TECHNICAL SPECIFICATION

ISO/TS 15877-7

Third edition
2018-11

Plastics piping systems for hot and cold water installations — Chlorinated poly(vinyl chloride) (PVC-C) —

Part 7: Guidance for the assessment of conformity

Systèmes de canalisations en plastique pour les installations d'eau chaude et froide — Poly(chlorure de vinyle) chloré (PVC-C) —

Partie 7: Guide pour l'évaluation de la conformité

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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.

The procedures used to develop this document and those intended for its further maintenance are described in the ISO/IEC Directives, Part 1. In particular the different approval criteria needed for the different types of ISO documents should be noted. This document was drafted in accordance with the editorial rules of the ISO/IEC Directives, Part 2 (see www.iso.org/directives).

Attention is drawn to the possibility that some of the elements of this document may be the subject of patent rights. ISO shall not be held responsible for identifying any or all such patent rights. Details of any patent rights identified during the development of the document will be in the Introduction and/or on the ISO list of patent declarations received (see www.iso.org/patents).

Any trade name used in this document is information given for the convenience of users and does not constitute an endorsement.

For an explanation on the voluntary nature of standards, the meaning of ISO specific terms and expressions related to conformity assessment, as well as information about ISO's adherence to the World Trade Organization (WTO) principles in the Technical Barriers to Trade (TBT) see the following URL: www.iso.org/iso/foreword.html.

This document was prepared by the European Committee for Standardization (CEN) Technical Committee CEN/TC 155, *Plastics piping systems and ducting systems*, in collaboration with ISO Technical Committee TC 138, *Plastics pipes, fittings and valves for the transport of fluids*, Subcommittee SC 2, *Plastics pipes and fittings for water supplies*, in accordance with the Agreement on technical cooperation between ISO and CEN (Vienna Agreement).

This third edition cancels and replaces the second edition (ISO/TS 15877-7:2009), which has been technically revised.

The main changes compared to the previous edition are as follows:

— Addition of new definitions of the terms “material”, compound” and “material grade”;

— Revision of 6.2 “Type testing (TT)” with a special focus on Table 4.

A list of all parts in the ISO 15877 series can be found on the ISO website.

Any feedback or questions on this document should be directed to the user’s national standards body. A complete listing of these bodies can be found at www.iso.org/members.html.

Introduction

This document can be used to support elaboration of national third party certification procedures for products conforming to the applicable part(s) of ISO 15877.

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

At the date of publication of this document, System Standards for piping systems of other plastics materials used for the same application are the following:

— ISO 15874, *Plastics piping systems for hot and cold water installations — Polypropylene (PP)*

— ISO 15875, *Plastics piping systems for hot and cold water installations — Crosslinked Polyethylene (PE-X)*

— ISO 15876, *Plastics piping systems for hot and cold water installations — Polybutene (PB)*

— ISO 21003, *Multilayer piping systems for hot and cold water installations inside buildings*

— ISO 22391, *Plastics piping systems for hot and cold water installations — Polyethylene of raised temperature resistance (PE-RT)*

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.

Figures 1 and 2 are intended to provide general information on the concept of testing and organisation of those tests used for the purpose of the assessment of conformity. For each type of test, i.e. type testing (TT), batch release test (BRT), process verification test (PVT), and audit test (AT), this document 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 materials, compounds, pipes, fittings, valves, joints or assemblies by product manufacturers is given in Figure 1.

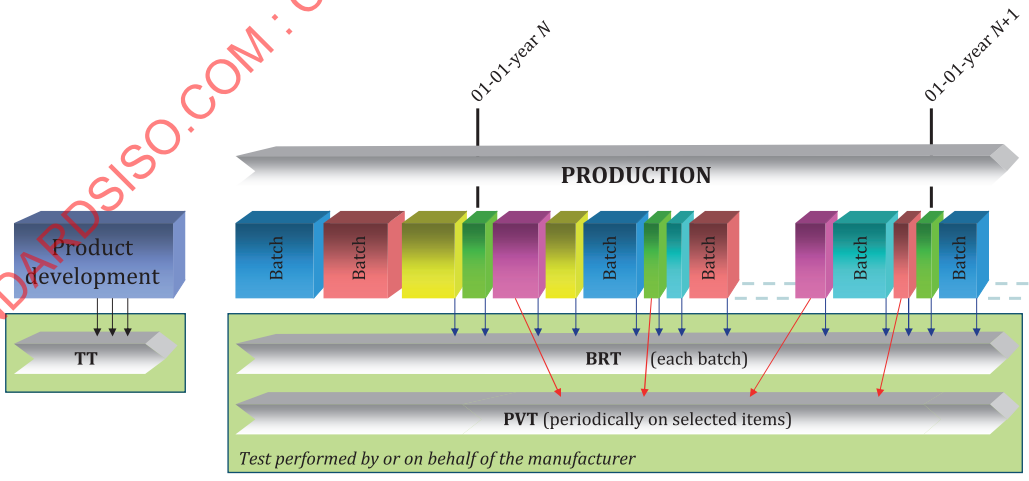

Figure 1 — Typical scheme for the assessment of conformity by a product manufacturer

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

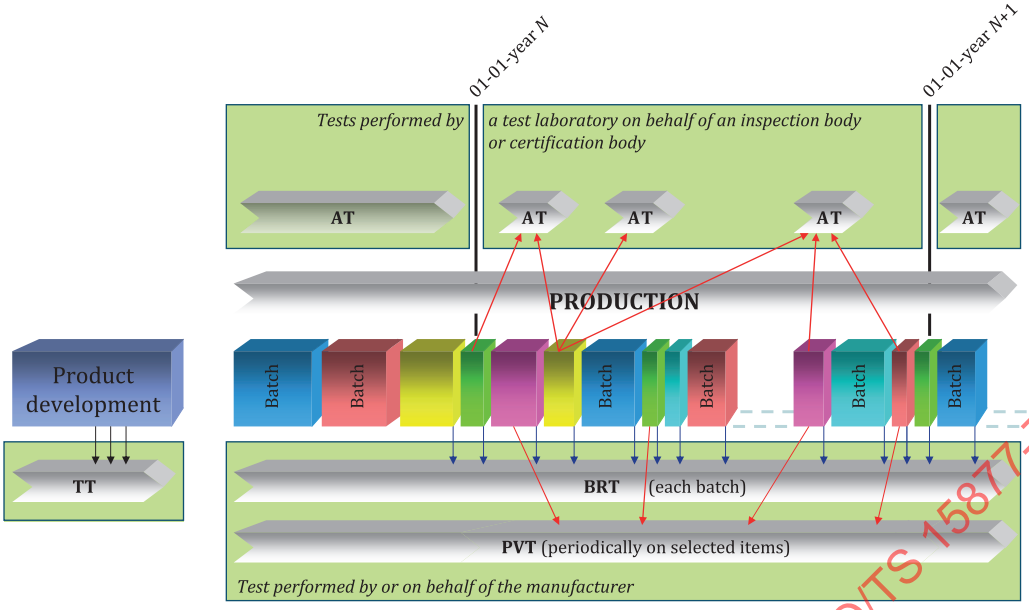

Figure 2 — Typical scheme for the assessment of conformity by a product manufacturer, including certification

Plastics piping systems for hot and cold water installations — Chlorinated poly(vinyl chloride) (PVC-C) —

Part 7: Guidance for the assessment of conformity

1 Scope

This document gives requirements and guidance for the assessment of conformity of materials, products, and assemblies in accordance with the applicable part(s) of ISO 15877 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 In order to help the reader, a basic test matrix is given in Annex A.

In conjunction with the other parts of ISO 15877 (see Foreword), this document is applicable to Chlorinated poly(vinyl chloride) (PVC-C) piping systems intended to be used for hot and cold water installations within buildings for the conveyance of water, whether or not intended for human consumption (domestic systems) and for heating systems, under design pressures and temperatures appropriate to the class of application (see ISO 15877-1:2009, Table 1).

2 Normative references

The following documents are referred to in the text in such a way that some or all of their content constitutes requirements of this document. For dated references, only the edition cited applies. For undated references, the latest edition of the referenced document (including any amendments) applies.

ISO 15877-1:2009, *Plastics piping systems for hot and cold water installations — Chlorinated poly(vinyl chloride) (PVC-C) — Part 1: General*

ISO 15877-2:2009, *Plastics piping systems for hot and cold water installations — Chlorinated poly(vinyl chloride) (PVC-C) — Part 2: Pipes*

ISO 15877-3:2009, *Plastics piping systems for hot and cold water installations — Chlorinated poly(vinyl chloride) (PVC-C) — Part 3: Fittings*

ISO 15877-5:2009, *Plastics piping systems for hot and cold water installations — Chlorinated poly(vinyl chloride) (PVC-C) — Part 5: Fitness for purpose of the system*

3 Terms and definitions

For the purposes of this document, the terms and definitions given in ISO 15877-1 and ISO 15877-3 and the following apply.

ISO and IEC maintain terminological databases for use in standardization at the following addresses:

— IEC Electropedia: available at http://www.electropedia.org/

— ISO Online browsing platform: available at http://www.iso.org/obp

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 ISO/IEC 17065[2].

3.2
inspection body
body that performs inspection

Note 1 to entry: An inspection body can be an organization, or part of an organization.

[SOURCE: ISO/IEC 17020:2012[3], 3.5]

Note 2 to entry: An inspection body is preferably compliant with ISO/IEC 17020[3].

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: A testing laboratory is preferably compliant with ISO/IEC 17025[4].

3.4
quality management system
part of a management system with regard to quality

[SOURCE: ISO 9000:2015, 3.5.4]

Note 1 to entry: Requirements for quality management systems are given in ISO 9001[6].

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 testing
TT
testing performed to prove that the *compound* (3.13), *component* (3.21), *product* (3.16), *joint* (3.22) or *assembly* (3.23) 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 *compound* (3.13) or *product* (3.16) or *assembly* (3.23) 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 *compound* (3.13), *components* (3.21) or *products* (3.16), 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 product manufacturer on *compounds* (3.13), *components* (3.21), *products* (3.16) or joints (3.22) at specific intervals to confirm that the process continues to be capable of producing *components* (3.21) and *products* (3.16) which conform to the requirements given in the relevant standard

Note 1 to entry: Such tests are not required to release batches of *materials* (3.12), *compound* (3.13), *components* (3.21) or *products* (3.16) 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* (3.2) or *certification body* (3.1) to confirm that the material, *compound* (3.13), *components* (3.21), *product* (3.16), *joint* (3.22) or *assembly* (3.23) continues to conform to the requirements given in the relevant standard and to provide information to assess the effectiveness of the *quality management system* (3.4)

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* (3.1) for *type testing* (3.6) 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* (3.1), qualified in testing

3.12
material
composition grouped by specific families, expressed by generic names used in various standards, e.g. PP-H, PB-R, PE-RT Type II, PE-X a, PVC-C

3.13
compound
clearly defined homogenous mixture of the polymer with additives, i.e. antioxidants, pigments, stabilizers and others, at a dosage level necessary for the processing and the intended use of the final *product* (3.16)

3.14
material grade
material (3.12) with a defined specification from a material manufacturer

3.15
batch of material grade
clearly identified quantity of a given homogeneous *material* (3.12) or *compound* (3.13) manufactured under uniform conditions and defined and identified by the material/compound manufacturer

3.16
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

3.17
product batch
clearly identified collection of units or *products* (3.16), manufactured consecutively or continuously under the same conditions, using the same *compounds* (3.13) conforming to the same specifications

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

3.18
lot
clearly identifiable sub-division of a batch for inspection purposes

3.19
sample
one or more units or *products* (3.16) drawn from the same production batch or *lot* (3.18), selected at random without regard to their quality

Note 1 to entry: The number of *products* (3.16) in the sample is the sample size.

3.20
group
collection of similar *components* (3.21) or *products* (3.16) from which *samples* (3.19) are selected for testing purposes

3.21
component
product (3.16) manufactured out of a specific *compound* (3.13), brought to the market as part of another *product* (3.16) or as a spare part

Note 1 to entry: For drinking water application, components may be considered as *products* (3.16) and be individually approved (e.g. o-ring, gasket) or they are tested as integral part of a *product* (3.16) (e.g. in a valve).

3.22
joint
connection between two or more *products* (3.16)

3.23
assembly
assembled product
assembled product using two or more parts

3.24
sampling plan
specific plan which defines the test and the number of units or *products* (3.16) or *assemblies* (3.23) to be inspected

3.25
product type
generic description of a *product* (3.16)

EXAMPLE A pipe or fitting or valve or their main parts, of the same design, from a particular *compound* (3.13).

3.26
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.

	EN	FR	DE
AT	audit test	essai d'audit	Überwachungsprüfung
BRT	batch release test	essai de libération de campagne de fabrication	Freigabeprüfung einer Charge
IT	indirect test	essai indirect	indirekte Prüfung
PVT	process verification test	essai de vérification du procédé de fabrication	Prozessüberprüfung
TT	type test	essai de type	Typprüfung
WT	witness testing	essai témoin	Prüfung unter Aufsicht

5 General

Compounds, products and assemblies shall conform to the requirements given in ISO 15877 (all parts).

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

For the effect on water quality, 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 document, the groups specified in 6.1.2 to 6.1.4 apply.

6.1.2 Pressure groups

Two pressure groups are defined, as given in Table 1.

Table 1 — Pressure groups

Pressure group	Operating pressure, p_{op} bar
1	4; 6
2	8; 10

6.1.3 Size groups

Two size groups are defined for pipes and fittings, as given in Table 2.

Table 2 — Size groups

Size group	Nominal diameter, d_n mm
1	$10 \leq d_n \leq 63$
2	$63 < d_n \leq 160$

6.1.4 Fitting groups

Four groups of fittings each having a similar design are defined, as given in Table 3.

Table 3 — Fitting groups

Fitting group	Type of fitting
1	Bends
2	Elbows, Tees
3	Reducers, couplers, double-sockets, end caps
4	Unions, flange adaptors, transition fittings, adaptor pieces and/or their plastics parts and others

6.2 Type testing (TT)

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

TTs shall demonstrate that the products conform to all requirements for the characteristics given in Table 5 to Table 7.

Conditions considered as leading to a change of compound (M) are given in Table 4. The dosage level of ingredients of the compound shall not exceed the tolerance bands given in Table 4. The values for *X* (see Table 4) shall be specified in the manufacturer's quality plan. The relevant characteristics to be tested in case of change of compound are given in Tables 5, 6 and 7 in columns M1 to M2, as applicable.

A change in the supplier of stabilizer or other additives does not necessarily constitute a change in compound (see Table 4, footnote [a].

A change of material of metal fittings without any change of design in those areas which are relevant to the joint performance does not require testing as specified in ISO 15877-5.

Table 4 — Conditions considered to lead to a change of compound (M)

	Type of material change	Conditions
M1	— Change of chlorine content of the resin	— Amount greater than X ± 0,5 %
M2[a]	— Change of additive package e.g. pigments, antioxidants, processing aids	— Amount greater than X ± 20 % of individual additive — Chemical properties or nature of additive
[a] Stabilizer, pigments or other additives with identical CAS number are considered as identical substances.		

For the purposes of defining a change in design, the following characteristics are relevant:

a) dimensions;

b) geometry of the product;

c) jointing system.

In the manufacturer's quality plan, the geometry, the dimensions and the dimensional tolerances shall be specified at least in accordance with and in addition to the requirements given in the relevant part(s) of ISO 15877. If one or more of these characteristics exceed the defined specifications, the relevant characteristics given in Table 5 to Table 7, as applicable, shall be retested.

In case of extension of the product range (E) the relevant characteristics given in Table 5 to Table 7, as applicable, shall be tested.

In case of a change of production site of a product (pipe/fitting) (P), the relevant characteristics given in column P of Table 5 to Table 7, as applicable, shall be tested.

NOTE Testing is not required in case of changes (M, E) for a product (pipes, fittings) manufactured at an alternative production site provided that these changes (M, E) have been evaluated according to this document for the same product (pipe, fitting) at an equivalent and evaluated production site and provided that the production process of the product is equivalent.

In case of change of a production site of a material grade, the supplier shall ensure that the material grade is identical. Additional type testing of products (pipe, fitting) is not required.

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

Characteristic	Reference	Conditions requiring test[a]					Evaluation procedure	
		N	M1	M2	E	P	Manufacturer	Certification body[b]
Density	ISO 15877-1:2009, 5.2	+	+	+	-	-	1 evaluation per compound	Evaluation checked by certification body
Chlorine content	ISO 15877-1:2009, 5.3	+	+	+	-	-	1 evaluation per compound	Evaluation checked by certification body
Verification of T_{mal} (95 °C, 100 °C)	ISO 15877-1:2009, 5.5	+	+	+	-	-	1 evaluation per compound	Evaluation checked by certification body
Influence on water intended for human consumption	ISO 15877-1:2009, 5.6	According to national regulations						
Hydrostatic stress properties of material[d]	ISO 15877-2:2009, 4.3	+[c]	+[c]	+[c]	-	-	1 evaluation per compound	Evaluation checked by certification body
Appearance	ISO 15877-2:2009, 5.1	+	+	+	+	+	1 test piece of each diameter and pressure group	1 test piece of 1 diameter/ size group and pressure group
Opacity	ISO 15877-2:2009, 5.3	+	+	+	+	+	1 test piece of the smallest wall thickness produced	1 test piece of the smallest wall thickness produced
Dimensions	ISO 15877-2:2009, 6.2, Tables 3 and 4	+	+	+	+	+	1 test piece of each diameter and pressure group	1 test piece of 1 diameter/ size group and pressure group
Resistance to internal pressure	ISO 15877-2:2009, 7.1, Table 5 or Table 6	+	+	+	+	+	3 test pieces of one diameter/size group and pressure group	3 test pieces of one diameter/ size group and pressure group
Impact resistance	ISO 15877-2:2009, 7.2, Table 7	+	+	+	+	+	1 evaluation per size group and pressure group	1 evaluation per size group and pressure group
Tensile Strength	ISO 15877-2:2009, 7.3, Table 9	+	+	+	-	-	1 evaluation per size group and pressure group	1 evaluation per size group and pressure group
Vicat softening temperature (VST)	ISO 15877-2:2009, Clause 8, Table 10 or 11	+	+	+	-	+	1 evaluation per compound	Evaluation checked by certification body
Longitudinal reversion	ISO 15877-2:2009, Clause 8, Table 10 or 11	+	+	+	+	+	3 test pieces one diameter/ size group and pressure group	3 test pieces of one diameter/ size group and pressure group

Table 5 *(continued)*

Characteristic	Reference	Conditions requiring test[a]					Evaluation procedure	
		N	M1	M2	E	P	Manufacturer	Certification body[b]
Thermal stability	ISO 15877-2:2009, Clause 8, Table 10 or 11	+	+	+	-	+	1 test piece per compound	Report checked by certification body
Marking	ISO 15877-2:2009, Clause 11	+	-	-	+	+	1 sample of each diameter	By checking the test result of the manufacturer

[a]

N: new system

M1: change of chlorine content; see Table 4.

M2: change of additive package; see Table 4.

E: extension of the product range (except the products already covered by the scheme of sampling procedure).

P: change of production site of the pipes and fittings made of the same compounds to an existing product location, provided that the production process is equivalent.

+: test to be carried out.

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

[c] If the material manufacturer/supplier has already evaluated the hydrostatic stress properties specified in ISO 15877-2:2009, (see also ISO 9080)[7]), by means of a test report of an accredited testing laboratory, the manufacturer of fittings shall conduct the conformity testing (2 500 h / 95 °C) according to footnote [d] only.

[d] Conformity testing of the compound: In order to check the conformity of the compound on the hydrostatic stress properties specified in ISO 15877-2:2009, three test pieces shall be tested at two different stress levels at 95 °C. The lowest stress level shall give failure times of approximately 2 500 h. All failure points shall be on or above the relevant reference curve of ISO 15877-2:2009, Figure 1 or 2 for the appropriate compound.

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

Characteristic	Reference	Conditions requiring test[a]						Sampling procedure	
		N	D	M1	M2	E	P	Manufacturer	Certification body[b]
Density	ISO 15877-1:2009, 5.2	+	-	+	+[d]	-	-	1 evaluation per material	Evaluation checked by certification body
Chlorine content	ISO 15877-1:2009, 5.3	+	-	+	+[d]	-	-	1 evaluation per material	Evaluation checked by certification body
Verification of T_{mal} (95 °C, 100°C)	ISO 15877-1:2009, 5.5	+	-	+	+[d]	-	-	1 evaluation per material	Evaluation checked by certification body
Influence on water intended for human consumption	ISO 15877-1:2009, 5.2	According to national regulations							
Hydrostatic stress properties of material[c]	ISO 15877-3:2009, 4.1	+	-	+	+[d]	-	-	1 evaluation per material	Evaluation checked by certification body
Thermal stability	ISO 15877-3:2009, Clause 4, Tables 1 and 2	+	-	+	+	-	-	1 test piece per material[e]	Report checked by certification body
Appearance	ISO 15877-3:2009, 5.1	+	+	+	+	+	+	5 test pieces/size/fitting group[f]	5 test pieces of one diameter/size group/fitting group
Opacity	ISO 15877-3:2009, 5.2	+	+[g]	+	+	+[g]	+	1 test piece with the smallest wall thickness produced	1 test piece with the smallest wall thickness produced
Dimensions	ISO 15877-3:2009, Clause 6	+	+	+	+	+	+	5 test pieces/ size/fitting group[f]	5 test pieces of one diameter/size group/fitting group

Table 6 *(continued)*

Characteristic	Reference	Conditions requiring test[a]						Sampling procedure	
		N	D	M1	M2	E	P	Manufacturer	Certification body[b]
Resistance to internal pressure	ISO 15877-3:2009, 7.1, Table 14	+	+	+	+	+	+	3 test pieces/size/fitting group for the relevant design pressure and appropriate class of application[f]	3 test pieces of one diameter/size group/fitting group for the relevant design pressure and appropriate class of application
Vicat softening temperature (VST)	ISO 15877-3:2009, 4.4, Table 1 or Table 2	+	-	+	+	-	+	1 evaluation per material	Evaluation checked by certification body
Marking	ISO 15877-3:2009, Clause 11	+	-	-	-	+	+	5 test piece/ size/fitting group[f]	5 test piece of one diameter/size group/fitting group

[a]

N: new system.

D: change in design.

M1: change of polymer.

M2: change of additive package.

E: extension of the product range (except the products already covered by the scheme of sampling procedure).

P: change of production site of the pipes and fittings made of the same compounds to an existing product location, provided that the production process is equivalent.

+: test to be carried out.

[b] Recommended sampling procedure for a testing laboratory working for a certification body. Testing undertaken in manufacturer's laboratory can be taken into account, by agreement with the certification body.

[c] If the material supplier has evaluated the hydrostatic stress properties specified in ISO 15877-3:2009 by means of a test report an accredited testing laboratory, the manufacturer of fittings shall conduct the conformity testing (2 500 h/95 °C) according to footnote [d] only.

[d] Conformity testing of the compound: In order to check the conformity of the compound on the hydrostatic stress properties specified in ISO 15877-3:2009, three test pieces shall be tested at two different stress levels at 95 °C. The lowest stress level shall give failure times of approximately 2 500 h. All failure points shall be on or above the relevant reference curve of ISO 15877-3:2009, Figure 1 for the appropriate material.

[e] Only if the fitting material is different from the pipe material.

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

[g] If extension includes smaller wall thickness than current range.

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

Characteristic	Reference	Conditions requiring test[a]			Sampling procedure	
		N	D	E	Manufacturer	Certification body[b]
Resistance to internal pressure	ISO 15877-5:2009, 4.2	+	+	+	1 evaluation per *diameter* and jointing system for the relevant design pressure and appropriate application class	1 evaluation per size group and jointing system for the relevant design pressure and appropriate application class
Resistance to pull-out	ISO 15877-5:2009, 4.3	+	+	+	1 evaluation per *diameter* and jointing system for the relevant design pressure and appropriate application class	1 evaluation for the smallest and largest *diameter* per size group and jointing system for the relevant design pressure and appropriate application class
Resistance to thermal cycling	ISO 15877-5:2009, 4.4	+	+	+	1 evaluation per *diameter* and jointing system for the relevant design pressure and appropriate application class	1 evaluation per *diameter* and jointing system for the relevant design pressure and appropriate application class

Table 7 *(continued)*

Characteristic	Reference	Conditions requiring test[a]			Sampling procedure	
		N	D	E	Manufacturer	Certification body[b]
Resistance to pressure cycling	ISO 15877-5:2009, 4.5	+	+	+	1 evaluation per *diameter* and jointing system for the relevant design pressure and appropriate application class	1 evaluation per size group and jointing system for the relevant design pressure
Leaktightness under vacuum	ISO 15877-5:2009, 4.6	+	+	+	1 evaluation per *diameter* and jointing system for the relevant design pressure and appropriate application class	1 evaluation per size group and jointing system for the relevant design pressure

[a]
N: new system.

D: change in design.

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 manufacturer's laboratory shall be taken into account, by agreement with the certification body.

6.3 Batch release tests (BRT)

Those characteristics specified in ISO 15877-2 and ISO 15877-3 and listed in Table 8 and Table 9 shall be subject to BRTs with the minimum sampling frequency as given in Table 8 or Table 9, as applicable.

Table 8 — Characteristics of pipes and minimum sampling frequencies for BRTs

Characteristic	Reference	Minimum sampling frequency
Appearance	ISO 15877-2:2009, 5.1	1 test piece at start up and at least every 8 h per machine
Outside diameter	ISO 15877-2:2009, 6.2, Table 3	1 test piece at start up and at least every 8 h per machine
Wall thickness	ISO 15877-2:2009, 6.3, Tables 3 and 4	1 test piece at start up and at least every 8 h per machine
Resistance to internal pressure (20 °C, 1 h)	ISO 15877-2:2009, Tables 5 and 6	1 test piece per 24 h per machine
Or		
Resistance to internal pressure (95 °C, 165 h)[a]		1 test piece per week per machine

[a] In case of dispute testing at 95 °C and 165 h shall be done.

Table 8 *(continued)*

Characteristic	Reference	Minimum sampling frequency
Longitudinal reversion	ISO 15877-2:2009, Tables 10 and 11	1 test piece per week per machine
Marking	ISO 15877-2:2009, 11.2, Table 12	1 test piece at start up and at least every 8 h per machine
Impact resistance	ISO 15877-2:2009, 7.2, Tables 7 and 8	1 test piece per week per machine
[a] In case of dispute testing at 95 °C and 165 h shall be done.		

Table 9 — Characteristics of fittings and minimum sampling frequencies for BRTs

Characteristic	Reference	Minimum sampling frequency[a]
Appearance	ISO 15877-3:2009, 5.1	1 test piece at start-up, and at least every 8 h per machine
Geometrical characteristics (but only those dimensions which vary by the manufacturing process and affect the function of the joint or fitting)	ISO 15877-3:2009, Clause 6	1 test piece at start-up, and at least every 8 h per machine
Resistance to internal pressure (20 °C, 1 h)	ISO 15877-3:2009, Clause 7, Tables 16 and 17	1 test piece/ batch, and at least once per week per machine
Marking	ISO 15877-3:2009, Clause 11, Table 18	1 test piece at start-up, and at least every 8 h per machine
[a] For multiple cavity moulds, a rotating sampling procedure between the cavities for testing during the shifts shall be considered. The manufacturer's quality plan shall give details accordingly. In such cases where more than one product is made per mould (family mould), sampling shall include all products.		

The manufacturer's quality plan shall specify a batch or a lot.

A batch or lot 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 or Table 9, as applicable, the batch or lot shall be rejected or the retest procedures shall be performed for the characteristic on which the product failed

The retest procedure shall be given in the manufacturer's quality plan.

6.4 Process verification tests (PVT)

Those characteristics specified in ISO 15877-2 and ISO 15877-3 and listed in Tables 10 and 11 shall be subject to PVTs with the minimum sampling frequency given in Table 10 or Table 11, as applicable, if not type tested or audit tested in the same period.

Table 10 — Characteristics of pipes and minimum sampling frequencies for PVTs

Characteristic	Reference	Minimum sampling frequency
Resistance to internal pressure (95 °C, 1 000 h)	ISO 15877-2:2009, Tables 5 and 6	3 test pieces per year per diameter[a]
[a] For multiple product lines, a rotating sampling procedure shall be considered. The manufacturer's quality plan shall give details accordingly.		

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

Characteristic	Reference	Minimum sampling frequency[a]
Resistance to internal pressure	ISO 15877-3:2009, Clause 7, Tables 16 and 17	3 test pieces per year per size group and fitting group
a For multiple cavity moulds, a rotating sampling procedure between the cavities for testing during the shifts shall be considered. The manufacturer's quality plan shall give details accordingly.		

If the product does not conform to the requirements in respect of any characteristic given in Tables 10 or 11, 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 Tables 10 or 11, as applicable.

A test performed as an AT does not need to be repeated as a PVT.

6.5 Audit tests (AT)

ATs are performed if certification is involved only.

Those characteristics specified in ISO 15877-2, ISO 15877-3 and ISO 15877-5 and listed in Table 12 to Table 14 are intended to be audit tested with the minimum sampling frequency as given in Table 12 to Table 14, as applicable.

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

Characteristic	Reference	Minimum sampling frequency
Appearance	ISO 15877-2:2009, 5.1	3 test pieces per year per size group
Dimensions	ISO 15877-2:2009, Tables 3 and 4	3 test pieces per year per size group
Resistance to internal pressure (95 °C, 1 000 h)	ISO 15877-2:2009, Tables 5 and 6	3 test pieces per year per size group
Longitudinal reversion	ISO 15877-2:2009, Tables 10 and 11	3 test pieces per year per size group
Marking	ISO 15877-2:2009, Clause 11, Table 12	3 test pieces per year per size group
Impact resistance	ISO 15877-2:2009, Tables 7 and 8	3 test pieces per year per size group

Table 13 — Characteristics of fittings and minimum sampling frequencies for ATs

Characteristic	Reference	Minimum sampling frequency[a]
Appearance	ISO 15877-3:2009, 5.1	3 fittings per year per size group and fitting group
Dimensions	ISO 15877-3:2009, Clause 6	3 fittings per year per size group and fitting group
Resistance to internal pressure (80 °C, 3 000 h)	ISO 15877-3:2009, Clause 7	3 fittings per year per size group and fitting group
Marking	ISO 15877-3:2009, Clause 11	3 fittings per year per size group and fitting group
a Change of fitting group, diameter and pressure group is recommended every visit to ensure that all fittings are tested over time. For multiple cavity moulds, a rotating sampling procedure between the cavities for testing during the shifts shall be considered. The manufacturer's quality plan shall give details accordingly. In such cases where more than one product is made per mould (family mould), sampling shall include all products.		