PD CEN/TS 12201-7:2014

BSI Standards Publication

Plastics piping systems for water supply, and for drainage and sewerage under pressure — Polyethylene (PE)

Part 7: Guidance for the assessment of conformity

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National foreword

This Published Document is the UK implementation of CEN/TS 12201-7:2014. It supersedes DD CEN/TS 12201-7:2003 and DD CEN/TS 13244-7:2003, which are withdrawn.

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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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Plastics piping systems for water supply, and for drainage and sewerage under pressure - Polyethylene (PE) - Part 7: Guidance for the assessment of conformity

Systèmes de canalisations en plastique pour l'alimentation en eau et pour les branchements et les collecteurs d'assainissement avec pression - Polyéthylène (PE) - Partie 7: Guide pour l'évaluation de la conformité

Kunststoff-Rohrleitungssysteme für die Wasserversorgung und für Entwässerungs- und Abwasserdruckleitungen - Polyethylen (PE) - Teil 7: Empfehlungen für die Beurteilung der Konformität

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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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Foreword

This document (CEN/TS 12201-7:2014) 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 CEN/TS 12201-7:2003 and CEN/TS 13244-7:2003.

EN 12201, *Plastics piping systems for water supply, and for drainage and sewerage under pressure — Polyethylene (PE)*, consists of the following parts:

— EN 12201-1, *Plastics piping systems for water supply, and for drainage and sewerage under pressure — Polyethylene (PE) — Part 1: General*

— EN 12201-2, *Plastics piping systems for water supply, and for drainage and sewerage under pressure — Polyethylene (PE) — Part 2: Pipes*

— EN 12201-3, *Plastics piping systems for water supply, and for drainage and sewerage under pressure — Polyethylene (PE) — Part 3: Fittings*

— EN 12201-4, *Plastics piping systems for water supply, and for drainage and sewerage under pressure — Polyethylene (PE) — Part 4: Valves*

— EN 12201-5, *Plastics piping systems for water supply, and for drainage and sewerage under pressure — Polyethylene (PE) — Part 5: Fitness for purpose of the system*

— CEN/TS 12201-7, *Plastics piping systems for water supply, and for drainage and sewerage under pressure — Polyethylene (PE) — Part 7: Guidance for the assessment of conformity*

This issue of CEN/TS 12201-7 takes into account the technical changes made in the revision of EN 12201-1, EN 12201-2, EN 12201-3, EN 12201-5 and EN 12201-4, published in 2011 and respectively in 2012. Guidance for the assessment of conformity given in this document has been revised to reflect the changes made to test methods and requirements given in EN 12201-1, EN 12201-2, EN 12201-3, EN 12201-4 and EN 12201-5. Two new types of pipe have been introduced, i.e. coextruded pipes and peelable layer pipes. The sampling procedures and sampling frequencies for these types of pipes have been introduced into the tables for TT, BRT, PVT and AT for pipes.

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

Figure 1 and Figure 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 test, i.e. type testing (TT), batch release test (BRT), process verification test (PVT), and audit test (AT), this part of EN 12201 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, pipes, fittings, valves, joints or assemblies by manufacturers is given in Figure 1.

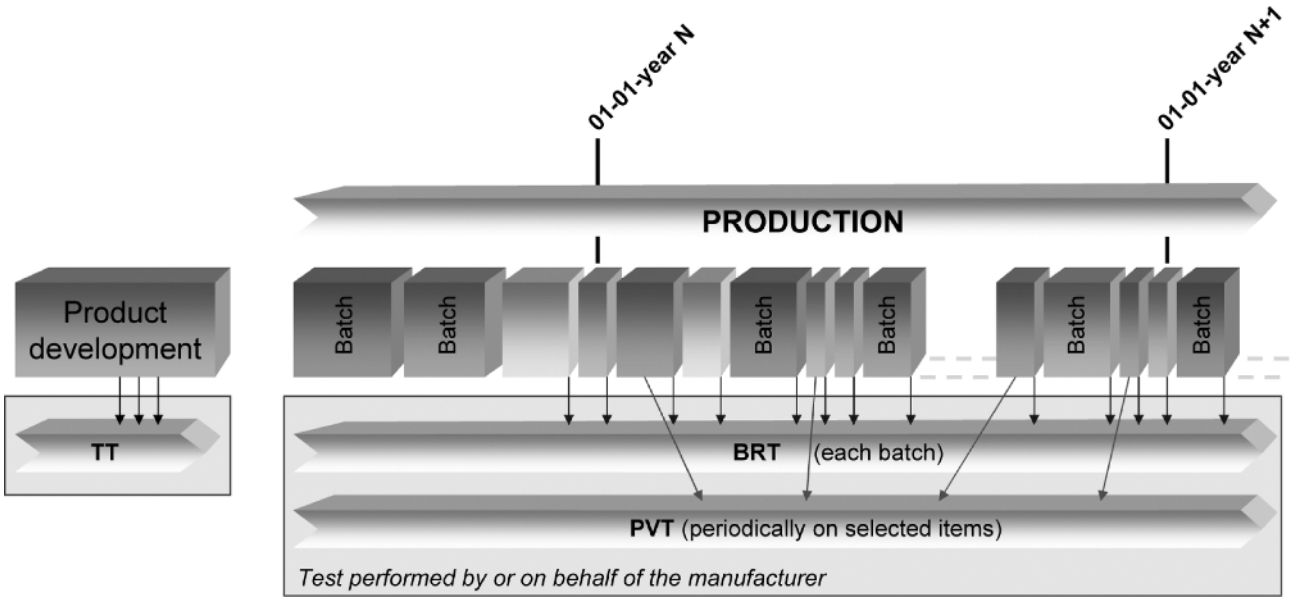

Figure 1 — Typical scheme for the assessment of conformity by a manufacturer

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

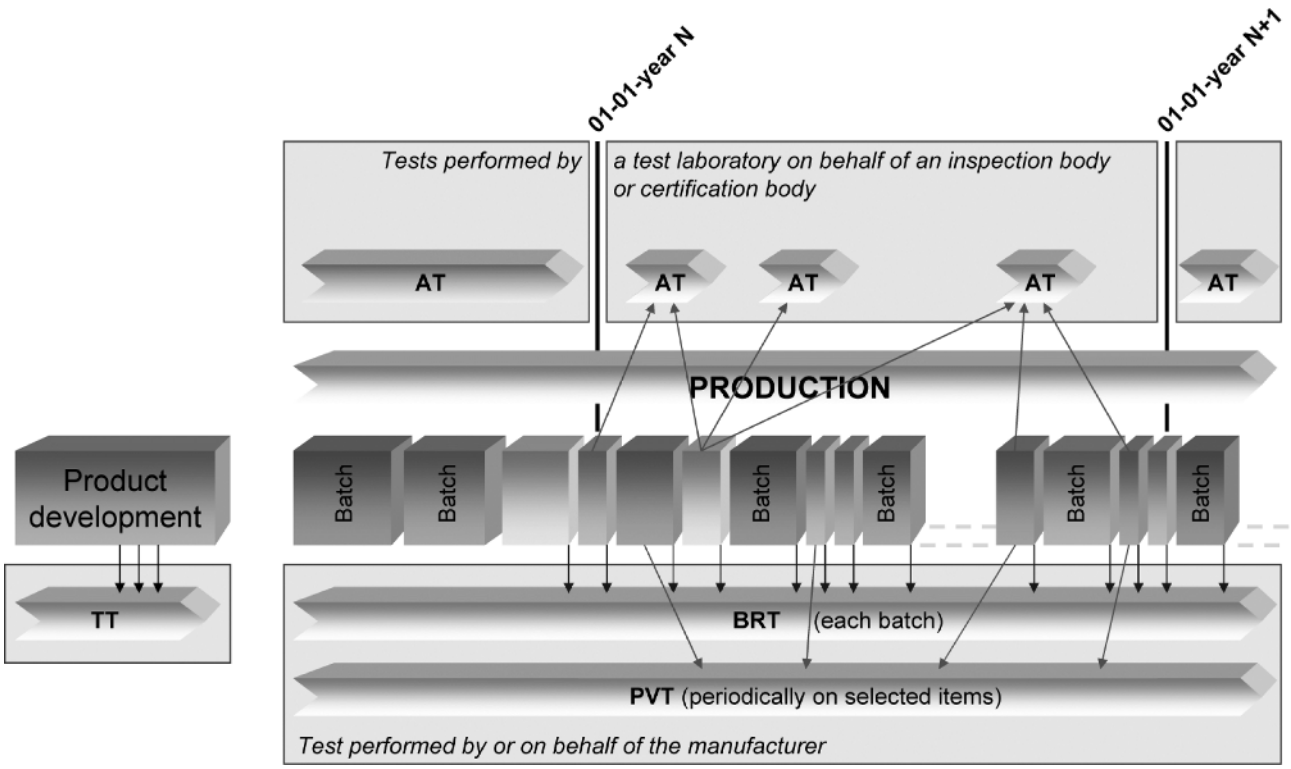

Figure 2 — Typical scheme for the assessment of conformity by a manufacturer, including certification

1 Scope

This part of EN 12201 gives guidance for the assessment of conformity of compounds, products, joints and assemblies in accordance with the applicable part(s) of EN 12201 intended to be included in the manufacturer's quality plan as part of the quality management system and for the establishment of certification procedures.

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 1 If certification is involved, the certification and inspection body is preferably compliant with EN ISO/IEC 17065 [5], EN ISO/IEC 17021 [3] or EN ISO/IEC 17020 [2], as applicable.

In conjunction with Parts 1 to 5 of EN 12201 (see Foreword) this document is applicable to polyethylene (PE) plastics piping systems for water supply, and for drainage and sewerage under pressure. It is applicable to PE pipes, fittings, and valves, their joints and to joints with components of other materials intended to be used under the following conditions:

a) allowable operating pressure, PFA, up to 25 bar[1)];

b) an operating temperature of 20 °C as a reference temperature;

c) buried in the ground;

d) sea outfalls;

e) laid in water;

f) above ground, including pipes suspended below bridges.

NOTE 2 For applications operating at constant temperature greater than 20 °C and up to 40 °C, see EN 12201-1:2011, Annex A.

NOTE 3 It is the responsibility of the purchaser or specifier to make the appropriate selections from these aspects, taking into account their particular requirements and any relevant national guidance or regulations and installation practices or codes.

2 Normative references

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

EN 12201-1:2011, *Plastics piping systems for water supply, and for drainage and sewerage under pressure - Polyethylene (PE) - Part 1: General*

EN 12201-2:2011+A1:2013, *Plastics piping systems for water supply, and for drainage and sewerage under pressure - Polyethylene (PE) - Part 2: Pipes*

EN 12201-3:2011+A1:2012, *Plastics piping systems for water supply, and for drainage and sewerage under pressure - Polyethylene (PE) - Part 3: Fittings*

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1) 1 bar = 0,1 MPa = 10^5 Pa; 1 MPa = 1 N/mm^2

EN 12201-4:2012, *Plastics piping systems for water supply, and for drainage and sewerage under pressure - Polyethylene (PE) - Part 4: Valves*

EN 12201-5:2011, *Plastics piping systems for water supply, and for drainage and sewerage under pressure - Polyethylene (PE) - Part 5: Fitness for purpose of the system*

EN ISO 6259-1, *Thermoplastics pipes - Determination of tensile properties - Part 1: General test method (ISO 6259-1)*

EN ISO 12162, *Thermoplastics materials for pipes and fittings for pressure applications - Classification, designation and design coefficient (ISO 12162)*

EN ISO 13477, *Thermoplastics pipes for the conveyance of fluids - Determination of resistance to rapid crack propagation (RCP) - Small-scale steady-state test (S4 test) (ISO 13477)*

EN ISO 13478, *Thermoplastics pipes for the conveyance of fluids - Determination of resistance to rapid crack propagation (RCP) - Full-scale test (FST) (ISO 13478)*

ISO 14236, *Plastics pipes and fittings - Mechanical-joint compression fittings for use with polyethylene pressure pipes in water supply systems*

ISO 17885, *Plastics piping systems - Mechanical fittings for pressure piping systems - Specifications* [2)]

ISO 21751, *Plastics pipes and fittings - Decohesion test of electrofusion assemblies - Strip-bend test*

3 Terms and definitions

For the purposes of this document, the terms and definitions given in EN 12201-1:2011, EN 12201-2:2011+A1:2013, EN 12201-3:2011+A1:2012, EN 12201-4:2012 and EN 12201-5:2011 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 12201, the materials and products can be subjected to type testing, batch release testing, process verification testing, audit testing, and witness testing, as applicable.

2) At the time of publication of this Technical Specification, this document is still in development and can be found under ISO/DIS 17885.

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 compound or products, which is satisfactorily completed before the batch can be released

3.8
process verification test
PVT
test performed by or on behalf of the manufacturer on compound or products or joints or assemblies at specific intervals to confirm that type tests originally performed on the compound or products or joints or assemblies continue to be valid and 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 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 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 composition (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
clearly defined homogenous mixture of base polymer with additives, i.e. antioxidants, pigments, stabilisers 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 manufactured continuously under uniform conditions and defined and identified by the compound 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 conforming to the same specification

Note 1 to entry: The product 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.

Note 2 to entry: The test pieces required for each test are taken from the sample. This information is given in this document, in the product standard or in the relevant test method standard.

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 or compound, brought to the market as part of another product or as a spare part

Note 1 to entry: Components may be considered as products and be individually approved (e.g. o-rings and gaskets) or they are tested as integral part of a finished product (e.g. in a valve).

3.21
joint
connection between two or more 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 type of test, 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.

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
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 Compounds, products, joints and assemblies shall conform to the requirements given in EN 12201-1:2011, EN 12201-2:2011+A1:2013, EN 12201-3:2011+A1:2012, EN 12201-4:2012, and EN 12201-5:2011.

NOTE For socket fusion fittings according to EN 12201–3+A1:2012, Annex A, assessment of conformity may be agreed between the manufacturer and the end user.

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

6 Testing and inspection

6.1 Grouping

6.1.1 General

For the purposes of this Technical Specification, the groups and types specified in 6.1.2, 6.1.3 and 6.1.4 applies.

6.1.2 Size groups

Five size groups are defined 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	$710 \leq d_n < 1\,800$
5	$1\,800 \leq d_n \leq 2\,500$

6.1.3 Fitting groups

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

Table 2 — Fitting groups

Fitting groups	Fitting type
(A)	Electrofusion socket fitting
(B)	Electrofusion saddle fitting
(C)	Spigot end fitting
(D)	Fabricated fitting

6.1.4 Fitting types

Fitting groups are divided in fitting types.

Fitting group (A) includes the following fitting types: Electrofusion couplers, electrofusion 45° elbows, electrofusion 90° elbows, electrofusion tees, electrofusion reducers, electrofusion end caps, etc.

Fitting group (B) includes the following fitting types: Electrofusion tapping saddles, electrofusion branch saddles, etc.

Fitting group (C) includes the following fitting types: 45° elbows, 90° elbows, tees, reducers, end caps, etc.

Fitting group (D) includes the following fitting types: Swept bends, segmented bends, segmented tees, etc.

6.2 Type testing

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

Type tests, to be carried out when occurs a change of the production site, 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 Tables 3 to 6, as applicable.

In case of a change in compound as defined in A.2, relevant type testing requirements as defined in A.3, and in Tables 3 to 6 as applicable, shall apply.

Effect on water quality shall only be considered for compounds and products intended for the conveyance of water for human consumption.

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

a) dimensions and geometry (see column D1 of Tables 5 and 6), as: change of visual and functional optimisations, change of overall dimensions, change of a non-PE part;

b) joint affected part (see column D2 of Tables 5 and 6), as: change of the dimensions of the fusion zone (e.g. wire pitch, wire depth), the electrical characteristics (e.g. wire, resistance), the fusion parameters (e.g. time, voltage).

For the extension of the production range, the relevant characteristics given in Tables 4 to 6, column E, as applicable, shall be retested. If certification is involved, retesting shall be agreed between the certification body and the manufacturer.

For fabricated fittings, guidance for type testing is given in Annex B.

Table 3 — Characteristics of compounds that require type testing (TT) by the compound manufacturer

Characteristic	Reference to part, clause or subclause of EN 12201	Sampling procedure
Compound density	EN 12201–1:2011, 4.4.1	3 samples/ compound
Oxidation induction time (thermal stability)	EN 12201–1:2011, 4.4.1	3 samples/ compound
Melt mass-flow rate (MFR)	EN 12201–1:2011, 4.4.1	3 samples/ compound
Volatile content	EN 12201–1:2011, 4.4.1	1 sample/ compound
Water content [a]	EN 12201–1:2011, 4.4.1	1 sample/compound
Carbon black content [b]	EN 12201–1:2011, 4.4.1	3 samples/ compound
Carbon black dispersion [b]	EN 12201–1:2011, 4.4.1	1 sample/ compound
Pigment dispersion [c]	EN 12201–1:2011, 4.4.1	1 sample/ compound
Resistance to weathering	EN 12201–1:2011, 4.4.2	Once/compound [d]
Resistance to rapid crack propagation (critical pressure, p_c), (250 mm SDR 11 or 500 mm SDR 11)	EN 12201–1:2011, 4.4.2	Number of test pieces shall conform to EN ISO 13477 or EN ISO 13478, Once/compound
Resistance to slow crack growth (d_n: 110 mm SDR 11)	EN 12201–1:2011, 4.4.2	3 test pieces/compound
Determination of the failure mode in a tensile test on a butt fusion weld (d_n: 110 mm SDR 11)	EN 12201–1:2011, 4.5.1	3 samples/compound
	EN 12201–1:2011, 4.5.2	3 samples/compound
Classification	EN 12201–1:2011, 4.6	Shall conform to EN ISO 12162, Once/compound
Effect on water quality	EN 12201–1:2011, 5	National regulation apply

[a] Only applicable if the requirement for volatile content is not conformed to. In case of dispute, the requirement for water content shall apply.

[b] Only applicable for black compound.

[c] Only applicable for non-black compound.

[d] Three pieces for elongation at break/ Three pieces for hydrostatic strength / One sample for decohesion of an electrofusion joint.

Table 4 — Characteristics of pipes, including coextruded pipes and peelable layer pipes that require type testing (TT)

Characteristic [g]	Reference to part, clause or subclause of EN 12201	Conditions requiring test [a]				Sampling procedure	
		N	D	M	E	Manufacturer [b]	Certification body [b, c]
Appearance	EN 12201–2:2011+A1:2013, 5.1	+	+	+	+	1 test piece of each diameter	1 test piece of one diameter/ size group
Colour	EN 12201–2:2011+A1:2013, 5.2	+	+	+	+	1 test piece of each diameter	1 test piece of one diameter/ size group
Effect on water quality	EN 12201–2:2011+A1:2013, 5.3	+	-	+	-	National regulation apply	
Geometrical characteristics	EN 12201–2:2011+A1:2013, 6	+	-	+	+	1 test piece of each diameter	1 test piece of one diameter/ size group
Hydrostatic strength (20 °C, 100 h)	EN 12201–2:2011+A1:2013, 7.2	+	-	+ [e]	+	3 test pieces of one diameter/size group 1, 2 and 3	3 test pieces of one diameter/ size group 1, 2 and 3
						1 test piece of one diameter/ size group 4 and 5 or by agreement with the end-user or purchaser [i]	By checking the test results of the manufacturer
Hydrostatic strength (80 °C, 1 000 h)	EN 12201–2:2011+A1:2013, 7.2	+	-	+ [e]	+	3 test pieces of one diameter/size group 1, 2 and 3	3 test pieces of one diameter/ size group 1, 2 and 3
						1 test piece of one diameter/ size group 4 and 5 or by agreement with the end-user or purchaser [i]	By checking the test results of the manufacturer
Elongation at break	EN 12201–2:2011+A1:2013, 7.2	+	-	+ [e]	+	Number of test pieces shall conform to EN ISO 6259-1, One sample/size group	Number of test pieces shall conform to EN ISO 6259-1, One sample/ size group
Oxidation induction time (Thermal stability) [f]	EN 12201–2:2011+A1:2013, 8.2	+	-	+	-	1 sample/ size group	1 sample/ size group
Melt mass-flow rate (MFR) [f]	EN 12201–2:2011+A1:2013, 8.2	+	-	+	-	1 sample/ size group	1 sample/ size group
Longitudinal reversion [d]	EN 12201–2:2011+A1:2013, 8.2	+	-	+	+	1 sample/ size group	1 sample/ size group
Marking	EN 12201–2:2011+A1:2013, 11.2	+	-	+	-	1 sample of each diameter	By checking the test results of the manufacturer

Characteristic [g]	Reference to part, clause or subclause of EN 12201	Conditions requiring test [a]				Sampling procedure	
		N	D	M	E	Manufacturer [b]	Certification body [b, c]
Tensile strength for butt fusion	EN 12201–5:2011, 4.2.2.1	+	-	+	-	1 sample/ size group 2	By checking the test results of the manufacturer
	EN 12201–5:2011, 4.2.2.2	+	-	+	-	1 sample/ size group 2	By checking the test results of the manufacturer
Additional tests for coextruded pipes [j]							
Integrity of the structure after deflection	EN 12201–2:2011+A1:2013, B.7	+	-	+	+	1 sample of each diameter	1 sample/ size group
Additional tests for peelable layer pipes							
Resistance to weathering [h]	EN 12201–2:2011+A1:2013, C.3	+	+	+	-	1 sample of one diameter/ peelable layer formulation	1 sample of one diameter/ peelable layer formulation
Resistance to rapid crack propagation (critical pressure, p_c), (250 mm SDR 11 or 500 mm SDR 11) [k]	EN 12201–2:2011+A1:2013, C.3	+	+	+	-	Number of test pieces shall conform to EN ISO 13477 or EN ISO 13478, Once/compound	By checking the test results of the manufacturer
Resistance to slow crack growth (d_n: 110 mm SDR 11) [k]	EN 12201–2:2011+A1:2013, C.3	+	+	+	-	3 test pieces, Once/compound	By checking the test results of the manufacturer

[a] N: new system;

D: only applicable for change of thickness of peelable layer, and change of material type or adhesive (if used) for the peelable layer;

M : change of compound;

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

+ : test to be carried out;

-: test not to be carried out.

[b] Successful testing will validate pipe with the same d_n and a higher SDR, i.e. thinner wall thickness. Where a manufacturer extends his production beyond his approval, additional relevant type testing shall be carried out.

[c] 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 prior agreement with the certification body.

[d] Longitudinal reversion is applicable to wall thickness ≤ 16 mm.

[e] For change of compound of the same MRS, 1 test piece of one diameter from the manufacturer's range.

[f] Applicable for each layer of coextruded pipe.

[g] All characteristics except marking are applicable for the base pipe of peelable layer pipe without the layer. Appearance, colour, resistance to weathering, and marking are also applicable to peelable layer pipes including the layer.

[h] Weathering of the base pipe is assessed in accordance with EN 12201–1. The weathering of peelable layer pipe with the layer is assessed by testing three test pieces for elongation at break/ three test pieces for hydrostatic strength / one sample for decohesion of an electrofusion joint.

[i] Indirect testing subject to study.

[j] For coextruded pipes, RCP and slow crack growth properties are covered by the use of compounds in conformance with EN 12201–1.

[k] Tests to be carried out with the peelable layer included. The base pipe is covered by the use of compounds in conformance with EN 12201–1.

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

Characteristic [c]	Reference to part, clause or subclause of EN 12201	Conditions requiring test [a]					Sampling procedure	
		N	D1	D2	M	E	Manufacturer	Certification body [b]
Appearance	EN 12201–3:2011+A1:2012, 5.1	+	–	–	+	+	5 test pieces/ size/ fitting type [g]	5 test pieces of one diameter/ size group/ fitting type
							1 test piece/ size/ fitting type [j]	1 test piece of one diameter/ size group/ fitting type [j]
Colour	EN 12201–3:2011+A1:2012, 5.3	+	–	–	+	+	5 test pieces/ size/fitting type [g]	5 test pieces of one diameter/ size group/ fitting type
							1 test piece/ size/ fitting type [j]	1 test piece of one diameter/ size group/ fitting type [j]
Electrical characteristics (A) (B)	EN 12201–3:2011+A1:2012, 5.4	+	–	+	-	+	5 test pieces/ size/fitting type [g]	5 test pieces of one diameter/ size group/ fitting type
							1 test piece/ size/ fitting type [j]	1 test piece of one diameter/ size group/ fitting type [j]
Geometrical characteristics	EN 12201–3:2011+A1:2012, 6	+	+	+	+	+	5 test pieces/ size/fitting type [g]	5 test pieces of one diameter/ size group/ fitting type
							1 test piece/ size/ fitting type [j]	1 test piece of one diameter/ size group/ fitting type [j]
Hydrostatic strength (20 °C,100 h)	EN 12201–3:2011+A1:2012, 7.3	+	–	–	+ [f]	+	3 test pieces/ size/ fitting type [g, l, m]	3 test pieces of one diameter/ size group/ fitting type [i]
							1 test piece/ size group/ fitting type [j, l, m, n]	By checking the test results of the manufacturer [j]
Hydrostatic strength (80 °C, 165 h) [h](C)	EN 12201–5:2011, 4.2.2	+	–	+	+	–	1 test piece/ size group/ fitting type	By checking the test results of the manufacturer
Hydrostatic strength (80 °C,1 000 h)	EN 12201–3:2011+A1:2012, 7.3	+	–	+	+ [f]	+	3 test pieces/ size/ fitting type [g, l, m]	3 test pieces of one diameter/ size group/ fitting type [i]
							1 test piece/ size group/ fitting type [j, l, m, n]	By checking the test results of the manufacturer [j]
Decohesive resistance (A)	EN 12201–3:2011+A1:2012, 7.3 EN 12201-5:2011, 4.2.3.1	+	–	+	+ [f]	+	1 test piece / size/ fitting type/ condition [g]	1 test piece of one diameter/size group/ fitting type/ condition
							1 test piece / size/ fitting type [j, k]	By checking the test results of the manufacturer [j]
	EN 12201–5:2011, 4.2.3.2	+	–	+	+ [f]	+	1 test piece / size/ fitting type/ condition [g]	1 test piece of one diameter/size group/ fitting type/ condition
							1 test piece / size group/ fitting type/ condition [j, k, l]	By checking the test results of the manufacturer [j]
Evaluation of ductility of fusion joint interface (B)	EN 12201–3:2011+A1 2012, 7.3 EN 12201–5:2011, 4.2.3.1	+	–	+	+ [f]	+	1 test piece / size/ fitting type/ condition [g, o]	1 test piece of one diameter/size group/ fitting type/ condition [o]
							1 test piece / size/ fitting type [j, k, o]	By checking the test results of the manufacturer [j]
	EN 12201–5:2011, 4.2.3.2	+	–	+	+ [f]	+	1 test piece / size/ fitting type/ condition [g, o]	1 test piece of one diameter/size group/ fitting type/ condition [o]
							1 test piece / size group/ fitting type/ condition [j, k, l, o]	By checking the test results of the manufacturer [j]

Characteristic [c]	Reference to part, clause or subclause of EN 12201	Conditions requiring test [a]					Sampling procedure	
		N	D1	D2	M	E	Manufacturer	Certification body [b]
Tensile strength for butt fusion [h] (C)	EN 12201–3:2011+A1:2012, 7.3 EN 12201–5:2011, 4.2.2.1	+	–	–	+	+	1 test piece/ size group / fitting group/ condition	By checking the test results of the manufacturer
	EN 12201–5:2011, 4.2.2.2	+	–	–	–	–	1 test piece/ size group / fitting group/ condition	By checking the test results of the manufacturer
Impact resistance (B)	EN 12201–3:2011+A1:2012, 7.3	+	–	+	+ [f]	+	1 test piece/ size/ fitting type [p]	1 test piece/ size group/ fitting type [p]
Pressure drop (B)	EN 12201–3:2011+A1:2012, 7.5	+	+	–	–	+	1 test piece/ size/ fitting type [p]	By checking the test results of the manufacturer [p]
Short-term internal pressure resistance (A) [d]	EN 12201–3:2011+A1:2012, 7.6	+	–	+	+ [f]	+	3 test pieces/ size/ fitting type [g, l, p]	3 test piece of one diameter/ size group/ fitting type [l, p]
Resistance to tensile load (A) [d]	EN 12201–3:2011+A1:2012, 7.6	+	–	+	+ [f]	+	3 test pieces/ size/ fitting type [g, l, p]	3 test pieces of one diameter/ size group/ fitting type [l, p]
Oxidation induction time (Thermal stability) [e]	EN 12201–3:2011+A1:2012, 8.2	+	–	–	+	–	1 sample/ size group/ fitting type	1 sample/ fitting group
Melt mass-flow rate (MFR)	EN 12201–3:2011+A1:2012, 8.2	+	–	–	+	–	1 sample/ size group/ fitting type	1 sample/ fitting group
Effect on water quality	EN 12201–3:2011+A1:2012, 8.2	+	–	–	+	–	National regulation apply	
Marking	EN 12201–3:2011+A1:2012, 11.2	+	–	–	+	+	1 test piece/ size/ fitting type [g]	1 test piece of one diameter/ size group/ fitting type
Fusion system recognition (A) (B)	EN 12201–3:2011+A1:2012, 11.4	+	–	+	–	+	1 test piece/ size/ fitting type	–

[a] N: new system;

D1 : change of dimensions and geometry as: change of visual and functional optimization, change of overall dimensions, change of a non-PE part;

D2 : change of joint affected part as: change of the dimension of the fusion zone (e.g. wire pitch, wire depth), the electrical characteristics (e.g. wire, resistance), the fusion parameters (e.g. time, voltage);

M : change of compound of the same MRS. In case of change of the MRS, type tests according column (N) shall apply;

E: extension of the fitting range;

+ : test to be carried out;

- : test not to be carried out.

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

[c] (A): Electrofusion socket fitting;

(B): Electrofusion saddle fitting;

(C): Spigot end fitting.

[d] Only applicable if EN 12201–3:2011+A1:2012, 6.2.2 b) applies.

[e] Test pieces should be taken from surfaces, especially those forming part of a fusion joint.

Characteristic [c]	Reference to part, clause or subclause of EN 12201	Conditions requiring test [a]					Sampling procedure	
		N	D1	D2	M	E	Manufacturer	Certification body [b]

[f] Manufacturer sampling procedure changed from “size/fitting type” to “2 dimensions/size group/fitting type” for size group 1, 2 and 3.
[g] Shall contain fittings from each cavity. The minimum number of samples shall be at least one from each cavity.
[h] Only applicable to size group 2 and 3 up to and including d_n 450 mm.
[i] One test piece for size group 3.
[j] Only applicable to size group 4 and 5.
[k] Test sample may be mechanically reduced in wall thickness for testing purpose.
[l] Largest dimension produced by the fitting manufacturer. Correlation to smaller dimensions to be confirmed e.g. by theoretical calculation or correlation testing.
[m] Alternatively, for d_n > 450 mm, the test can also be performed water-in-air. In case of dispute, water in water shall be used.
[n] For fitting type (B) alternative testing (e.g. pressurization through saddle outlet) is allowed.
[o] For size group 3, 4 and 5 to be checked by the strip-bend test according to ISO 21751.
[p] Test not applicable to size group 4 and 5.

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

Characteristic	Reference to part, clause or subclause of EN 12201	Conditions requiring test [a]					Sampling procedure	
		N	D1	D2	M	E	Manufacturer	Certification body [b]
Appearance	EN 12201–4:2012, 5.1	+	+ 1/2/6	–	+ 1/2/6	+	5 test pieces/ size/ product type [c, g]	5 test pieces of one diameter/ size group/ product type [g]
Colour	EN 12201–4:2012, 5.2	+	+ 1/2	–	+ 1/2	+	5 test pieces/ size/ product type [c, g]	5 test pieces of one diameter/ size group/ product type [g]
Effect on water quality	EN 12201–4:2012, 5.4	+	–	–	+	–	National regulation apply	
Geometrical characteristics	EN 12201–4:2012, 6	+	+ 2/6	+ 2/6	+ 2/6	+	5 test pieces/ size/ product type [c, g]	5 test pieces of one diameter/ size group/ product type [g]
Hydrostatic strength (20 °C,100 h)	EN 12201–4:2012, 7.3	+	–	+ 1/2	+ 1/2	+	3 test pieces/ size/ product type [c, g]	3 test pieces of one diameter/ size group 1 and 2/ product type
								For size group 3, by checking the test results of the manufacturer
Hydrostatic strength (80 °C,1 000 h)	EN 12201–4:2012, 7.3	+	–	+ 1/2/4	+ 1/2/4	+	3 test pieces/ size/ product type [c, g]	3 test pieces of one diameter/ size group/ product type
								For size group 3, by checking the test results of the manufacturer
Leaktightness of seat and packing	EN 12201–4:2012, 7.3	+	–	+	+	+	1 test piece/ body type	1 test piece/ body type
Operating torque	EN 12201–4:2012, 7.3	+	–	+	+	+	1 test piece/ body type	1 test piece/ body type
Stop resistance	EN 12201–4:2012, 7.3	+	–	+ 1/3/5/6	+ 1/3/5/6	+	1 test piece/ body type	1 test piece/ body type
Actuation mechanism resistance	EN 12201–4:2012, 7.3	+	–	+ 3/5/6	+ 3/5/6	–	1 test piece/ body type	1 test piece/ body type
Resistance to bending between supports	EN 12201–4:2012, 7.3	+	–	+ 1/2/3/4	+ 1/2/3/4	+	1 test piece/ size/ product type [c]	1 test piece/ size/product type
Leaktightness under tensile loading	EN 12201–4:2012, 7.3	+	–	+ 1/2/3/4	+ 1/2/3/4	+	1 test piece/ body type	1 test piece/ body type
Leaktightness under and after bending applied to the operating mechanism	EN 12201–4:2012, 7.3	+	–	+	+	+	1 test piece/ body type	1 test piece/ body type
Impact loading resistance	EN 12201–4:2012, 7.3	+	–	+ 1/3/5/6	+ 1/3/5/6	–	1 test piece/ body type	1 test piece/ body type
Multiple test after the internal pressure test [f, h]	EN 12201–4:2012, 7.3	+	–	+	+	+	1 test piece/ body type/ size group	1 test piece/ body type/ size group

Characteristic	Reference to part, clause or subclause of EN 12201	Conditions requiring test [a]					Sampling procedure	
		N	D1	D2	M	E	Manufacturer	Certification body [b]
1) Long term resistance 2) Leaktightness of seat and packing 25 mbar 3) Leaktightness of seat and packing 1,5 MOP 4) Operating torque 5) Impact loading resistance								
Oxidation induction time (thermal stability) [d]	EN 12201–4:2012, 8.2	+	–	–	+ 1/2	–	1 test piece/ size group	1 test piece/ size group
Melt mass-flow rate (MFR)	EN 12201–4:2012, 8.2	+	–	–	+ 1/2	–	1 test piece/ size group	1 test piece/ size group
Marking	EN 12201–4:2012, 10.2	+	+ 1/2	+ 1/2	–	+	1 test piece/ size/ product type	1 test piece/ size/ product type
Tensile strength for butt fusion [e]	EN 12201–5:2012, 4.2.2.1	+	–	+ 2	+ 2	+	1 test piece/ size group/ product type	By checking the test results of the manufacturer
	EN 12201–5:2012, 4.2.2.2	+	–	+ 2	+ 2	+	1 test piece/ size group/ product type	By checking the test results of the manufacturer
Hydrostatic strength (80 °C, 165 h) [e]	EN 12201–5:2012, 4.2.2	+	–	+ 2	+ 2	–	1 test piece/ size group/ product type [c]	By checking the test results of the manufacturer

[a] N: new system;

D1 : change in design with no effect on valve performance;

D2 : change in design with effect on valve performance;

M : change of compound of the same MRS. In case of change of the MRS, type tests according column (N) shall apply;

E: extension of the valve range;

+ : test to be carried out;

_ : test not to be carried out.

The code numbers following the + indicate which modified component of the valve initiates testing:

Code 1: body

Code 2: outlets

Code 3: obturator

Code 4: sealing element

Code 5: spindle / drive

Code 6: actuator

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

[c] The minimum number of test pieces shall be one from each cavity of the mould for the PE part.

[d] Test pieces should be taken from surfaces, especially those forming part of a fusion joint.

[e] Only applicable for valves with a spigot end of size group 2 and 3.

[f] If agreed between the manufacturer and the end-user an additional test can be carried out to check the initiating torque after a specified time in a closed position under pressure.

[g] One test piece for size group 3.

[h] The multiple tests shall be carried out at least 24 h after completion of the pressure test, if not otherwise specified by the manufacturer.

6.3 Batch release tests

Those characteristics specified in EN 12201-1:2011, EN 12201-2:2011+A1:2013, EN 12201-3:2011+A1:2012, EN 12201-4:2012 or EN 12201-5:2011 and listed in Tables 7 to 10 shall be subject to BRTs with the minimum sampling frequency as given in Tables 7 to 10, 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.

For fabricated fittings, guidance for batch release testing is given in Annex B.

Table 7 — Characteristics of compounds and minimum sampling frequencies for BRTs by the compound manufacturer

Characteristic	Reference to part, clause or subclause of EN 12201	Minimum sampling frequency
Compound density	EN 12201–1:2011, 4.4.1	1 sample/ batch/ 7 days
Oxidation induction time (thermal stability)	EN 12201–1:2011, 4.4.1	1 sample/ batch/ 7 days
Melt mass-flow rate (MFR)	EN 12201–1:2011, 4.4.1	1 sample/batch/ 7 days
Volatile content	EN 12201–1:2011, 4.4.1	1 sample/batch/ 7 days
Water content [a]	EN 12201–1:2011, 4.4.1	1 sample/batch/ 7 days
Carbon black content [b]	EN 12201–1:2011, 4.4.1	1 sample/batch/ 7 days
Carbon black dispersion [b]	EN 12201–1:2011, 4.4.1	1 sample/batch/ 7 days
Pigment dispersion [c]	EN 12201–1:2011, 4.4.1	1 sample/batch/ 7 days

[a] Only applicable if the requirement for volatile content is not conformed to. In case of dispute, the requirement for water content shall apply.

[b] Only applicable for black compound.

[c] Only applicable for non-black compound.

Table 8 — Characteristics of pipes, including coextruded pipes and peelable layer pipes, and minimum sampling frequencies for BRTs by the pipe manufacturer

Characteristic [f]	Reference to part, clause or subclause of EN 12201	Minimum sampling frequency [a]
Appearance	EN 12201–2: 2011+A1:2013, 5.1	At start up and at least every 8 h.
Colour	EN 12201–2: 2011+A1:2013, 5.2	At start up and at least every 8 h.
Geometrical characteristics	EN 12201–2: 2011+A1:2013, 6	At start up and continuously [c] or at least every 8 h.
Hydrostatic strength (80 °C, 165 h)	EN 12201–2: 2011+A1:2013, 7.2	1 test piece/ batch, but at least every 7 d (size groups 1 and 2), 1 test piece/ batch (size group 3) By agreement with the end-user or purchaser (size group 4 and 5) [g]
Elongation at break [d]	EN 12201–2: 2011+A1:2013, 7.2	1 sample/ batch
Oxidation induction time (thermal stability) [b]	EN 12201–2: 2011+A1:2013, 8.2	1 sample/ batch
Melt mass-flow rate (MFR) [d]	EN 12201–2: 2011+A1:2013, 8.2	1 sample/ batch
Marking	EN 12201–2: 2011+A1:2013, 11.2	At start up and every 8 h
Additional tests for coextruded pipes		
Delamination [e]	EN 12201–2: 2011+A1:2013, B.6	After the hydrostatic strength test

[a] Batch refers to pipe batch but an alternative approach could be considered based on compound batch if agreed by the certification body.

[b] Test carried out on the inner surface. For coextruded pipes test inner/outer and each mid layer. Tests may be carried out at higher temperatures by indirect testing, see EN 12201–2:2011+A1:2013, Table 5, Note c.

[c] By indirect testing.

[d] Tests to be carried out where own reprocessed materials of the same compound are used. The test is not applicable in case of use of 100 % of virgin material. Applicable for all layers of coextruded pipes for the MFR test.

[e] Test samples from the hydrostatic strength test shall be examined after testing for any signs of delamination, see EN 12201–2:2011+A1:2013, B.6.

[f] For peelable layer pipes all characteristics are assessed on the base pipe without the layer except marking. Appearance, colour, and marking are also assessed on the peelable layer pipe with the layer.

[g] Indirect testing subject to study.

Table 9 — Characteristics of fittings and minimum sampling frequencies for BRTs by the fitting manufacturer

Characteristic [a]	Reference to part, clause or subclause of EN 12201	Minimum sampling frequency
Appearance [c]	EN 12201-3: 2011+A1:2012, 5.1	1 test piece/ cavity at start-up, then 1 test piece per shift, but at least every 8 h
Colour [c]	EN 12201-3: 2011+A1:2012, 5.3	1 test piece/ cavity at start-up, then 1 test piece per shift, but at least every 8 h
Electrical characteristics (A) (B)	EN 12201-3: 2011+A1:2012, 5.4	1 test piece/ cavity at start-up, then: a) 1 test piece per shift (quantitative), but at least every 8 h [c] b) Each fitting during production [d]
Geometrical characteristics [c]	EN 12201-3: 2011+A1:2012, 6	1 test piece/ cavity at start-up, then 1 test piece per shift, but at least every 8 h
Hydrostatic strength (80 °C, 165 h) [f, g, h]	EN 12201-3: 2011+A1:2012, 7.3	1 test piece/ batch/ cavity, but at least every 10 days
Evaluation of ductility of fusion joint interface (B) [b, f, h, i]	EN 12201-3: 2011+A1:2012, 7.3	1 test piece/ batch/ cavity, but at least every 10 days
Marking [c]	EN 12201-3: 2011+A1:2012, 11.2	1 test piece/ cavity at start-up, then 1 sample per shift, but at least every 8 h
Fusion system recognition (A) (B) [e, f]	EN 12201-3: 2011+A1:2012, 11.4	1 test piece/ batch, but at least every 10 days

[a] (A): Electrofusion socket fitting;

(B): Electrofusion saddle fitting.

[b] Only to be performed if requested by the end-user or purchaser.

[c] For multiple cavity moulds, a rotating sampling procedure between the cavities for testing during the shifts shall be considered. The manufacturer shall give details in his quality plan accordingly.

[d] May be checked on a qualitative basis (pass – do not pass).

[e] May be checked when welding the hydrostatic strength test sample.

[f] For fittings in size group 3, 4 and 5, test to be performed either every 10 days or alternatively every 1 000 fittings.

[g] Alternatively, for d_n > 450 mm, the test can also be performed water-in-air. In case of dispute, water in water shall be used.

[h] Test not applicable to size group 4 and 5, or by agreement with the end-user or purchaser.

[i] For size group 3 to be checked by the strip-bend test according to ISO 21751.

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

Characteristic	Reference to part, clause or subclause of EN 12201	Minimum sampling frequency
Appearance	EN 12201-4:2012, 5.1	1 test piece at start-up, then 1 test piece per shift, but at least every 8 h
Colour	EN 12201-4:2012, 5.2	1 test piece at start-up, then 1 test piece per shift, but at least every 8 h
Geometrical Characteristics	EN 12201-4:2012, 6	1 test piece at start-up, then 1 test piece per shift, but at least every 8 h
Hydrostatic Strength (80 °C -165 h)	EN 12201-4:2012, 7.3	1 test piece/ batch, but at least every 10 d
Operating Torque	EN 12201-4:2012, 7.3	Every valve
Leaktightness of seat and packing at 1.5 PN with water or 1,1 PN with air or nitrogen (see safety precautions) [a]	EN 12201-4:2012, 7.3	Every valve
Leaktightness of seat and packing at 25 mbar	EN 12201-4:2012, 7.3	1 test piece/ batch, but at least every 10 d
Marking	EN 12201-4:2012, 10.2	1 test piece at start-up, then 1 test piece per shift, but at least every 8 h

[a] SAFETY PRECAUTIONS — Safety precautions need to be taken when testing with air or nitrogen up to 1,1 PN. For testing with air or nitrogen, a pressure of a maximum of 6 bar should be used. Testing with water should be considered, and the test conditions shall be agreed between the manufacturer and end user.

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 the specified frequencies and the requirements have been met.

If a product fails in respect of any characteristic given in Tables 7 to 10, 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

Those characteristics specified in EN 12201-1:2011, EN 12201-2:2011+A1:2013, EN 12201-3:2011+A1:2012, EN 12201-4:2012 or EN 12201-5:2011 and listed in Table 11 to Table 14 shall be subject to PVTs with the minimum sampling frequency given in Table 11 to Table 14, as applicable.

For fabricated fittings, guidance for process verification testing is given in Annex B.

Table 11 — Characteristics and minimum sampling frequencies for PVTs by the compound manufacturer

Characteristic [a]	Reference to part, clause or subclause of EN 12201	Minimum sampling frequency
Classification [b]	EN 12201–1:2011, 4.6	1 sample / two years/ compound/ production site
Resistance to rapid crack propagation (critical pressure, p_c), (250 mm SDR 11 or 500 mm SDR 11)	EN 12201–1:2011, 4.4.2	1 sample/ five years/ compound/ production site
Resistance to slow crack growth (d_n: 110 mm SDR 11)	EN 12201–1:2011, 4.4.2	3 test pieces/ year/ compound/ production site

[a] Only to be performed if no AT is performed during the same period.

[b] Check two stress levels at 20 °C as follows:

PE 80 at 10,0 MPa/ 100 h, 9,1 MPa/ 2 500 h;

PE 100 at 12,0 MPa/ 100 h, 11,1 MPa/ 2 500 h

In addition every 8 years a test at 80 °C for PE 80 at 3,8 MPa/ 5 000 h and for PE 100 at 4,8 MPa/ 5 000 h shall be carried out. Test three test pieces on 1 diameter of size group 1 pipe. The corresponding time shall be exceeded without failure.

Table 12 — Characteristics of pipes including coextruded and peelable layer pipes, and minimum sampling frequencies for PVTs by the pipe manufacturer

Characteristic [d]	Reference to part, clause or subclause of EN 12201	Minimum sampling frequency [a, b]
Hydrostatic strength (80 °C, 1 000 h) [e]	EN 12201–2: 2011+A1:2013, 7.2	One diameter/ year/ MRS class/ size group 1, 2 and 3/ production site One diameter/ year/ MRS class/ size group 4 and 5/ production site, or by agreement with the end-user or purchaser [f]
Elongation at break [g]	EN 12201–2: 2011+A1:2013, 7.2	1 sample of one diameter/ size group/ year/ compound designation/ production site
Longitudinal reversion [c]	EN 12201–2: 2011+A1:2013, 8.2	1 sample of one diameter/ size group/ year/ compound designation/ production site
Additional tests for coextruded pipes		
Integrity of the structure after deflection	EN 12201–2: 2011+A1:2013, B.7	One diameter/size group/ year/ compound designation/ production site
Delamination [g]	EN 12201–2: 2011+A1:2013, B.6	After the elongation at break test

[a] Only to be performed if no AT is performed during the same period.

[b] Rotate sizes, SDR and compound, as applicable.

[c] Longitudinal reversion applicable to wall thickness ≤ 16 mm.

[d] For peelable layer pipes all tests are performed on the base pipe without the layer.

[e] 3 test pieces of size group 1 or 2, 1 test piece size group 3, 4 and 5.

[f] Indirect testing subject to study.

[g] Only to be performed if not carried out in BRT. Test samples from the elongation at break test on coextruded pipes shall be examined after testing for any signs of delamination, see EN 12201–2:2011+A1:2013, B.6.

Table 13 — Characteristics of fittings and minimum sampling frequencies for PVTs by the fitting manufacturer

Characteristic [a]	Reference to part, clause or subclause of EN 12201	Minimum sampling frequency [b, c]
Hydrostatic strength (80 °C,1 000 h) [f, g]	EN 12201-3:2011+A1:2012, 7.3	1 test piece per cavity of one diameter from one fitting type/ fitting group/ size group/ year/ compound/ production site
Decohesive resistance (A) [h]	EN 12201–3:2011+A1:2012, 7.3	1 test piece per cavity of one diameter from one fitting type/ size group/ year/ compound/ production site
Evaluation of ductility of fusion joint interface (B) [d, h, i]	EN 12201–3:2011+A1:2012, 7.3	1 test piece per cavity of one diameter from one fitting type/ size group/ year/ compound/ production site
Tensile strength for butt fusion (C)	EN 12201–3:2011+A1:2012, 7.3	1 test piece per cavity of one diameter from one fitting type/ size group 2/ year/ compound/ production site
Impact resistance (B) [k]	EN 12201–3:2011+A1:2012, 7.3	1 test piece per cavity of one diameter from one fitting type/ size group/ year/ compound/ production site
Short-term internal pressure resistance (A) [e, k]	EN 12201–3:2011+A1:2012, 7.6	1 test piece per cavity of one diameter from one fitting type/ size group/ year/ compound/ production site
Resistance to tensile load (A) [e, k]	EN 12201–3:2011+A1:2012, 7.6	1 test piece per cavity of one diameter from one fitting type/ size group/ year/ compound/ production site

[a] (A): Electrofusion socket fitting;

(B): Electrofusion saddle fitting;

(C): Spigot end fitting.

[b] Change of product type, diameter and SDR every year to grant that all fittings are tested over a certain time period. Details shall be given in the manufacturer's quality plan.

[c] Results from audit tests should be regarded as PVTs.

[d] Only to be performed if not tested in the BRT.

[e] Only applicable if EN 12201–3:2011+A1:2012, 6.2.2 b) applies.

[f] Alternatively, for d_n > 450 mm, the test can also be performed in air. In case of dispute, water in water shall be used.

[g] For fitting type (B) of size group 3, 4 and 5 alternative testing (e.g. pressurization through saddle outlet) is allowed.

[h] Test sample may be mechanically reduced in wall thickness for testing purpose.

[i] For size group 3, 4 and 5 to be checked by the strip-bend test according to ISO 21751.

[k] Test not applicable to size group 4 and 5.

Table 14 — Characteristics and minimum sampling frequencies for PVTs by the valve manufacturer

Characteristic	Reference to part, clause or subclause of EN 12201	Minimum sampling frequency [a, b]
Hydrostatic strength (80 °C, 1 000 h)	EN 12201–4:2012, 7.3	3 test piece/ body type/ year/ compound/ production site [c]
Stop Resistance	EN 12201–4:2012, 7.3	1 test piece/ body type/ year/ compound/ production site
Actuation Mechanism resistance	EN 12201–4:2012, 7.3	1 test piece/ body type/ year/ compound/ production site
Resistance to bending between supports	EN 12201–4:2012, 7.3	1 test piece body type/ year/ compound/ production site
Leaktightness under tensile loading	EN 12201–4:2012, 7.3	1 test piece/ body type/ year/ compound/ production site
Impact loading resistance	EN 12201–4:2012, 7.3	1 test piece/ body type/ year/ compound/ production site

[a] Change of product type, diameter and SDR every year to grant that all valves are tested over a certain time period.
Details shall be given in the manufacturer's quality plan.

[b] Results from audit tests should be regarded as PVTs.

[c] One test piece for size group 3.

If the product does not conform to the requirements in respect of any characteristic given in Tables 11 to 14, as applicable, the retest procedure detailed in the manufacturer's quality plan shall be performed. If certification is involved, the certification body shall be informed.

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 11 to 14, as applicable.

6.5 Audit tests

Audit Tests are performed if certification is involved only.

Those characteristics specified in EN 12201-1:2011, EN 12201-2:2011+A1:2013, EN 12201-3:2011+A1:2012, EN 12201-4:2012 or EN 12201-5:2011 and listed in Tables 15 to 18 are intended to be audit tested with the minimum sampling frequency as given in Tables 15 to 18, as applicable.

For fabricated fittings, guidance for audit testing is given in Annex B.

Table 15 — Characteristics and minimum sampling frequencies for ATs for the compound

Characteristic	Reference to part, clause or subclause of EN 12201	Minimum sampling frequency
Classification [a]	EN 12201–1:2011, 4.6	1 sample/ two years/ compound/ production site
Resistance to rapid crack propagation (critical pressure, p_c), (250 mm SDR 11 or 500 mm SDR 11)	EN 12201–1:2011, 4.4.2	1 sample/ five years/ compound/ production site
Resistance to slow crack growth (d_n: 110 mm - SDR 11)	EN 12201–1:2011, 4.4.2	3 test pieces / year/ compound/ production site

[a] Check two stress levels at 20 °C as follows:

PE 80 at 10,0 MPa/ 100 h, 9,1 MPa/ 2 500 h;

PE 100 at 12,0 MPa/ 100 h, 11,1 MPa/ 2 500 h.

In addition every 8 years a test at 80 °C for PE 80 at 3,8 MPa/ 5 000 h and for PE 100 at 4,8 MPa/ 5 000 h shall be carried out. Test three test pieces at each stress level on 1 diameter of size group 1 pipe. The corresponding times shall be exceeded without failure.

Table 16 — Characteristics and minimum sampling frequencies for ATs for pipes, including coextruded pipes and peelable layer pipes

Characteristic [f]	Reference to part, clause or subclause of EN 12201	Minimum sampling frequency [a]
Appearance	EN 12201–2: 2011+A1:2013, 5.1	1 test piece of one diameter/ year/ size group/ production site
Colour	EN 12201–2: 2011+A1:2013, 5.2	1 test piece of one diameter/ year/ size group/ production site
Geometrical characteristics	EN 12201–2: 2011+A1:2013, 2	1 test piece of one diameter/ year/ size group/ production site
Hydrostatic strength (80 °C, 1 000 h) [c, d, g]	EN 12201–2: 2011+A1:2013, 7.2	One diameter/ year/ one size group/ production site
Elongation at break [c]	EN 12201–2: 2011+A1:2013, 7.2	Number of samples shall conform to EN ISO 6259-1, one diameter/ year/ size group/ production site
Oxidation induction time (thermal stability) [e]	EN 12201–2: 2011+A1:2013, 8.2	1 sample of one diameter/ year/ size group/ production site
Melt mass-flow rate (MFR) [e]	EN 12201–2: 2011+A1:2013, 8.2	1 sample of one diameter/ year/ size group/ production site
Longitudinal reversion [b]	EN 12201–2: 2011+A1:2013, 8.2	1 test piece of one diameter/ year/ size group/ production site
Marking	EN 12201–2: 2011+A1:2013, 11.2	1 test piece of one diameter/ year/ size group/ production site

[a] Rotate sizes and SDR every year.

[b] Longitudinal reversion is applicable to wall thickness ≤ 16 mm.

[c] For coextruded pipes test samples from the hydrostatic strength and elongation at break tests shall be examined after testing for any signs of delamination, see EN 12201–2:2011+A1:2013, B.6.

[d] 3 test pieces of size group 1 or 2, 1 test piece size group 3, 4 or 5.

[e] Applicable for each layer of coextruded pipe.

[f] All tests except marking are applied to the base pipe of peelable layer pipes. Appearance, colour and marking are also assessed for peelable layer pipes with the layer included.

[g] For size group 4 and 5 by agreement with the inspection body. Indirect tests under study.

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

Characteristic [a]	Reference to part, clause or subclause of EN 12201	Minimum sampling frequency [b]
Appearance	EN 12201–3: 2011+A1:2012, 5.1	1 test piece of one diameter from one fitting type/ fitting group/ size group/ 2 years/ compound/ production site
Colour	EN 12201–3: 2011+A1:2012, 5.3	1 test piece of one diameter from one fitting type/ fitting group/ size group/ 2 years/ compound/ production site
Electrical characteristics (A) (B)	EN 12201–3: 2011+A1:2012, 5.4	1 test piece of one diameter from one fitting type/ fitting group/ size group/ 2 years/ compound/ production site
Geometrical characteristics	EN 12201–3: 2011+A1:2012, 3	1 test piece of one diameter from one fitting type/ fitting group/ size group/ 2 years/ compound/ production site
Hydrostatic strength (80 °C,1 000 h) [c, d]	EN 12201–3: 2011+A1:2012, 7.3	1 test piece of one diameter from one fitting type/ fitting group/ 2 years/ compound/ production site
Decohesive resistance (A) [e]	EN 12201–3: 2011+A1:2012, 7.3	1 test piece of one diameter from one fitting type/ 2 years/ compound/ production site
Evaluation of ductility of fusion joint interface (B) [e, f, g]	EN 12201–3: 2011+A1:2012, 7.3	1 test piece of one diameter from one fitting type/ 2 years/ compound/ production site
Tensile strength for butt fusion (C) [h]	EN 12201–3: 2011+A1:2012, 7.3	1 test piece of one diameter from one fitting type/ size group 3/ 2 years/ compound/ production site
Impact resistance (B) [i]	EN 12201–3: 2011+A1:2012, 7.3	1 test piece of one diameter from one fitting type/ 2 years/ compound/ production site

[a] (A): Electrofusion socket fitting
(B): Electrofusion saddle fitting;
(C): Spigot end fitting.

[b] Change of fitting type, diameter and SDR every visit to grant that all fittings are tested over a certain time period.

[c] Alternatively, for d_n > 450 mm, the test can also be performed in air. In case of dispute, water in water shall be used.

[d] For fitting type (B) of size group 3, 4 and 5 alternative testing (e.g. pressurization through saddle outlet) is allowed.

[e] Test sample may be mechanically reduced in wall thickness for testing purpose.

[f] If tested in BRT this may be carried out by checking the test results of the manufacturer.

[g] For size group 3, 4 and 5 to be checked by the strip-bend test according to ISO 21751.

[h] Only applicable to size group 2 and 3 up to and including d_n 450 mm.

[i] Test not applicable to size group 4 and 5.

Table 18 — Characteristics and minimum sampling frequencies for ATs for valves

Characteristic	Reference to part, clause or subclause of EN 12201	Minimum sampling frequency [a]
Appearance	EN 12201-4:2012, 5.1	1 test piece / 2 years/ compound/ production site
Colour	EN 12201-4:2012, 5.2	1 test piece / 2 years/ compound/ production site
Geometrical characteristics	EN 12201-4:2012, 6	1 test piece / 2 years/ compound/ production site
Hydrostatic strength (80 °C,1 000 h)	EN 12201-4:2012, 7.3	1 test piece/ 2 years/ compound/ production site
Stop resistance	EN 12201-4:2012, 7.3	1 test piece / 2 years/ compound/ production site
Actuation mechanism resistance	EN 12201-4:2012, 7.3	1 test piece / 2 years/ compound/ production site
Resistance to bending between supports	EN 12201-4:2012, 7.3	1 test piece / 2 years/ compound/ production site
Leaktightness under tensile loading	EN 12201-4:2012, 7.3	1 test piece / 2 years/ compound/ production site
Impact loading resistance	EN 12201-4:2012, 7.3	1 test piece / 2 years/ compound/ production site
[a] Change of product type, diameter and SDR every visit to grant that all valves are tested over a certain time period.		

6.6 Indirect tests

Generally, testing shall be performed using the test methods referred to EN 12201-1:2011, EN 12201-2:2011+A1:2013, EN 12201-3:2011+A1:2012, EN 12201-4:2012 or EN 12201-5:2011.

Indirect testing may be used for BRT characteristics as given in Table 7 to Table 10. Usually, indirect testing should not be used for TTs, PVTs or 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 7 to Table 10, as applicable, shall be used.

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

6.7 One-off products and products produced in very low quantity

For fittings and valves produced one-off or in a very low quantity, testing shall be agreed between the manufacturer and end user.

6.8 Mechanical fittings

Mechanical fittings shall be tested according to the provisions in ISO 14236 or ISO 17885 as applicable.

6.9 Documentation

6.9.1 Type test results

All Type Tests and their results shall be documented in test reports.

All test reports shall be retained by the manufacturer for at least until the last date of production of the pipes, fittings or valves to which they relate.

6.9.2 Test records

Unless otherwise specified all records shall be maintained for a minimum of 10 years in accordance with the information given in the quality management system.

6.9.3 Technical file for certification purposes

A technical file shall be made available to the certification body by the pipe, fitting and/or valve manufacturer for product certification purposes, containing:

— description of product range concerned;

— technical product specification.

This specification should contain, depending on the product for example:

— dimensions and tolerances for each geometrical characteristic in accordance with EN 12201-1:2011, EN 12201-2:2011+A1:2013, EN 12201-3:2011+A1:2012 or EN 12201-4:2012;

NOTE For spigot end fittings, see ISO/TS 19911 [6].

— components and materials list with characteristics;

— for electrofusion fittings: electrical characteristics (wire material, diameter and length of the resistive wire, nominal value of the electrical resistance, material and dimensions of terminal connection);

— welding parameters and/or cooling time;

— Type Test results of the products concerned;

— quality plan of the products concerned.

Annex A
(normative)

Change of compound

A.1 General

For the purposes of this Technical Specification the following definitions of the changes of compound shall apply in the determination of type tests re-evaluation requirements for compound.

A.2 Change

A.2.1 Change of base polymer

Change of polymer manufacture, polymerisation process or chemical nature of the comonomer.

A.2.2 Change of grade

A.2.2.1 Any change of nominated density and/or MFR outside of the following limits:

— increase MFR (190 °C, 5 kg) > 20 % or 0,1 g/10 min;

— change of density > 3 kg/m^3.

If a decrease of MFR is greater than 20 %, the processing conditions (e.g. injection-moulding) of the compound could be influenced and it should be verified with the product manufacturer.

If the changes are within the above-mentioned limits, only PVT testing as Table 11 is required.

A.2.2.2 Production of the same base polymer at a different site.

A.2.2.3 Production of the same base polymer with a new production line at the same site.

A.2.3 Change of pigment

A.2.3.1 Change of chemical nature or colour of pigment.

A.2.3.2 Increase of pigment level by > 30 %.

A.2.4 Change of additives other than pigments

A.2.4.1 Change of chemical nature or addition or deletion of any additive.

A.2.4.2 Change of any additive (other than UV-stabilizers) level by > 30 %.

A.2.4.3 Decrease of UV-stabilizers by > 30 % or increase by > 50 %.

A.3 Type testing required for re-evaluation

A.3.1 Changes A.2.1 and A.2.3.1

Changes conforming to A.2.1 and/or A.2.3.1 shall require the compound to be regarded as a new compound, for which all type tests shall be required and carried out according to Table 3.

A.3.2 Changes A.2.2.1, A.2.2.2, A.2.2.3, A.2.3.2, A.2.4.1, A.2.4.2 and A.2.4.3

These changes are considered as “minor changes”.

Type tests shall be carried out as shown in Table A.1, taken from Table 3 of this Technical Specification.

Failure of the specified requirements is not acceptable.

Table A.1 — Type testing required for re-evaluation

Characteristic	Change [a]						
	A.2.2.1	A.2.2.2	A.2.2.3	A.2.3.2	A.2.4.1	A.2.4.2	A.2.4.3
Physical [a, b]	+	+	+	+	+	+	+
Resistance to slow crack growth	+	+	+	+	+	+	+
Resistance to rapid crack propagation	+	+	+	+	+	−	−
Tensile strength for butt fusion	+	−	−	+	+	+	+
Resistance to weathering	−	−	−	−	+	−	+
Hydrostatic strength [c] (20 °C)	+	+	+	−	+	−	−
Hydrostatic strength [d] (80 °C)	+	+	+	+	+	+	+

[a] ” + ” denotes test to be carried out.
” − ” denotes test not to be carried out.

[b] As defined in Table 3 of this Technical Specification (Conventional density, Oxidation induction time, Water content, Carbon black content and dispersion, Pigment dispersion, MFR).

[c] Check two stress levels at 20 °C as follows: PE 80 at 10 MPa/ 100 h, 9,1 MPa/ 2 500 h;
PE 100 at 12 MPa/ 100 h, 11,1 MPa/ 2500 h. Test three test pieces at each stress level on size group 1 pipe.
The corresponding times shall be exceeded without failure.

[d] Check two stress levels at 80 °C as follows: PE 80 at 4,5 MPa/ 165 h, 3,9 MPa/ 2 500 h;
PE 100 at 5,4 MPa/ 165 h, 4,9 MPa/ 2 500 h. Test three test pieces at each stress level on size group 1 pipe.
The corresponding times shall be exceeded without failure.

Annex B
(normative)

Testing and inspection of fabricated fittings

B.1 Grouping

For the purposes of this annex, the groups and types specified in 6.1.2, 6.1.3 and 6.1.4 apply.

B.2 Type tests

Table B.1 — Characteristics of swept bends that require type testing (TT)

Characteristic	Reference to part, clause or subclause of EN 12201	Conditions requiring test [a]				Sampling procedure	
		N	D	M	E	Manufacturer	Certification body
Appearance	EN 12201–3: 2011+A1:2012, B.1	+	+	+	+	1 test piece of one diameter/ size group	1 test piece of one diameter/ size group
Colour	EN 12201–3: 2011+A1:2012, B.1	+	-	+	+	1 test piece of one diameter/ size group	1 test piece of one diameter/ size group
Geometrical characteristics	EN 12201–3: 2011+A1:2012, B.1	+	+	+	+	1 test piece of one diameter/ size group	1 test piece of one diameter/ size group
Hydrostatic strength (20 °C,100 h) [b]	EN 12201–3: 2011+A1:2012, B.2	+	+	+	+	1 test piece of one diameter/ size group [c d]	By checking the results of the manufacturer
Hydrostatic strength (80 °C,1 000 h) [b]	EN 12201–3: 2011+A1:2012, B.2	+	+	+	+	1 test piece of one diameter/ size group [c d]	By checking the results of the manufacturer
Marking	EN 12201–3: 2011+A1:2012, B.1	+	+	+	+	1 test piece of one diameter/ size group	1 test piece of one diameter/ size group

[a] N: new system;

D: Change of manufacturing/bending proces

M : change of compound of the same MRS. In case of change of the MRS, type tests according column (N) shall apply;

E: extension of the fitting range;

+ : test to be carried out;

– : test not to be carried out.

[b] Test procedure to be developed for handling the test piece

[c] For size groups 4 and 5, by agreement with the end user or purchaser

[d] Alternatively, for d_n > 450 mm, the test can also be performed in air. In case of dispute, water in water shall be used.

Table B.2 — Characteristics of segmented fittings that require type testing (TT)

Characteristic	Reference to part, clause or subclause of EN 12201	Conditions requiring test [a]				Sampling procedure	
		N	D	M	E	Manufacturer	Certification body
Design of fitting (inc. cutting angle, segment length	EN 12201-3:2011+A1:2012, B.3 EN 12201-3:2011+A1:2012, B.5	+	+	-	-	To be declared by manufacturer	-
Appearance	EN 12201-3:2011+A1:2012, B.1	+	+	+	+	1 test piece of one diameter/ size group	1 test piece of one diameter/ size group
Colour	EN 12201-3:2011+A1:2012, B.1	+	+	+	+	1 test piece of one diameter/ size group	1 test piece of one diameter/ size group
Geometrical characteristics	EN 12201-3:2011+A1:2012, B.1	+	+	+	+	1 test piece of one diameter/ size group	1 test piece of one diameter/ size group
Hydrostatic strength (20 °C,100 h) [b]	EN 12201-3:2011+A1:2012, B.1	+	+	+	+	1 test piece of one diameter/ size group [a, c]	By checking the results of the manufacturer
Hydrostatic strength (80 °C,1 000 h) [b, d]	EN 12201-3:2011+A1:2012, B.1	+	+	+	+	1 test piece of one diameter/ size group [a, c]	By checking the results of the manufacturer
Tensile strength	EN 12201-3:2011+A1:2012, B.1	+	+	+	+	1 sample of one diameter/ size group	By checking the results of the manufacturer
Marking	EN 12201-3:2011+A1:2012, B.1	+	+	+	+	1 test piece of one diameter/ size group	1 sample of one diameter/ size group

[a] N: new system;

D: Change of manufacturing proces

M : change of compound of the same MRS. In case of change of the MRS, type tests according column (N) shall apply;

E: extension of the fitting range;

+ : test to be carried out;

– : test not to be carried out.

[b] For size groups 4 and 5 by agreement with the end user/purchaser.

[c] Test procedure to be developed for handling the test piece

[d] Alternatively, for d_n > 450 mm, the test can also be performed in air. In case of dispute, water in water shall be used.

B.3 Batch release tests

Table B.3 — Characteristics and minimum sampling frequencies for BRTs by the fabricated fitting manufacturer

Characteristic	Reference to part, clause or subclause of EN 12201	Minimum sampling frequency
Appearance	EN 12201-3:2011+A1:2012, B.1	One test piece/ batch
Geometrical characteristics	EN 12201-3:2011+A1:2012, B.3	One test piece/ batch
Marking	EN 12201-3:2011+A1:2012, B.1	One test piece/ batch

B.4 Process verification tests

Table B.4 — Characteristics and minimum sampling frequencies for PVTs by the fabricated fitting manufacturer

Characteristic	Reference to part, clause or subclause of EN 12201	Minimum sampling frequency
Hydrostatic strength (80 °C,1 000 h)	EN 12201-3:2011+A1:2012, B.1	One diameter/ size group/ year [a, b]
Tensile strength [c]	EN 12201-3:2011+A1:2012, B.1	One diameter/ size group/ year [a, b]
[a] Rotate sizes, SDR and compound, as applicable. [b] Size groups 4 and 5 by checking documentation of manufacturer. [c] Not applicable to swept bends.		

B.5 Audit tests

Table B.5 — Characteristics and minimum sampling frequencies for ATs for fabricated fittings

Characteristic	Reference to part, clause or subclause of EN 12201	Minimum sampling frequency
Appearance	EN 12201-3:2011+A1:2012, B.1	One diameter/ size group/ year [a, b]
Geometric characteristics	EN 12201-3:2011+A1:2012, B.1	One diameter/ size group/ year [a, b]
Hydrostatic strength (80 °C,1 000 h)	EN 12201-3:2011+A1:2012, B.1	One diameter/ size group/ year [a, b]
Tensile strength [c]	EN 12201-3:2011+A1:2012, B.1	One diameter/ size group/ year [a, b]
[a] Rotate sizes, SDR and compound, as applicable. [b] Size group 4 and 5 by checking documentation of manufacturer. [c] Not applicable to swept bends.		

Annex C
(informative)

Basic test matrix for PE water compounds and piping products

Table C.1 — Basic test matrix for PE water compounds and piping products

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	Compound density	X	X														
2	Oxidation induction time	X	X			X	X		X	X				X			
3	Melt mass flow (MFR)	X	X			X	X		X	X				X			
4	Volatile content	X	X														
5	Water content	X	X														
6	Carbon black content	X	X														
7	Carbon black/pigment dispersion	X	X														
8	Effect on water quality					X				X				X			
9	Resistance to weathering	X															
10	Resistance to rapid crack propagation	X		X	X	X (1)			X (1)								
11	Resistance to slow crack growth	X		X	X	X(1)			X(1)								
12	Tensile test on a butt fusion weld	X								X (7)		X (7)	X (7)				
13	Classification	X		X	X												
14	Appearance					X	X		X	X	X		X	X	X		X
15	Colour					X	X		X	X	X		X	X	X		X
16	Geometric characteristics					X	X		X	X	X		X	X	X		X
17	Hydrostatic strength (20 °C, 100 h)					X				X				X			
18	Hydrostatic strength (80 °C, 165 h) (2)						X				X				X		
19	Hydrostatic strength (80 °C, 1 000 h)					X		X	X	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
20	Elongation at break					X	X	X	X								
21	Longitudinal reversion					X		X	X								
22	Marking					X	X		X	X	X			X	X		
23	Coextruded pipes – Integrity of the structure					X		X									
24	Coextruded pipes - Delamination						X										
25	Peelable layer pipes - Weathering					X											
26	Electrical Characteristics (3)									X	X		X				
27	Decohesive resistance (4)									X		X	X				
28	Ductility of fusion joint interface (5)									X	X	X	X				
29	Impact resistance (5)									X		X	X				
30	Pressure drop (5)									X							
31	Short-term internal pressure (6)									X		X					
32	Resistance to tensile load (6)									X		X					
33	Fusion system recognition									X	X						
34	Leaktightness of seat and packing													X	X		
35	Pressure drop													X			
36	Operating torque X													X	X		
37	Stop resistance													X		X	X
38	Actuation mechanism resistance													X		X	X
39	Resistance to bending between supports													X		X	X
40	Thermal cycling resistance d_n > 63 mm													X			X
41	Leaktightness under bending with thermal cycling, $d_n \leq 63$ mm													X			X
42	Leaktightness under tensile loading													X		X	X
43	Leaktightness under and after bending applied to the operating mechanism													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
44	Impact loading resistance													X		X	X
45	Multiple test after the internal pressure test													X			
46	Tensile strength for butt fusion (8)					X				X				X			
47	Decohesive resistance (4)									X							
48	Ductility of fusion joint interface (5)									X							
49	Hydrostatic strength 80C 165 h (8)									X				X			

(1) Applicable to peelable layer pipes only

(2) Applicable for pipes and spigot end fittings

(3) Applicable for electrofusion socket and saddle fusion fittings

(4) Applicable for electrofusion socket fittings

(5) Applicable for electrofusion saddle fittings

(6) Only applicable if the wall thickness does not conform with EN 12201–3:2011+A1:2012, 6.2.2 a)

(7) Applicable for spigot end fittings

(8) Applicable for pipes and spigot end fittings

Bibliography

[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)*

[4] EN ISO/IEC 17025, *General requirements for the competence of testing and calibration laboratories (ISO/IEC 17025)*

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

[6] ISO/TS 19911, *Plastics pipes and fittings - Format of a technical file for characterizing PE spigot end fittings*

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