PD CEN/TS 1852-2:2015

BSI Standards Publication

Plastics piping systems for non-pressure underground drainage and sewerage — Polypropylene (PP)

Part 2: Guidance for the assessment of conformity

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National foreword

This Published Document is the UK implementation of CEN/TS 1852-2:2015. It supersedes DD CEN/TS 1852-2:2009 which is withdrawn.

The UK participation in its preparation was entrusted to Technical Committee PRI/88/1, Plastics piping for non-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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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
EUROPÄISCHES KOMITEE FÜR NORMUNG

CEN-CENELEC Management Centre: Avenue Marnix 17, B-1000 Brussels

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European foreword

This document (CEN/TS 1852-2:2015) has been prepared by Technical Committee CEN/TC 155 “Plastics piping systems and ducting systems”, the secretariat of which is held by NEN.

This document supersedes CEN/TS 1852-2:2009.

The main change compared to the previous version concerns the compliance with the latest version of the template for assessment of conformity.

EN 1852 consists of the following parts, under the general title Plastics piping systems for non-pressure underground drainage and sewerage — Polypropylene (PP)

— Part 1: Specifications for pipes, fittings and the system

— Part 2: Guidance for the assessment of conformity (the present TS)

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Introduction

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, pipes, fittings, joints or assemblies by manufacturers is given in Figure 1.

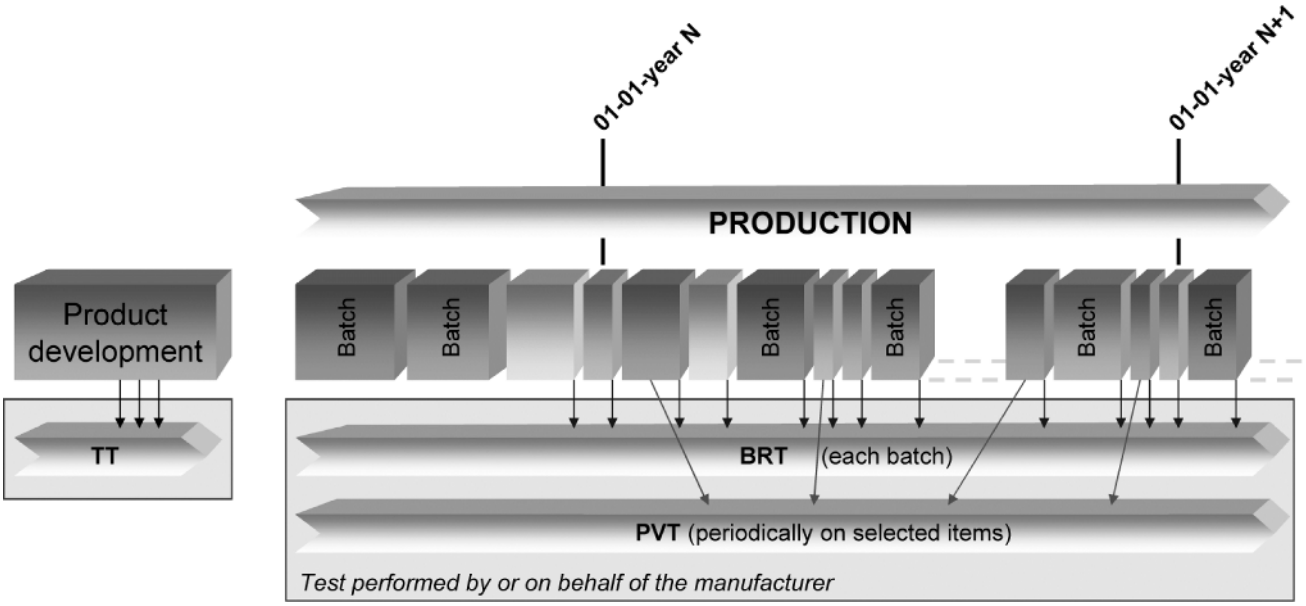

Figure 1 — Typical scheme for the assessment of conformity by a manufacturer

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

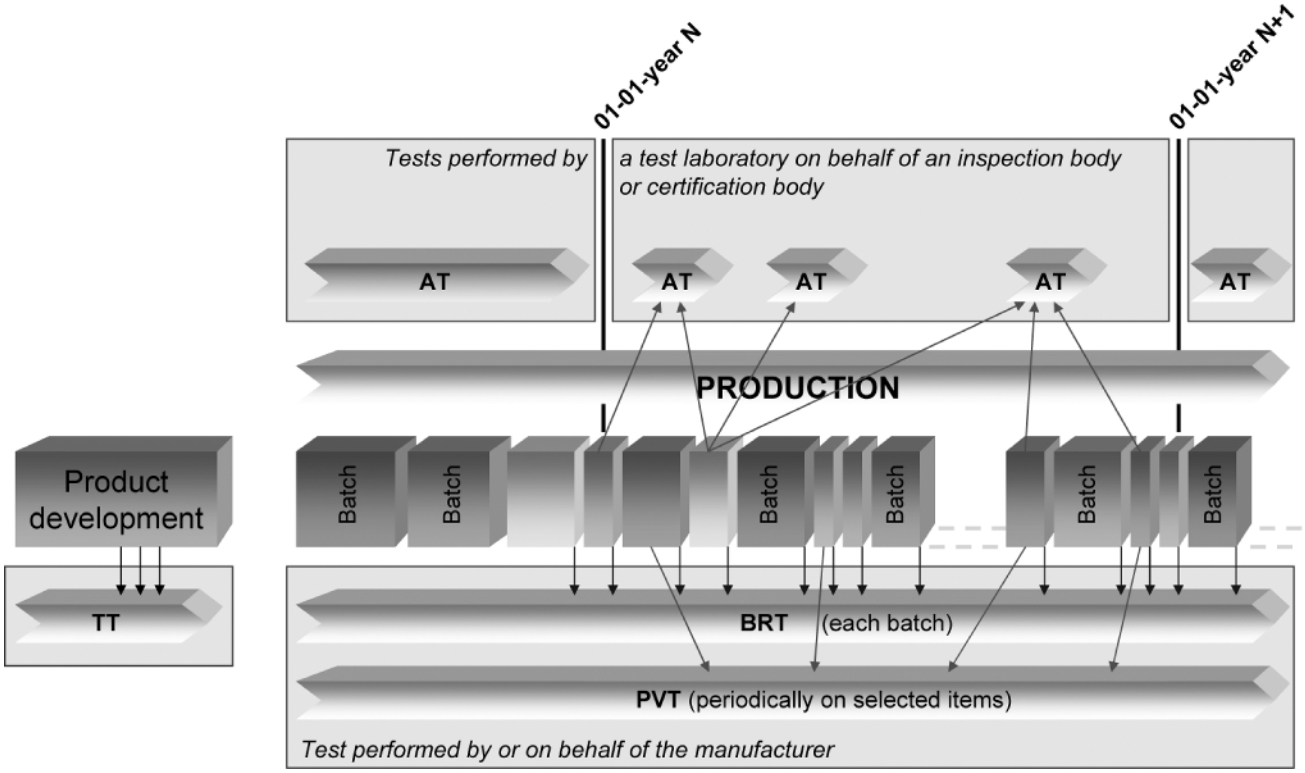

Figure 2 — Typical scheme for the assessment of conformity by a manufacturer, including certification

1 Scope

This Technical Specification gives guidance for the assessment of conformity of materials, products, joints and assemblies in accordance with the applicable part(s) of EN 1852 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 EN 1852-1 this document is applicable to solid wall piping systems made of polypropylene (PP) intended to be used for:

— non-pressure underground drainage and sewerage outside the building structure (application area code "U"), and

— non-pressure underground drainage and sewerage for both buried in ground within the building structure (application area code "D") and outside the building structure.

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

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 1852-1:2009, *Plastics piping systems for non-pressure underground drainage and sewerage - Polypropylene (PP) - Part 1: Specifications for pipes, fittings and the system*

3 Terms and definitions

For the purposes of this document, the following terms and definitions given in EN 1852-1 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 17021-1 [1].

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 1852, the materials and products can be subjected 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 [3].

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 [4].

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 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 materials 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 materials, products or joints at specific intervals to confirm 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 materials 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 material, 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 of 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, i.e. antioxidants, pigments, stabilizers and others, at a dosage level necessary for the processing and the intended use of the final product

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

3.21
joint
connection between two products

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

3.23
thermoplastics fabricated fitting
fitting produced from pipe and/or from injection-moulded fittings by thermoforming, solvent-cementing or welding

3.24
assembly
product that can be dismantled into a set of components

EXAMPLE A test piece consisting of various products.

3.25
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 or tests to be made

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

3.26
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.

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.

	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

Materials, products, joints and assemblies shall conform to the requirements given in EN 1852-1.

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

NOTE It is advised that the quality management system conforms to or is no less stringent than the relevant requirements to EN ISO 9001 [4].

6 Testing and inspection

6.1 Material specification

For the purposes of this Technical Specification, the material specification consists of a polypropylene (PP) compound with specific trade name and additives with known dosage level.

The re-use of materials is permitted as specified in EN 1852-1:2009, 4.2.

When a masterbatch is used, it shall be considered as a change of compound, if the type of carrier of the pigment is changed.

6.2 Grouping

6.2.1 General

For the purposes of this Technical Specification, the groups specified in 6.2.2 and 6.2.3 applies.

6.2.2 Size groups

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

For testing purposes, one individual nominal diameter, d_n, shall be selected from each group.

Table 1 — Size groups

Size group	Nominal outside diameter, d_n mm
1	$d_n \leq 200$
2	$200 < d_n \leq 500$
3	$500 < d_n \leq 1\,200$
4	$1\,200 < d_n \leq 1\,600$

6.2.3 Fitting groups

Three groups of fittings each having a similar design are defined, as given in Table 2.

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

Table 2 — Fitting groups

Fitting group	Type of fitting
1	Bends
2	Branches
3	Other fittings

Push fit fittings and fusion fittings shall be considered separately for each group.

6.3 Type testing (TT)

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

Type tests, to be carried out when a change of the production site occurs, depend on the extent of the change. Therefore relevant type tests should be defined individually by the manufacturer.

Type tests shall demonstrate that the products conform to all requirements for the characteristics given in Table 3 to Table 5 as applicable.

Table 3 — Characteristics of pipes that require type testing (TT)

Characteristic	Reference to clause or subclause of EN 1852-1:2009	Conditions requiring test [a]				Sampling procedure	
		N	D	M	E	Manufacturer	Certification body [b]
Melt mass-flow rate (MFR-value)	4.3	+	-	+	-	Once per material	Once per material
Resistance to internal pressure	4.4 – Table 1	+	-	+	-	Once per material with one optional dimension	Once per material with one optional dimension
Thermal stability (OIT)[c]	4.5	+	-	+	-	Once per material	Once per material
Appearance	5.1	+	-	-	+	Once per size	Once per size group
Colour	5.2	+	-	-	+	Once per size	Once per size group
Geometrical characteristics	6.2 and 6.4 – Tables 2, 3, 4, 6 and 7	+	+	-	+	Once per size	Once per size group
Impact resistance (round-the-clock method)	7.1.1 – Table 8	+	-	-	+	Once per size per material	Once per size group
		-	-	+	-	Once per material	Once per material
Impact resistance (staircase method)[d]	7.1.2 – Table 9	+	-	-	+	Once per size per material	Once per size group
		-	-	+	-	Once per material	Once per material
Ring stiffness	7.1.1 – Table 8	+	-	+	+	Once per SN class/material	Once per SN class/material
Longitudinal reversion	8.1 – Table 11	+	-	-	+	Once per size	Once per size group
Marking	11.2 – Table 15	+	-	-	+	Once per size	Once per size group

a N : new system;

D : change in design;

M : change of material;

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 for a certification body.

c For butt fusion application only.

d Only for pipes intended to be installed at temperature below -10°C. If this test is required, then the round-the-clock method is not necessary.

Table 4 — Characteristics of fittings that require type testing (TT)

Characteristic	Reference to clause or subclause of EN 1852-1:2009	Conditions requiring test [a]					Sampling procedure	
		N	D	M	P	E	Manufacturer	Certification body [b]
Melt mass-flow rate (MFR-value)	4.3	+	-	+	-	-	Once per material	Once per material
Resistance to internal pressure[c]	4.4 – Table 1	+	-	+	-	-	Once per material with one optional dimension	Once per material with one optional dimension
Thermal stability [d]	4.5	+	-	+	-	-	Once per material	Once per material
Appearance	5.1	+	-	-	+	+	Once per each fitting	Once per fitting group
Colour	5.2	+	-	-	+	+	Once per each fitting	Once per fitting group
Geometrical characteristics	6.3 and 6.4 – Tables 5, 6 and 7	+	+	-	+	+	Once per each fitting	Once per fitting group
Flexibility or mechanical strength [e]	7.2 – Table 10	+	+	-	+	+	Once per each fitting	Once per fitting group
Impact strength (drop test)	7.2 – Table 10	+	+	+	+	-	Once per each fitting	Once per fitting group
Effect of heating [f]	8.2 – Table 12	+	+	+	+	+	Once per each fitting	Once per fitting group
Marking	11.3 – Table 16	+	-	-	+	+	Once per each fitting	Once per fitting group

a N : new system;

D : change in design;

M : change of material;

P : change of production method;

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 for a certification body.

c Not to be repeated for fitting material when the material is the same as for pipes and already tested for that purpose.

d For butt fusion application only.

e Only for fabricated fittings made from more than one piece.

f Only for injection-moulded parts.

Table 5 — Characteristics of fitness for purpose of the system that require type testing (TT)

Characteristic	Reference to clause or subclause of EN 1852-1:2009	Conditions requiring test [a]				Sampling procedure	
		N	D	M	E	Manufacturer	Certification body [b]
Tightness of elastomeric sealing ring joints [c, d]	9 – Table 14	+	+	-	+	Once per size per joint design [e]	Once per size per joint design [e]
Elevated temperature cycling	9 – Table 14	+	+	+	-	Once per material per joint design [e] on the smallest produced stiffness class	Once per material per joint design [e] on the smallest produced stiffness class

a N : new system;

D : change in design;

M : change of material;

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 for a certification body.

c Not required for butt fusion joints.

d Only to be tested on fittings if the socket of the fitting is different from the socket of the pipe.

e Joint design at least includes: seal design, groove geometry and seal hardness (± 5 IRHD)

6.4 Batch release tests

Those characteristics specified in EN 1852-1 and listed in Table 6 and Table 7 shall be subject to BRTs with the minimum sampling frequency as given in Table 6 or Table 7, as applicable.

Table 6 — Characteristics of pipes and minimum sampling frequencies for BRTs

Characteristic	Reference to clause or subclause of EN 1852-1:2009	Minimum sampling frequency
Appearance	5.1	Once at start up and then every 8 h
Colour	5.2	Once at start up and then every 8 h
Mean outside diameter	6.2.1 – Table 2 6.2.2 – Table 3	Once at start up and then every 8 h
Length of pipe	6.2.3	Once at start up and then every 8 h
Chamfer[a]	6.2.4	Once at start up and then every 8 h
Wall thickness	6.2.5 – Table 4	Once at start up and then every 8 h
Socket dimensions[b]	6.4.1 – Table 6 6.4.2 – Table 7	Once at start up and then every 8 h
Impact resistance (round-the-clock method)	7.1.1 – Table 8	Once at start up and then every week
Longitudinal reversion	8.1 – Table 11	Once at start up and then every week
Marking	11.2 – Table 15	Once at start up and then every 8 h

[a] If a chamfer is required.

[b] Only for dimensions which are influenced by the process.

Table 7 — Characteristics of fittings and minimum sampling frequencies for BRTs

Characteristic	Reference to clause or subclause of EN 1852-1:2009	Minimum sampling frequency
For injection-moulded fittings		
Appearance	5.1	Once per cavity at start up and then every 8 h
Colour	5.2	Once per cavity at start up and then every 8 h
Wall thickness [a]	6.3.3 – Table 5	Once per cavity at start up
Socket and spigot dimensions [a]	6.4	Once per cavity at start up and then every 8 h
Effect of heating	8.2 – Table 12	Once per cavity at start up and then every week
Marking	11.3 – Table 16	Once per cavity at start up
For thermoplastics fabricated fittings		
Watertightness	8.2 – Table 13	One sample for each type of fabricated fitting / 8h
[a] Only for dimensions which are influenced by the process.		

The manufacturer shall specify a batch in his quality plan.

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 6 or Table 7, 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 as follows:

Find the last product, which conforms to the requirements as specified in EN 1852-1. Release all products produced before that point and reject the products produced after that point;

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

6.5 Process verification tests

Those characteristics specified in EN 1852-1 and listed in Table 8 to Table 10 shall be subject to PVTs with the minimum sampling frequency given in Table 8 to Table 10, as applicable, if not type tested or audit tested in the same period.

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

Characteristic	Reference to clause or subclause of EN 1852-1:2009	Minimum sampling frequency
Resistance to internal pressure	4.4 – Table 1	Once per year per material currently used with one optimal dimension
Thermal stability (OIT)[a]	4.5	Once per year per material currently used
Ring stiffness	7.1.1 – Table 8	Once per year per material and size group and pipe series
Impact resistance (staircase method)[b]	7.1.2 – Table 9	Once per month per size and material currently used
Melt mass-flow rate (MFR-value)	8.1 – Table 11	Once per year per material currently used
[a] For butt fusion application only. [b] Only for pipes intended to be installed of temperatures below -10°C.		

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

Characteristic	Reference to clause or subclause of EN 1852-1:2009	Minimum sampling frequency
Melt mass-flow rate (MFR-value) [b]	4.3	Once per year per material currently used
Resistance to internal pressure [b]	4.4 – Table 1	Once per 2 years per material currently used with one optional dimension
Thermal stability (OIT)[a, b]	4.5	Once per year per material currently used
Flexibility or mechanical strength [c]	7.2 – Table 10	Once per year per size group per socket design
[a] For butt fusion application only. [b] Not to be repeated for fittings material when the material is the same as for pipes and already tested for this purpose. [c] Only for fabricated fittings made from more than one piece. A sealing ring retaining mean is not considered as a piece.		

Table 10 — Characteristics for fitness for purpose and minimum sampling frequencies for PVTs

Characteristic	Reference to clause or subclause of EN 1852-1:2009	Minimum sampling frequency
Tightness of elastomeric sealing ring joints	9 – Table 14	Once per 2 years per size group per joint design[a]
Elevated temperature cycling	9 – Table 14	Once per 3 years per joint design[a] and material currently used/applicable series with lowest wall thickness
[a] Joint design at least includes: seal design, groove geometry and seal hardness (± 5 IHRD)		

If the product does not conform to the requirements in respect of any characteristic given in Table 8 to Table 10, 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 8 to Table 10, as applicable.

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

6.6 Audit tests

ATs are performed if certification is involved only.

Those characteristics specified in EN 1852-1 and listed in Table 11 to Table 13 are intended to be audit tested with the minimum sampling frequency as given in Table 11 to Table 13, as applicable.

Table 11 — Characteristics of pipes and minimum sampling frequencies for ATs

Characteristic	Reference to clause or subclause of EN 1852-1:2009	Minimum sampling frequency
Melt mass-flow rate (MFR-value)	4.3	Once per year per material currently used
Resistance to internal pressure	4.4 – Table 1	Once per 3 years per material currently used with one optional dimension
Thermal stability (OIT) [a]	4.5	One per year per material currently used.
Appearance	5.1	Once per year per size group
Colour	5.2	Once per year per size group
Geometrical characteristics	6.2 and 6.4 – Tables 2, 3, 4, 6 and 7	Once per year per size group
Impact resistance (round-the-clock method)[b]	7.1.1 – Table 8	Once per year per size group
Impact resistance (staircase method)[c]	7.1.2 – Table 9	Once per year per size group
Ring stiffness	7.1.1 – Table 8	Once per year per size group
Longitudinal reversion	8.1 – Table 11	Once per year per size group
Marking	11.2 – Table 15	Once per year per size group

[a] For butt fusion only.

[b] Not to be tested if the staircase method is performed.

[c] Only for pipes intended to be installed at temperatures below -10 °C.

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

Characteristic	Reference to clause or subclause of EN 1852-1:2009	Minimum sampling frequency
Melt mass-flow rate (MFR-value)	4.3	Once per year per material currently used
Resistance to internal pressure[a]	4.4 – Table 1	Once per 3 years per material currently used with one optional dimension
Thermal stability (OIT) [a, b]	4.5	One per year per material currently used.
Appearance	5.1	Once per year per fitting group
Colour	5.2	Once per year per fitting group
Geometrical characteristics	6.3 and 6.4 – Tables 5, 6 and 7	Once per year per fitting group
Effect of heating[c]	8.2 – Table 12	Once per year per fitting group
Marking	11.3 – Table 16	Once per year per fitting group

[a] Not to be repeated for fittings material when the material is the same as for pipes and already tested for this purpose.

[b] For butt fusion only.

[c] Only for injection moulded parts.

Table 13 — Characteristics for fitness for purpose of the system and minimum sampling frequencies for ATs

Characteristic	Reference to clause or subclause of EN 1852-1:2009	Minimum sampling frequency
Tightness of elastomeric sealing ring joints	9 – Table 14	Once per 2 years on one size
Elevated temperature cycling	9 – Table 14	Once per 3 years per joint design[a] on the smallest wall thickness produced

[a] Joint design at least includes: seal design, groove geometry and seal hardness (± 5 IHRD).

The sizes, types and classes selected for tests should preferably be primarily those which have not previously been selected for audit testing. Samples should be preferably taken from the largest volume of production per group.

Certification bodies may accept process verification tests (PVT) as audit tests (AT) if witnessed by them or by their agencies.

6.7 Indirect tests

Generally, testing shall be performed using the test methods referred to in EN 1852-1.

ITs may be used for BRT characteristics as given in Table 6 and Table 7. Indirect testing shall not be used for TTs, PVTs and ATs.

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 BRTs as specified in Table 6 and Table 7, as applicable, shall be used.

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

6.8 Test records

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

Annex A
(informative)

Basic test matrix

Table A1 — Basic test matrix

Characteristic	TT	BRT	PVT	AT
Pipes				
Melt mass-flow rate (MFR-value)	+		+	+
Resistance to internal pressure	+		+	+
Thermal stability (OIT)	+		+	+
Appearance	+	+		+
Colour	+	+		+
Geometrical characteristics	+	+		+
Impact resistance (round-the-clock method)	+	+		+
Impact resistance (staircase method)	+		+	+
Ring stiffness	+		+	+
Longitudinal reversion	+	+		+
Marking	+	+		+
Fittings				
Melt mass-flow rate (MFR- value	+		+	+
Resistance to internal pressure	+		+	+
Thermal stability	+		+	+
Appearance	+	+		+
Colour	+	+		+
Geometrical characteristics	+	+		+
Flexibility or mechanical strength	+		+	
Impact strength (drop test)	+			
Effect of heating	+	+		+
Marking	+	+		+
Watertightness		+		
Fitness for purpose				
Tightness of elastomeric sealing ring joints	+		+	+
Elevated temperature cycling	+		+	+

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