité

Kunststoff-Rohrleitungssysteme für die Wasserversorgung und für erdverlegte und nicht erdverlegte Entwässerungs- und Abwasserdruckleitungen - Weichmacherfreies Polyvinylchlorid (PVC-U) - Teil 7: Empfehlungen für die Beurteilung der Konformität

This Technical Specification (CEN/TS) was approved by CEN on 9 December 2013 for provisional application.

The period of validity of this CEN/TS is limited initially to three years. After two years the members of CEN will be requested to submit their comments, particularly on the question whether the CEN/TS can be converted into a European Standard.

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EUROPEAN COMMITTEE FOR STANDARDIZATION
COMITÉ EUROPÉEN DE NORMALISATION
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Foreword

This document (CEN/TS 1452-7:2014) has been prepared by Technical Committee CEN/TC 155 “Plastics piping systems and ducting systems”, the secretariat of which is held by NEN.

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

This document supersedes ENV 1452-7:2000, CEN/TS 1456-2:2003, which have been technically revised.

EN ISO 1452, *Plastics piping systems for water supply and for buried and above-ground drainage and sewerage under pressure — Unplasticized poly(vinyl chloride) (PVC-U)*, consists of the following parts:

— *Part 1: General*

— *Part 2: Pipes*

— *Part 3: Fittings*

— *Part 4: Valves*

— *Part 5: Fitness for purpose of the system*

This part of EN ISO 1452 gives guidance for the assessment of conformity of compounds/formulations, products, joints and assemblies in accordance with the applicable parts of EN ISO 1452 intended to be included in the manufacturer’s quality plan as part of the quality management system and for the establishment of certification procedures:

Part 7: Guidance for the assessment of conformity.

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

Introduction

Figures 1 and 2 are intended to provide general information on the concept of testing and organization of those tests used for the purpose of the assessment of conformity. For each type of tests (i.e. type testing (TT), batch release test (BRT), process verification test (PVT) and audit test (AT), this part of EN ISO 1452 details the applicable characteristics to be assessed as well as the frequency and sampling of testing.

A typical scheme for the assessment of conformity of compounds/formulations, pipes, fittings, valves, joints or assemblies by manufacturers is given in Figure 1.

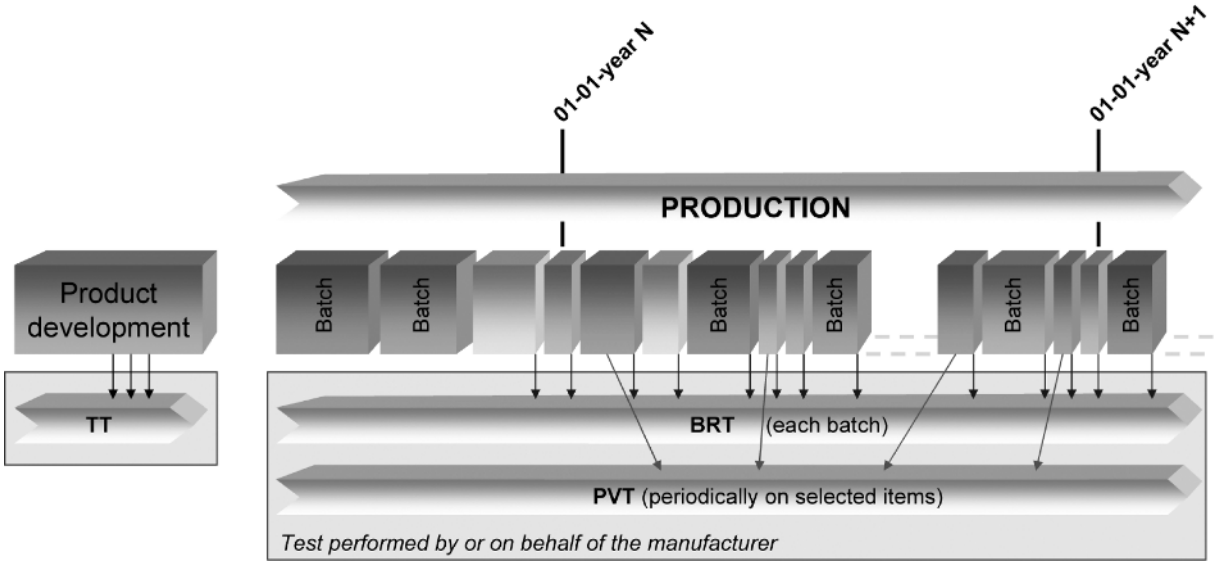

Figure 1 — Typical scheme for the assessment of conformity by a manufacturer

A typical scheme for the assessment of conformity of compounds/formulations, pipes, fittings, valves, joints or assemblies by manufacturers, including a certification, is given in Figure 2.

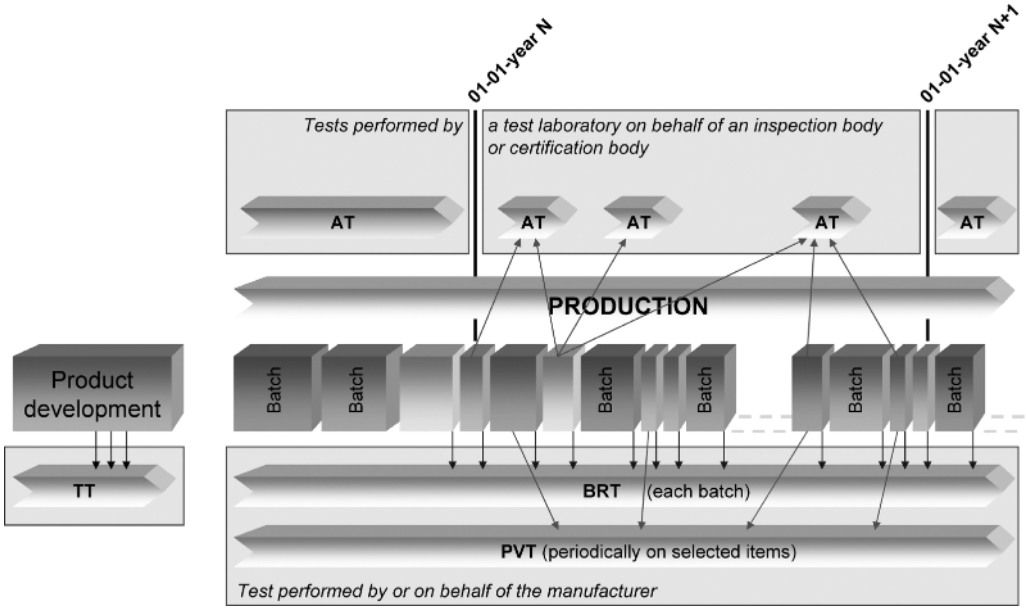

Figure 2 — Typical scheme for the assessment of conformity by a manufacturer, including a certification

1 Scope

This part of EN ISO 1452 gives guidance for the assessment of conformity of compounds/formulations, products, joints and assemblies in accordance with the applicable parts of EN ISO 1452 intended to be included in the manufacturer's quality plan as part of the quality management system and for the establishment of certification procedures.

NOTE 1 It is recommended that the quality management system conforms to or is no less stringent than the relevant requirements to EN ISO 9001 [1].

NOTE 2 If certification is involved, the certification body and inspection body is preferably compliant with EN ISO/IEC 17065 [5] or EN ISO/IEC 17021 [3], as applicable.

In conjunction with Parts 1 to 5 of EN ISO 1452 (see Foreword) this document is applicable to unplasticized poly(vinyl chloride) (PVC-U) plastics piping systems for water supply and for buried and above-ground drainage and sewerage under pressure.

2 Normative references

The following documents, in whole or in part, are normatively referenced in this document and are indispensable for its application. For dated references, only the edition cited applies. For undated references, the latest edition of the referenced document (including any amendments) applies.

EN ISO 1452-1:2009, *Plastics piping systems for water supply and for buried and above-ground drainage and sewerage under pressure - Unplasticized poly(vinyl chloride) (PVC-U) - Part 1: General (ISO 1452-1:2009)*

EN ISO 1452-2:2009, *Plastics piping systems for water supply and for buried and above-ground drainage and sewerage under pressure - Unplasticized poly(vinyl chloride) (PVC-U) - Part 2: Pipes (ISO 1452-2:2009)*

EN ISO 1452-3:2010, *Plastics piping systems for water supply and for buried and above-ground drainage and sewerage under pressure - Unplasticized poly(vinyl chloride) (PVC-U) - Part 3: Fittings (ISO 1452-3:2009, corrected version 2010-03-01)*

EN ISO 1452-4:2009, *Plastics piping systems for water supply and for buried and above-ground drainage and sewerage under pressure - Unplasticized poly(vinyl chloride) (PVC-U) - Part 4: Valves (ISO 1452-4:2009)*

EN ISO 1452-5:2010, *Plastics piping systems for water supply and for buried and above-ground drainage and sewerage under pressure - Unplasticized poly(vinyl chloride) (PVC-U) - Part 5: Fitness for purpose of the system (ISO 1452-5:2009, corrected version 2010-03-01)*

3 Terms and definitions

For the purposes of this document, the following terms and definitions given in EN ISO 1452-1:2009, EN ISO 1452-2:2009, EN ISO 1452-3:2010, EN ISO 1452-4:2009 and the following apply.

3.1
certification body
impartial body, governmental or non-governmental, possessing the necessary competence and responsibility to carry out certification of conformity according to given rules of procedure and management

Note 1 to entry: A certification body is preferably compliant with EN ISO/IEC 17065 [5].

3.2
inspection body
body that performs inspection

Note 1 to entry: A body can be an organization or part of an organization.

Note 2 to entry: An inspection body is preferably compliant with EN ISO/IEC 17020 [2].

3.3
testing laboratory
laboratory which measures, tests, calibrates or otherwise determines the characteristics of the performance of materials and products

Note 1 to entry: In the context of this part of EN ISO 1452, the materials and products can be subject to type testing, batch release testing, process verification testing, audit testing and witness testing, as applicable.

Note 2 to entry: A testing laboratory is preferably compliant with EN ISO/IEC 17025 [4].

3.4
quality management system
management system to direct and control an organization with regard to quality

Note 1 to entry: Requirements for quality management systems are given in EN ISO 9001 [1].

3.5
quality plan
document setting out the specific quality practices, resources and sequence of activities relevant to a particular product or range of products

3.6
type test
TT
test performed to prove that the material, product, joint or assembly is capable of conforming to the requirements given in the relevant standard

Note 1 to entry: The type test results remain valid until there is a change in the material or product or assembly, provided that the process verification tests are done regularly.

3.7
batch release test
BRT
test performed by or on behalf of the manufacturer on a batch of formulation/compound or products, which has to be satisfactorily completed before the batch can be released

3.8
process verification test
PVT
test performed by or on behalf of the manufacturer on formulation/compound or products or joints or assemblies at specific intervals to confirm that type test originally performed on these formulation/compound or products or joints or assemblies continue to be valid and that the process continues to be capable of producing products which conform to the requirements given in the relevant standard

Note 1 to entry: Such tests are not required to release batches of formulation/compound or products and are carried out as a measure of process control.

3.9
audit test
AT
test performed by a test laboratory on behalf of an inspection body or certification body to confirm that the formulation/compound, product, joint or assembly continues to conform to the requirements given in the relevant standard and to provide information to assess the effectiveness of the quality management system

3.10
indirect test
IT
test performed by or on behalf of the manufacturer, different from that specified test for that particular characteristic, having previously verified its correlation with the specified test

3.11
witness test
WT
test accepted by an inspection or a certification body for type testing and/or audit testing, which is carried out by or on behalf of the manufacturer and supervised by a representative of the inspection or certification body, qualified in testing

3.12
material
generic term for compositions (compounds/formulations) grouped by families, expressed by generic names, e.g. polypropylene, stainless steel, brass or EPDM

Note 1 to entry: Definition from European Commission, Directorate-General for Enterprise and Industry, Sub-group on Product Testing Procedures (EC, DG ENT and IND, SG PTP).

3.13
compound/formulation
clearly defined homogenous mixture of base polymer with additives, e.g. anti-oxidants, pigments, stabilizers and others, at a dosage level necessary for the processing and the intended use of the final product

Note 1 to entry: In water and food contact regulations, the term “composition” is often used instead of compound or formulation.

3.14
material batch
clearly identified quantity of a given homogeneous compound/formulation manufactured under uniform conditions and defined and identified by the compound/formulation manufacturer

3.15
product
pipe, fitting, or valve of a clearly identified type intended to be a part of a piping system which the manufacturer puts on the market

3.16
product batch
clearly identified collection of products, manufactured consecutively or continuously under the same conditions, using the same compound/formulation conforming to the same specification

Note 1 to entry: The production batch is defined and identified by the product manufacturer.

3.17
lot
clearly identifiable sub-division of a batch for inspection purposes

3.18
sample
one or more products drawn from the same production batch or lot, selected at random without regard to their quality

Note 1 to entry: The number of products in the sample is the sample size.

3.19
group
collection of similar products from which samples are selected for testing purposes

3.20
component
part of a product manufactured out of a specific composition (compound/formulation), brought to the market as part of another product or as a spare part

Note 1 to entry: For drinking water application, components may be considered as products and be individually approved (e.g. o-ring, gasket) or they are tested as integral part of a finished product (e.g. in a valve).

3.21
joint
connection between two products

3.22
assembled product
assembled final product using two or more single parts

3.23
assembly
unit of two or more products assembled for testing purposes

3.24
sampling plan
specification of the type of sampling to be used combined with the operational specification of the entities or increments to be taken, the samples to be constituted and the measurements to be made

EXAMPLE A specific plan which indicates the number of units of products or assemblies to be inspected.

3.25
product type
generic description of a product

EXAMPLE A pipe or fitting or valve or their main parts, of the same design, from a particular compound/formulation.

3.26
body type
generic description of a body

EXAMPLE A valve body of a particular design, which can have different end connections.

3.27
cavity
(moulding) space within a mould to be filled to form the moulded product

EXAMPLE That part of an injection mould which gives the form to the injection-moulded product.

4 Abbreviated terms

To avoid misunderstanding, the abbreviations in this clause are defined as being the same in each language. For the same reason, the terms are given in the three languages, English, French and German.

AT en : audit test
fr : essai d'audit
de : Überwachungsprüfung

BRT en : batch release test
fr : essai de libération de campagne de fabrication
de : Freigabeprüfung einer Charge

IT en : indirect test
fr : essai indirect
de : indirekte Prüfung

PVT en : process verification test
fr : essai de vérification du procédé de fabrication
de : Prozessüberprüfung

TT en : type test
fr : essai de type
de : Typprüfung

WT en : witness test
fr : essai témoin
de : Prüfung unter Aufsicht

5 General

5.1 Materials, products, joints and assemblies shall conform to the requirements given in EN ISO 1452-1, EN ISO 1452-2, EN ISO 1452-3, EN ISO 1452-4 or EN ISO 1452-5.

5.2 Products and assemblies shall be produced by the manufacturer under a quality management system which includes a quality plan.

5.3 For products intended to be used for the supply of water for human consumption, attention is drawn to the requirements of National regulations.

6 Testing and inspection

6.1 Grouping

6.1.1 General

For the purposes of this Technical Specification, the groups specified in 6.1.2 and 6.1.3 apply.

6.1.2 Size groups

Four size groups are defined for pipes and fittings, as given in Table 1.

Table 1 — Size groups

Size group	Nominal diameter, d_n mm
1	$d_n < 75$
2	$75 \leq d_n < 250$
3	$250 \leq d_n < 710$
4	$710 \leq d_n \leq 1\,000$

6.1.3 Fitting/valve groups

Four groups of fittings are defined, as given in Table 2.

For testing purposes, one individual fitting shall be selected from each group.

Table 2 — Fitting/valve groups

Fitting group	Type of fitting
1	Bends
2	Elbows, tees
3	Other fittings (reducers, double sockets, end caps, adapters, etc.)
4	Valves

6.2 Type tests (TTs)

Relevant type tests shall be carried out whenever there is a change in design, in compound/formulation and/or in the production method, other than routine in-process adjustments, and/or whenever there is an extension of the product range or change of production site.

NOTE Testing to be performed in case of change of production site depends on the complexity of the changes and therefore should be defined by the manufacturer case by case.

Type tests shall demonstrate that products conform to all requirements for the characteristics given in Table 5 to Table 7, as applicable.

The dosage level of ingredients of a compound/formulation shall not exceed the tolerance bands given in Table 3. If any level exceeds the dosage band or if a type is changed, this variation constitutes a change in compound/formulation.

The values of the parts *X* added to 100 parts by mass of PVC shall be specified by the manufacturer in his quality plan.

Table 3 — Compound/formulation specification

Ingredients	Characteristic/Type	Band
PVC resin 100 parts	K-value	X1: ± 2
Stabilizers based on	1) Ca-Zn or 2) Sn or 3) Others (OBS, Pb, etc.)	X2: ± 25 %
Total quantity of other additives	$CaCO_3$, pigments, lubricants, etc.	$\sum_{3}^{n} x_i : \pm 50\%$

If any level exceeds the dosage band or if a type of ingredient is changed, this variation constitutes a change in compound/formulation and the relevant characteristics given in Table 5 to Table 7, column M, as applicable, shall be retested. A change in the supplier of an ingredient or within a type of stabilizer does not necessarily constitute a change in formulation. A change in the chemical nature of the stabilizer, e.g. from Pb to Sn, shall constitute a change in compound/formulation (see EN ISO 1452-1:2009, 4.4.2 or 4.4.3 as applicable).

For the purpose of defining a change in design, the following aspects are relevant:

a) functional dimensions;

b) geometry of the functional parts of the product;

c) joint affected parts.

If one or more of these characteristics exceed the defined specifications, the relevant characteristics given in Table 4 to Table 7, column D, as applicable, shall be retested. If third party certification is involved, retesting shall be agreed between the certification body and the manufacturer.

For the extension of the production range, the relevant characteristics given in Table 5 to Table 7, column E, as applicable, shall be retested. If third party certification is involved, retesting shall be agreed between the certification body and the manufacturer.

Table 4 is applicable if the compound/formulation is produced by the raw material manufacturer and not by the pipe, fitting or valve manufacturer.

Table 4 — Characteristics of compound/formulation that require type testing (TT)

Characteristic	Reference to part, clause or subclause of EN ISO 1452	Conditions requiring test [a]		Sampling procedure	
		N	M	Manufacturer	Certification body [b]
VCM – content of the resin [c]	1–4.1	+	+	1 sample per compound/ formulation	1 sample per compound/ formulation
Requirement for compounds/formulations for components in contact with drinking water	1–4.2	See 5.3 of this document			
Classification and verification of materials	1–4.4	+	+	Once per compound/ formulation	Once per compound/ formulation

[a] N : new compound/formulation;
M : change of compound/formulation (see Table 3);
+ : test to be carried out.

[b] Recommended sampling procedure for a testing laboratory working on behalf of a certification body. Testing undertaken in a manufacturer's laboratory shall be taken into account, provided prior acceptance by the certification body.

[c] To be tested and documented by the resin manufacturer.

Table 5 — Characteristics of pipes that require type testing (TT)

Characteristic	Reference to part, clause or subclause of EN ISO 1452	Conditions requiring test [a]				Sampling procedure	
		N	D	M	E	Manufacturer	Certification body [b]
VCM – content of the resin [c]	1–4.1	+	−	+	−	1 sample per compound/ formulation	1 sample per compound/ formulation
Requirement for compounds/formulations for components in contact with drinking water	1–4.2	See 5.3 of this document					
Density	2–4.2	+	−	+	−	1 sample per compound/ formulation	1 sample per compound/ formulation
Classification and verification of materials MRS-Value [d]	1–4.4 2–4.3	+ +	− −	+ +	− −	Once per compound/ formulation	Once per compound/ formulation
Sealing rings	2–10	+	−	+	−	Once per ring material	Once per ring material
Adhesives	2–11	+	−	+	−	Once per adhesive	Once per adhesive
Appearance Colour Geometrical characteristics Marking	2–5.1 2–5.2 2–6, Table 1 to 5 2–13, Table 10	+ + + +	+ + + +	+ + + +	+ + + +	1 sample per size per compound/ formulation	1 sample per size group per compound/ formulation

Characteristic	Reference to part, clause or subclause of EN ISO 1452	Conditions requiring test [a]				Sampling procedure	
		N	D	M	E	Manufacturer	Certification body [b]
Opacity of pipes intended for the above ground conveyance of water	2–5.3	+	−	+	−	1 sample on thinnest wall thickness per compound/ formulation	1 sample on thinnest wall thickness per compound/ formulation
Impact strength	2–8.1, Table 6	+	−	+	+	1 sample per size per compound/ formulation	1 sample per size group per compound/ formulation
Resistance to internal pressure for pipe 1 h test	2–8.2, Table 7	+	+	+	+	3 test pieces per size per compound/ formulation	1 test piece per size group per compound/ formulation
Resistance to internal pressure for pipe 1000 h test	2–8.2, Table 7	+	+	+	+	3 test pieces of one diameter per size group per compound/ formulation	1 test piece per size group per compound/ formulation
Resistance to internal pressure for pipe with integral socket	2–8.2, Table 8	+	+	+	+	1 test piece per size per compound/ formulation	1 test piece per size group per compound/ formulation
Vicat softening temperature	2–9, Table 9	+	−	+	−	1 sample per compound/ formulation	1 sample per compound/ formulation
Longitudinal reversion	2–9, Table 9	+	−	−	+	1 sample per size	1 sample per size group
Degree of gelation	2–9, Table 9	+	−	+	+	1 sample per size per compound/ formulation	1 sample per size group per compound/ formulation

[a] N : new system;
D : change in design (incl. change of sealing ring);
M : change of compound/formulation;
E : extension of the product range (except the products already covered by the scheme of sampling procedure);
+ : test to be carried out.

[b] Recommended sampling procedure for a testing laboratory working on behalf of a certification body. Testing undertaken in a manufacturer's laboratory shall be taken into account, provided prior acceptance by the certification body.

[c] To be tested and documented by the resin manufacturer.

[d] Not to be carried out if already done by the raw material manufacturer.

Table 6 — Characteristics of fittings and valves that require type testing (TT)

Characteristic	Reference to part, clause or subclause of EN ISO 1452	Conditions requiring test [a]				Sampling procedure	
		N	D	M	E	Manufacturer	Certification body [b]
VCM – content of the resin [d]	1–4.1	+	–	+	–	1 sample per compound/ formulation	1 sample per compound/ formulation
Requirement for compounds/formulations for components in contact with drinking water	1–4.2	See 5.3 of this document					
Density	3–4.2, 4–4.2	+	–	+	–	1 sample per compound/ formulation	1 sample per compound/ formulation
Classification and verification of materials MRS-Value [f]	1–4.4 3–4.3, 4–4.3	+	–	+	–	Once per compound/ formulation	Once per compound/ formulation
Sealing rings	3–10, 4–11	+	–	+	–	Once per ring material	Once per ring material
Adhesives	3–11, 4–12	+	–	+	–	Once per adhesive	Once per adhesive
Appearance Colour Geometrical characteristics Marking	3–5.1, 4–5.1 3–5.2, 4–5.2 3–6, 4–6 3–13, 4–14	+ + + +	+ + + +	+ + + +	+ + + +	5 test pieces per fitting/valve per compound/ formulation [g]	5 test pieces of one diameter per fitting group/valve type per size group per compound/ formulation
Opacity for fittings (intended for the above ground conveyance of water) and valves	3–5.3, 4–5.3	+	–	+	–	1 test piece on thinnest fitting/valve body wall thickness per compound/ formulation	1 test piece on thinnest fitting/valve body wall thickness per compound/ formulation
Vicat softening temperature	3–9, Table 23, 4–9, Table 1	+	–	+	–	1 sample per compound/ formulation	1 sample per compound/ formulation
Resistance to internal pressure for fittings 1 h test	3–8.1, Table 22	+	+	+	+	3 test pieces per fitting per compound/ formulation [g]	1 test pieces per fitting group per size group per compound/ formulation
Resistance to internal pressure for fittings 1 000 h test	3–8.1, Table 22	+	+	+	+	3 test pieces of one diameter per fitting group per size group per compound/ formulation	1 test pieces per fitting group per size group per compound/ formulation

Characteristic	Reference to part, clause or subclause of EN ISO 1452	Conditions requiring test [a]				Sampling procedure	
		N	D	M	E	Manufacturer	Certification body [b]
Resistance to internal pressure for valve bodies	4–8.1	+	+	+	+	3 test pieces per valve body per compound/ formulation [g]	1 test pieces per valve body type per size group per compound/ formulation
Crushing test [c]	3–8.2, 4–8.2	+	+	+	+	3 test pieces per fitting/valve part per compound/ formulation	1 test pieces per fitting/valve part per size group per compound/ formulation
Durability (for valves only)	4–8.3	+	+	+	+	1 test piece per valve body per compound/ formulation	1 test piece per valve type per size group per compound/ formulation
Operating torque (for valves only)	4–8.4.1	+	+	+	+	1 test piece per valve body per compound/ formulation	1 test piece per valve type per size group per compound/ formulation
Seat and packing test (for valves only)	4–8.4.2	+	+	+	+	1 test piece per valve body per compound/ formulation	1 test piece per valve type per size group per compound/ formulation
Effects of heating [e]	3–9, Table 23, 4–9, Table 1	+	+	+	+	3 test pieces per fitting/valve per compound/ formulation [g]	1 test pieces per fitting group/valve type per size group per compound/ formulation

[a] N : new system;
D : change in design (incl. change of sealing ring);
M : change of compound/formulation;
E : extension of the product range (except the products already covered by the scheme of sampling procedure);
+ : test to be carried out.

[b] Recommended sampling procedure for a testing laboratory working on behalf of a certification body. Testing undertaken in a manufacturer's laboratory shall be taken into account, provided prior acceptance by the certification body.

[c] Only for components on which hydrostatic pressure cannot be applied.

[d] To be tested and documented by the resin manufacturer.

[e] For injection moulded fittings/valves only.

[f] Not to be carried out if already done by the raw material manufacturer.

[g] Shall contain fittings from each cavity. The minimum number of samples shall be at least one from each cavity.

Table 7 — Characteristics of fitness for purpose of the system that require type testing (TT)

Characteristic	Reference to part, clause or subclause of EN ISO 1452	Conditions requiring test [a]				Sampling procedure	
		N	D	M	E	Manufacturer	Certification body [b]
Assemblies with non-end-load-bearing joints							
Leaktightness at short-term hydrostatic internal pressure	5–4.5, Table 1	+	+	–	+	1 sample per size per joint design	1 sample per size group per joint design [c]
Leaktightness at short-term negative air pressure	5–4.5, Table 1	+	+	–	+	1 sample per size group per joint design [c]	1 sample per size group per joint design [c]
Leaktightness at long-term hydrostatic internal pressure	5–4.5, Table 1	+	+	–	+	1 sample per size group per joint design [c]	1 sample per size group per joint design [c]
Assemblies with end-load-bearing joints							
Leaktightness at long-term hydrostatic internal pressure	5–4.5, Table 2	+	+	–	+	1 sample per size group per joint design [c]	1 sample per size group per joint design [c]
Leaktightness at short-term hydrostatic pressure and at negative air pressure	5–4.5, Table 2	+	+	–	+	1 sample per size per joint design [c]	1 sample per size group per joint design [c]

[a] N : new system;
D : change in design;
M : change of compound/formulation;
E : extension of the product range (except the products already covered by the scheme of sampling procedure);
+ : test to be carried out.

[b] Recommended sampling procedure for a testing laboratory working on behalf of a certification body. Testing undertaken in a manufacturer's laboratory shall be taken into account, provided prior acceptance by the certification body.

[c] Joint design includes solvent cement type, sealing ring type, flange type, mechanical fitting type and treaded type.

6.3 Batch release tests (BRTs)

Those characteristics specified in EN ISO 1452-1, EN ISO 1452-2, EN ISO 1452-3 or EN ISO 1452-4 and listed in Table 8, Table 9 and Table 10 shall be batch release tested with the minimum sampling frequency as given in the relevant tables, as applicable.

All tests shall be carried out for each start-up of the production facility of a product. A restart after production has been suspended shall not be considered as an interruption of a continuous production, provided this period of interruption does not exceed a maximum period to be defined in the manufacturer's quality plan.

Table 8 is applicable if the compound/formulation is produced by the raw material manufacturer and not by the pipe, fitting or valve manufacturer.

Table 8 — Characteristics of compound/formulation and minimum sampling frequencies for BRTs by the raw material manufacturer

Characteristic	Reference to part, clause or subclause of EN ISO 1452	Minimum sampling frequency
VCM – content of the resin [a]	1–4.1	1 sample per batch
[a] To be tested and documented by the resin manufacturer.		

Table 9 — Characteristics of pipes and minimum sampling frequencies for BRTs by the pipe manufacturer

Characteristic	Reference to part, clause or subclause of EN ISO 1452	Minimum sampling frequency
Appearance Colour	2–5.1 2–5.2	At start-up and once per 8 h
Geometrical characteristics: - pipe diameter - out-of-roundness - wall thickness - pipe length - socket dimensions - chamfer (if applicable)	2–6.2, 2–6.3, Table 1 2–6.3, Table 1 2–6.4, Table 2, Table 3 2–6.5 2–6.6, Table 4/ Table 5 2–6.7	At start-up and once per 8 h
Impact strength	2–8.1, Table 6	At start-up and once per 7 days
Internal pressure 1 h, 20 °C [a]	2–8.2, Table 7	At start-up and once per 7 days
Longitudinal reversion	2–9, Table 9	At start-up and once per 7 days
Degree of gelation	2–9, Table 9	At start-up and once per 24 h
Marking	2–13	At start-up and once per 8 h
[a] A short-term burst pressure test may be used as indirect test.		

Table 10 — Characteristics of fittings and valves and minimum sampling frequencies for BRTs by the fitting/valve manufacturer

Characteristic	Reference to part, clause or subclause of EN ISO 1452	Minimum sampling frequency [g]
Appearance Colour	3–5.1,4–5.1 3.5.2, 4–5.2	At start-up and 1 test piece per cavity per 8 h [a]
Geometrical characteristics [b] - spigot diameter - spigot length - socket diameter - socket depth - out-of-roundness	3–6, 4.6	At start-up and 1 test piece per cavity per 8h [a]
Internal pressure 1 h test [c, d]	3–8.1, Table 22	1 test piece per cavity per batch [a]
Crushing test [e]	3–8.2, 4–8.2	1 test piece per cavity per 24 h [a]
Effects of heating [f]	3–9, Table 23 4–9, Table 1	1 test piece per cavity per 24 h [a]
Marking	3–13, 4–14	At start-up and 1 test piece per cavity per 8 h [a]

[a] For moulds having more than 2 cavities, a sampling procedure taking into account a rotation between all cavities during the testing process shall be considered. The manufacturer shall give details in his quality plan accordingly.

[b] Only dimensions relevant for jointing, as appropriate.

[c] Only for components which are stressed by hydrostatic pressure in the system and for which a separate hydrostatic pressure test can be applied.

[d] A short-term burst pressure test or pulsation test may be used as indirect test.

[e] Only for components on which hydrostatic pressure cannot be applied.

[f] For injection moulded fittings only.

[g] For size groups 3 and 4 the sampling frequency may differ from the one given hereunder and shall be given in the manufacturers quality plan.

The manufacturer shall specify the maximum batch size in his quality plan.

A batch shall only be released for supply when all the relevant tests and inspections have been carried out at least once at the specified frequencies and the requirements have been met.

If a product fails in respect of any characteristic given in Table 8, Table 9 or Table 10, as applicable, the batch shall be rejected or the retest procedures shall be performed for the characteristic on which the product failed.

Procedures for dealing with rejected products shall be detailed in the manufacturer's quality plan.

6.4 Process verification tests (PVTs)

Those characteristics specified in EN ISO 1452-1, EN ISO 1452-2, EN ISO 1452-3, EN ISO 1452-4 or EN ISO 1452-5 and listed in Table 11 to Table 14 shall be process verification tested with the minimum sampling frequency given in the relevant tables, as applicable, if not type tested or audit tested in the same period.

Table 11 is applicable if the compound/formulation is produced by the raw material manufacturer and not by the pipe, fitting or valve manufacturer.

Table 11 — Characteristics of compound and minimum sampling frequencies for PVTs

Characteristic	Reference to part, clause or subclause of EN ISO 1452	Minimum sampling frequency
Classification and verification of materials	1–4.4	3 samples every 3 years per compound [a]
[a] Test shall be performed on size group 1 or 2 pipe. Check two stress levels at 20 °C taken from the reference curves, corresponding to 100 h and 3 000 h up to 5 000 h. The corresponding times shall be exceeded without failure.		

Table 12 — Characteristics of pipes and minimum sampling frequencies for PVTs

Characteristic	Reference to part, clause or subclause of EN ISO 1452	Minimum sampling frequency
Classification and verification of materials	1–4.4	3 samples every 3 years per compound/formulation [a, c]
Internal pressure 60 °C, 1 000 h	2–8.2, Table 7	3 test pieces of one diameter per size group per year per compound/formulation currently used [b]
[a] Test shall be performed on size group 1 or 2. Check two stress levels at 20 °C taken from the reference curves, corresponding to 100 h and 3 000 h up to 5 000 h. The corresponding times shall be exceeded without failure. [b] Samples to be evenly selected from all pressure groups and size groups in such a way that units of each d_n produced are tested regularly and continuously according to the manufacturer's quality plan. [c] Not to be carried out if already done by the raw material manufacturer.		

Table 13 — Characteristics of fittings and valves and minimum sampling frequencies for PVTs

Characteristic	Reference to part, clause or subclause of EN ISO 1452	Minimum sampling frequency
Classification and verification of materials	1–4.4	3 samples every 3 years per compound/formulation [a, c]
Internal pressure 20 °C, 1 000 h	3–8.1, Table 22 4–8.1	According to the manufacturer's quality plan [b]
[a] Test shall be performed on size group 1 or 2. Check two stress levels at 20 °C taken from the reference curves, corresponding to 100 h and 3 000 h up to 5 000 h. The corresponding times shall be exceeded without failure. [b] Samples to be evenly selected from all size and fitting/valve groups in such a way that units of each d_n and type produced are tested regularly and continuously, but at least once per five years. [c] Not to be carried out if already done by the raw material manufacturer.		

Table 14 — Characteristics of fitness for purpose of the system and minimum sampling frequencies for PVTs

Characteristic	Reference to part, clause or subclause of EN ISO 1452	Minimum sampling frequency [a]
Assemblies with non-end-load-bearing joints		
Leaktightness at short-term hydrostatic internal pressure	5–4.3 Table 1	1 sample per size group per year per joint design [b]
Leaktightness at short-term negative air pressure	5–4.4 Table 1	1 sample per size group per year per joint design [b]
Leaktightness at long-term hydrostatic internal pressure	5–4.5 Table 1	1 sample per size group per year per joint design [b]
Assemblies with end-load-bearing joints		
Leaktightness at long-term hydrostatic internal pressure	5–4.5 Table 2	1 sample per size group per year per joint design [b]
Leaktightness at short-term hydrostatic pressure and at negative air pressure	5–4.5 Table 2	1 sample per size group per year per joint design [b]
Samples should be taken in such a way that each size will be tested over some years according to the manufacturer's quality plan.		

[a] Audit tests carried out on the same characteristics are deemed to satisfy the PVT requirements.

[b] Joint design includes solvent cement type, sealing ring type, flange type, mechanical fitting type and treaded type.

If the product does not conform to the requirements in respect of any characteristic given in Table 11, Table 12, Table 13 or Table 14, as applicable, the retest procedure detailed in the manufacturer's quality plan shall be performed.

If the retest procedure does not confirm conformity of the product to the requirements, then the process shall be investigated and corrected in accordance with the procedures given in the manufacturer's quality plan, as well as to verify the characteristics given in Table 11, Table 12, Table 13 or Table 14, as applicable.

6.5 Audit tests (ATs)

ATs are only performed if certification is involved.

Those characteristics specified in EN ISO 1452-1, EN ISO 1452-2, EN ISO 1452-3, EN ISO 1452-4 or EN ISO 1452-5 and listed in Table 15 to Table 18 are intended to be audit tested with the minimum sampling frequency as given in the relevant tables as applicable.

Table 15 is applicable if the compound/formulation is produced by the raw material manufacturer and not by the pipe, fitting or valve manufacturer.

Table 15 — Characteristics of compounds/formulations and minimum sampling frequencies for ATs

Characteristic	Reference to part, clause or subclause of EN ISO 1452	Minimum sampling frequency
Vicat softening temperature	2–9, Table 9	One evaluation per compound/formulation per year
VCM-content of the resin [a]	1–4.1	Check of documentation once per compound/formulation per year

[a] To be tested and documented by the resin manufacturer.

Table 16 — Characteristics of pipes and minimum sampling frequencies for ATs

Characteristic	Reference to part, clause or subclause of EN ISO 1452	Minimum sampling frequency
VCM-content of the resin [b]	1–4.1	Check of documentation once per compound/formulation per year
Density	2–4.2	1 sample per compound/formulation per year
Appearance Colour Geometrical Characteristics Marking	2–5.1 2–5.2 2–6 Table 1 to 5 2–13 Table 10	1 test piece per size group per year
Impact strength	2–8.1, Table 6	1 sample per size group per year
Internal pressure for pipe [a]	2–8.2, Table 7	3 test pieces per size group per year
Internal pressure for pipe with integral socket	2–8.2, Table 8	1 test piece per size group per year
Vicat softening temperature	2–9, Table 9	1 sample per compound/formulation per year
Longitudinal reversion	2–9, Table 9	1 sample per size group per year
Degree of gelation	2–9, Table 9	1 sample per size group per year
Samples should be taken in such a way that each size will be tested over some years according to the manufacturer's quality plan.		
[a] Certification bodies may accept process verification tests as audit tests. [b] To be tested and documented by the resin manufacturer.		

Table 17 — Characteristics of fittings and valves and minimum sampling frequencies for ATs

Characteristic	Reference to part, clause or subclause of EN ISO 1452	Minimum sampling frequency
VCM-content of the resin [c]	1–4.1	Check of documentation once per compound/formulation per year
Density	3–4.2, 4–4.2	1 sample per compound/formulation per year
Appearance Colour Geometrical characteristics Marking	3–5.1, 4–5.1 3–5.2, 4–5.2 3–6, 4–6 3–13, 4–14	1 test piece per size group per year
Vicat softening temperature	3–9, Table 23 4–9, Table 1	1 sample per compound/formulation per year
Resistance to internal pressure for fittings 20 °C / 1 h test Resistance to internal pressure for fittings 20 °C / 1000 h test [a]	3–8.1, Table 22 3–8.1, Table 22	3 test pieces per size group per year
Resistance to internal pressure for valve bodies 20 °C / 1 h test Resistance to internal pressure for valve bodies 60 °C / 1000 h test [a] Resistance to internal pressure for valve bodies 20 °C / 1000 h test [a]	4–8.1 4–8.1 4–8.1	1 test piece per size group per year
Crushing test [b]	3–8.2, 4–8.2	1 test piece per size group per year
Effects of heating	3–9 Table 23, 4–9 Table 1	1 test piece per size group per year
Samples should be taken in such a way that each size of the fitting/valve range will be tested over some years.		

[a] Certification bodies may accept process verification tests as audit tests.

[b] Only for components on which hydrostatic pressure cannot be applied.

[c] To be tested and documented by the resin manufacturer.

Table 18 — Characteristics of fitness for purpose of the system and minimum sampling frequencies for ATs

Characteristic	Reference to part, clause or subclause of EN ISO 1452	Minimum sampling frequency [a]
Assemblies with non-end-load-bearing joints		
Leaktightness at short-term hydrostatic internal pressure	5–4.3 Table 1	1 sample per size group per year per joint design [b]
Leaktightness at short-term negative air pressure	5–4.4 Table 1	1 sample per size group per year per joint design [b]
Leaktightness at long-term hydrostatic internal pressure	5–4.5 Table 1	1 sample per size group per year per joint design [b]
Assemblies with end-load-bearing joints		
Leaktightness at long-term hydrostatic internal pressure	5–4.5 Table 2	1 sample per size group per year per joint design [b]
Leaktightness at short-term hydrostatic pressure and at negative air pressure	5–4.5 Table 2	1 sample per size group per year per joint design [b]
Samples should be taken in such a way that each size of the fitting/valve range will be tested over some years.		
[a] Certification bodies may accept process verification tests as audit tests. [b] Joint design includes solvent cement type, sealing ring type, flange type, mechanical fitting type and treaded type.		

6.6 Indirect tests (ITs)

Generally, testing shall be performed using the test methods referred to in EN ISO 1452-1, EN ISO 1452-2, EN ISO 1452-3, EN ISO 1452-4 or EN ISO 1452-5.

Indirect testing may be used for BRT characteristics as given in Table 9 and Table 10. Indirect testing shall not be used for TT, PVT and AT.

The indirect test method used and the correlation or safe relationship of the indirect testing to the specified testing shall be documented in the manufacturer's quality plan. The continuing validity of the indirect testing shall be checked at regular intervals.

In cases of dispute, the BRT as specified in Table 9 and Table 10, as applicable, shall be used.

If certification is involved, the IT shall be accepted by the certification body.

6.7 Test records

Unless otherwise specified all records shall be maintained for a minimum of ten years in accordance with the information given in the quality management system.

Annex A
(informative)

Basic test Matrix for PVC-U Water and Pressure Sewer piping components

Table A.1 — Basic test matrix for PVC-U Water and Pressure Sewer piping components

Requirements for		Compound/formulation (by producer)				Pipes				Fittings				Valves			
Characteristic		TT	BRT	PVT	AT	TT	BRT	PVT	AT	TT	BRT	PVT	AT	TT	BRT	PVT	AT
1	VCM content (on base resine)	X	X		X												
2	Classification of compound/formulation	X															
3	Density					X		a	X	X		a	X	X			X
4	Appearance					X	X		X	X	X		X	X	X		X
5	Colour					X	X		X	X	X		X	X	X		X
6	Opacity					X				X				X			
7	Geometrical characteristics					X	X		X	X	X		X	X	X		X
8	Impact strength					X	X		X								
9	Resistance to internal pressure 20 °C / 1 h					X	X		X	X	X		X	X	X		X
10	Resistance to internal pressure 60 °C / 1 000 h					X		X	X					X		X	X
11	Resistance to internal pressure 20 °C / 1 000 h									X		X	X	X		X	X
12	Short-term strength 20 °C / 1 h					X		a	X								
13	Crushing test									X	X		X	X	X		X
14	Fatigue strength test (Durability)													X			
15	Operating torque													X			
16	Seat and packing test 20 °C													X			
17	Vicat softening temperature					X		a	X	X		a	X	X			X
18	Effects of heating (VST)									X	X		X	X	X		X

Requirements for		Compound/formulation (by producer)				Pipes				Fittings				Valves			
Characteristic		TT	BRT	PVT	AT	TT	BRT	PVT	AT	TT	BRT	PVT	AT	TT	BRT	PVT	AT
19	Longitudinal reversion					X	X		X								
20	Resistance to dichlormethan					X	X		X								
21	Uniaxial tensile test					X	X		X								
22	DSC					X	X		X								
23	Marking					X	X		X	X	X		X	X	X		X
	Requirements for jointing elements																
31	Sealing rings					X			X	X			X	X			X
32	Adhesives					X			X	X			X	X			X
	Assemblies with non-end-load bearing joints																
41	Leaktight. at short-term hydrost. int. pressure					X		a	X	X		a	X	X			X
42	Leaktight. at short-term neg. air. pressure					X		a	X	X		a	X	X			X
43	Leaktight. at long-term hydrost. int. pressure 20 °C					X		a	X	X		a	X	X			X
44	Leaktight. at long-term hydrost. int. pressure 40 °C					X		a	X	X		a	X	X			X
	Assemblies with end-load bearing joints																
51	Leaktight. at long-term hydrost. int. pressure 20 °C					X		a	X	X		a	X	X			X
52	Leaktight. at long-term hydrost. int. pressure 40 °C					X		a	X	X		a	X	X			X
53	Leaktight. at short-term pre. and neg. air. pressure					X		a	X	X		a	X	X			X

a To be performed if no audit tests are performed.

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[1] EN ISO 9001, *Quality management systems - Requirements (ISO 9001)*

[2] EN ISO/IEC 17020, *Conformity assessment - Requirements for the operation of various types of bodies performing inspection (ISO/IEC 17020)*

[3] EN ISO/IEC 17021, *Conformity assessment - Requirements for bodies providing audit and certification of management systems (ISO/IEC 17021)*

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[5] EN ISO/IEC 17065, *Conformity assessment - Requirements for bodies certifying products, processes and services (ISO/IEC 17065)*

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