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English version

**Plastics piping systems for the supply of gaseous fuels –  
Polyethylene (PE) – Part 7: Guidance for the assessment of  
conformity**

Systèmes de canalisations en plastique pour la distribution  
des combustibles gazeux – Polyéthylène (PE) – Partie 7:  
Guide pour l'évaluation de la conformité

Kunststoff-Rohrleitungssysteme für die Gasversorgung –  
Polyethylen (PE) – Teil 7: Empfehlungen für die  
Beurteilung der Konformität

This draft Technical Specification is submitted to CEN members for formal vote. It has been drawn up by the Technical Committee CEN/TC 155.

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## Foreword

This document prCEN/TS 1555-7:2002 has been prepared by Technical Committee CEN /TC 155, "Plastics piping systems and ducting systems", the secretariat of which is held by NEN.

It has been prepared in liaison with CEN/TC 234 "Gas supply".

This document is currently submitted to the second Formal Vote.

This Technical Specification can be used to support elaboration of national third party certification procedures for products conforming to the applicable Parts of prEN 1555.

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

System Standards are based on the results of the work undertaken in ISO/TC 138 "Plastics pipes, fittings and valves for the transport of fluids", which is a Technical Committee of the International Organization for Standardization (ISO).

They are supported by separate standards on test methods to which references are made throughout the System Standard.

The System Standards are consistent with general standards on functional requirements and on recommended practice for installation.

prEN 1555 consists of the following Parts, under the general title *Plastics piping systems for the supply of gaseous fuels - Polyethylene (PE)*

- *Part 1: General*
- *Part 2: Pipes*
- *Part 3: Fittings*
- *Part 4: Valves*
- *Part 5: Fitness for purpose of the system*
- *Part 7: Guidance for assessment of conformity (this Technical Specification).*

NOTE The document dealing with recommended practice for installation which was initially submitted for CEN enquiry as prEN 1555-6 was withdrawn when EN 12007-2<sup>[1]</sup>, prepared by CEN/TC 234 "Gas supply", was published with the title "*Gas supply systems - Pipelines for maximum operating pressure up to and including 16 bar - Part 2: Specific functional recommendations for polyethylene (MOP up to and including 10 bar)*".

This Part of prEN 1555 includes the following :

- Annex A (normative) Change of compound
- Bibliography.

## **Introduction**

The System Standard, of which this is Part 7, specifies the requirements for a piping system and its components made from polyethylene (PE) and is intended to be used for the supply of gaseous fuels.

Requirements and test methods for material and components of the piping system are specified in prEN 1555-1, prEN 1555-2, prEN 1555-3 and prEN 1555-4. Characteristics for fitness for purpose are covered in prEN 1555-5. Recommended practice for installation is given in EN 12007-2<sup>[1]</sup> prepared by CEN/TC 234.

This Part of prEN 1555 gives guidance to procedures and requirements for the assessment of conformity of materials, components, joints and is intended to be used by manufacturers, inspection bodies, testing laboratories and certification bodies.

## 1 Scope

This Part of prEN 1555 gives guidance for assessment of conformity to be included in the manufacturer's quality plan as part of the quality system.

This Part of prEN 1555 includes:

- a) requirements for materials, components and joints given in the applicable Parts of prEN 1555;
- b) requirements for the manufacturer's quality system;

NOTE 1 It is recommended that the quality system conforms to EN ISO 9001<sup>[2]</sup>.

- c) definitions and procedures to be applied if third party certification is involved.

NOTE 2 If third party certification is involved, it is recommended that the certification body is accredited to EN 45011<sup>[3]</sup> or EN 45012<sup>[4]</sup>, as applicable.

In conjunction with the other Parts of prEN 1555 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) a maximum operating pressure, MOP, up to and including 10 bar <sup>1)</sup>;
- b) an operating temperature of 20 °C as reference temperature.

NOTE 3 For other operating temperatures, derating coefficients can be used, see prEN 1555-5.

For mechanical fittings conforming to ISO 10838-1<sup>[5]</sup>, ISO 10838-2<sup>[6]</sup> or ISO 10838-3<sup>[7]</sup>, as applicable, guidance for assessment of conformity is not given in this part of prEN 1555. When requested, a quality plan based on the tests mentioned in ISO 10838-1<sup>[5]</sup>, ISO 10838-2<sup>[6]</sup> or ISO 10838-3<sup>[7]</sup>, as applicable, should be set up in agreement between user and manufacturer.

prEN 1555 covers a range of maximum operating pressures and gives requirements concerning colours and additives.

NOTE 4 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 regulations and installation practices or codes.

## 2 Normative references

This European Technical Specification incorporates by dated or undated reference, provisions from other publications. These normative references are cited at the appropriate places in the text, and the publications are listed hereafter. For dated references, subsequent amendments to or revisions of any of these publications apply to this European Technical Specification only when incorporated in it by amendment or revision. For undated references the latest edition of the publication referred to applies (including amendments).

EN 728, *Plastics piping and ducting systems — Polyolefin pipes and fittings — Determination of oxidation induction time.*

prEN 1555-1:2002, *Plastics piping systems for the supply of gaseous fuels — Polyethylene (PE) — Part 1: General.*

prEN 1555-2:2002, *Plastics piping systems for the supply of gaseous fuels — Polyethylene (PE) — Part 2: Pipes.*

prEN 1555-3:2002, *Plastics piping systems for the supply of gaseous fuels — Polyethylene (PE) — Part 3: Fittings.*

prEN 1555-4:2002, *Plastics piping systems for the supply of gaseous fuels — Polyethylene (PE) — Part 4: Valves.*

prEN 1555-5:2002, *Plastics piping systems for the supply of gaseous fuels — Polyethylene (PE) — Part 5: Fitness for purpose of the system.*

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1) 1 bar = 0,1 MPa

EN ISO 12162, *Thermoplastics materials for pipes and fittings for pressure applications — Classification and designation — Overall service (design) coefficient (ISO 12162:1995).*

ISO 2859-1, *Sampling procedures for inspection by attributes — Part 1: Sampling schemes indexed by acceptance quality limit (AQL) for lot-by-lot inspection.*

ISO 2859-2, *Sampling procedures for inspection by attributes — Part 2: Sampling plans indexed by limiting quality (LQ) for isolated lot inspection.*

ISO 6259-1, *Thermoplastics pipes – Determination of tensile properties – Part 1: General test method.*

ISO 6259-3, *Thermoplastics pipes – Determination of tensile properties – Part 3: Polyolefin pipes.*

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 13953, *Polyethylene (PE) pipes and fittings — Determination of the tensile strength and failure mode of test pieces from a butt-fused joint.*

ISO 13954, *Plastics pipes and fittings — Peel decohesion test for polyethylene (PE) electrofusion assemblies of nominal outside diameter greater than or equal to 90 mm.*

ISO 13955, *Plastics pipes and fittings — Crushing decohesion test for polyethylene (PE) electrofusion assemblies.*

ISO/DIS 13956, *Plastics pipes and fittings — Determination of cohesive strength — Tear test for polyethylene (PE) assemblies.*

### **3 Terms and definitions, symbols and abbreviations**

For the purposes of this Technical Specification, the terms and definitions, symbols and abbreviations given in prEN 1555-1, prEN 1555-3, prEN 1555-4 and prEN 1555-5, as applicable, apply together with the following.

#### **3.1 Terms and definitions**

##### **3.1.1**

##### **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

##### **3.1.2**

##### **inspection body**

impartial organization or company, approved by a certification body as possessing the necessary competence to verify and/or to carry out initial type testing, witness testing, audit testing, and inspection of the manufacturer's factory production control in accordance with the relevant European Standard

##### **3.1.3**

##### **testing laboratory**

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

##### **3.1.4**

##### **quality system**

organizational structure, responsibilities, procedures, processes and resources for implementing quality management (see EN ISO 9000<sup>[8]</sup>)

##### **3.1.5**

##### **quality plan**

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

**3.1.6****type testing (TT)**

testing performed to prove that the material, component, assembly is capable of conforming to the requirements given in the relevant standard

NOTE A component is a pipe, a fitting, or a valve intended to be a part of a piping system.

**3.1.7****preliminary type testing (PTT)**

type testing carried out by or on behalf of the manufacturer

**3.1.8****initial type testing (ITT)**

type testing carried out by or on behalf of a certification body for certification purposes

**3.1.9****batch release test (BRT)**

test performed by the manufacturer on a batch of material or components which has to be satisfactorily completed before the batch can be released

**3.1.10****process verification test (PVT)**

test performed by the manufacturer on material, components, assemblies at specific intervals to confirm that the process continues to be capable of producing components conforming to the requirements given in the relevant standard

NOTE Such tests are not required to release batches of components and are carried out as a measure of process control.

**3.1.11****audit test (AT)**

test performed by or on behalf of a certification body to confirm that the material, components, assemblies continues to conform to the requirements given in a System Standard and to provide information to assess the effectiveness of the quality system

**3.1.12****indirect test (IT)**

test performed by the manufacturer, different from that specified for that particular characteristic, having verified its correlation with the specified test

**3.1.13****witness testing (WT)**

testing accepted by an inspection or certification body as initial 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

**3.1.14****material batch**

clearly identifiable quantity of a particular material

**3.1.15****compound batch**

clearly identifiable quantity of a given homogeneous compound manufactured under uniform conditions. The compound batch is defined and identified by the compound manufacturer

**3.1.16****production batch**

clearly identifiable collection of units, manufactured consecutively or continuously under the same conditions, using material or compound conforming to the same specification

### 3.1.17

#### **pipe batch**

number of pipes, all of them of the same nominal outside diameter, wall thickness and marking, extruded from the same compound on the same machine. The pipe batch is defined and identified by the pipe manufacturer

### 3.1.18

#### **fitting or valve batch**

number of fittings or valves of the same type, identical dimensional characteristics (same nominal diameter, same thickness) and same marking, from the same compound. The fitting or valve batch is defined and identified by the fitting or valve manufacturer.

### 3.1.19

#### **lot**

clearly identifiable sub-division of a batch for inspection purposes

### 3.1.20

#### **sample**

one or more units of product drawn from a batch or lot, selected at random without regard to quality

NOTE The number of units of product in the sample is the sample size.

### 3.1.21

#### **acceptable quality level (AQL)**

when a continuous series of lots or batches is considered, the quality level which for the purposes of sampling inspection is the limit of a satisfactory process average (see ISO 2859-1 and ISO 2859-2)

NOTE The designation of an AQL does not imply that a manufacturer has the right knowingly to supply any non-conforming unit of product.

### 3.1.22

#### **inspection level**

the relationship between the lot or batch size and the sample size (see ISO 2859-1)

### 3.1.23

#### **group**

collection of similar components from which samples are selected for testing purposes

### 3.1.24

#### **product type**

pipe or a fitting or a valve or their main parts, of the same design, from a particular compound, suitable for the conveyance of gaseous fuels, meeting the requirements given in a standard

### 3.1.25

#### **body type**

same body of a valve which contains different end connections

### 3.1.26

#### **cavity**

part of the injection mould which gives the form to the injection-moulded product. A mould can consist of several cavities.

## 3.2 Abbreviations

NOTE 1 For reasons of avoiding misunderstanding the following abbreviations are kept the same in each of the languages. For the same reason the terms are given in the three languages. (E for English, F for French and D for German)

NOTE 2 In the French language the abbreviation for « acceptable quality level » (AQL) is NQA, however for the purpose of this European Technical Specification for all three languages the same abbreviation (AQL) is used.

AQL en : acceptable quality level

fr : niveau de qualité acceptable

de : annehmbare Qualitätsniveau



AT	en : audit test fr : essai d'audit de : Überwachungsprüfung
BRT	en : batch release test fr : essai de libération de lot de fabrication de : Freigabeprüfung einer Charge
IT	en : indirect test fr : essai indirect de : indirekte Prüfung
ITT	en : initial type testing fr : essais de type initiaux de : Erst-Typprüfung
PTT	en : preliminary type testing fr : essais de type préliminaires de : vorausgehende Typprüfung
PVT	en : process verification test fr : essai de vérification du procédé de fabrication de : Prozessüberprüfung
TT	en : type testing fr : essais de type de : Typprüfung
WT	en : witness testing fr : essais témoins de : Prüfung unter Aufsicht

## 4 Requirements

### 4.1 General

4.1.1 Compound, components, joints shall conform to the requirements given in prEN 1555-1, prEN 1555-2, prEN 1555-3, prEN 1555-4 and prEN 1555-5, as applicable.

4.1.2 Components and/or joints shall be produced by the manufacturer under a quality management system which includes a quality plan.

### 4.2 Testing and inspection

#### 4.2.1 Grouping

For the purposes of this Technical Specification the size groups given in Table 1 shall apply for pipes, fittings and valves.

**Table 1 — Size groups for pipes, fittings and valves**

Size group	Dimensions in millimetres		
	1	2	3
Nominal outside diameter, $d_n$ , for pipes, fittings and valves	$d_n < 75$	$75 \leq d_n < 250$	$250 \leq d_n \leq 630$

Fittings are also grouped according to jointing technique

- (A) Electrofusion socket fitting;
- (B) Electrofusion saddle fitting;
- (C) Spigot end fitting;
- (D) Mechanical fitting.

## **4.2.2 Type testing (TT)**

### **4.2.2.1 General**

Type tests shall demonstrate that products conform to all requirements for the characteristics given in Tables 2 to 6, as applicable.

In addition, relevant type tests shall be carried out whenever there is a change in design, and/or in the production method, other than routine in-process adjustments, and to extensions of the product range as indicated in Tables 3 to 6.

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

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

- a) dimensions and geometry (See column X of Tables 4 and 5), as: change of visual and functional optimisations, change of overall dimensions, change of a non-PE part;
- b) joint affected part (See column Y of Tables 4 and 5), 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 product range for fittings and valves, the relevant characteristics given in Tables 4 and 5 shall be retested. If third party certification is involved, the extent of retesting shall be agreed between the manufacturer and the certification body.

**Table 2 — Characteristics of the compound that require type testing (TT) by the compound manufacturer**

Characteristic	Reference to Part and clause of prEN 1555	Sampling procedure	Number of samples <sup>a</sup>	Number of measurements per sample
Conventional density	1-4.2.3.1	Once/compound	3	1
Oxidation induction time (thermal stability)	1-4.2.3.1	Once/compound	3	1
Melt mass-flow rate (MFR)	1-4.2.3.1	Once/compound	3	1
Volatile content	1-4.2.3.1	Once/compound	1	1
Water content <sup>b</sup>	1-4.2.3.1	Once/compound	1	1
Carbon black content <sup>c</sup>	1-4.2.3.1	Once/compound	3	1
Carbon black dispersion <sup>c</sup>	1-4.2.3.1	Once/compound	1	6
Pigment dispersion <sup>d</sup>	1-4.2.3.1	Once/compound	1	6
Resistance to gas condensate	1-4.2.3.2	Once/compound	3	1
Resistance to weathering <sup>e</sup>	1-4.2.3.2	Once/compound	3/3/5 <sup>f</sup>	1/1/1 <sup>f</sup>
Resistance to rapid crack propagation (critical pressure, $p_c$ ) ( $e \geq 15$ mm)	1-4.2.3.2	Once/compound	Shall conform to ISO 13477	Shall conform to ISO 13477
	5-5	Once/compound		
Resistance to slow crack growth ( $d_n$ : 110 mm or 125 mm - SDR 11)	1-4.2.3.2	Once/compound	3	1
Tensile strength for butt fusion ( $d_n$ : 110 mm or 125 mm - SDR 11)	1-4.3.1	Once/compound	3	Shall conform to ISO 13953
	1-4.3.2	Once/compound	3	
Classification	1-4.4	Once/compound	Shall conform to EN ISO 12162	Shall conform to EN ISO 12162

<sup>a</sup> The number of samples given in the table is the minimum. All samples shall pass the relevant test(s).

<sup>b</sup> Only applicable if the requirement for volatile content is not conformed to. In case of dispute the requirement for water content shall apply.

<sup>c</sup> Only applicable for black compound.

<sup>d</sup> Only applicable for yellow compound.

<sup>e</sup> For the determination of the oxidation induction time, 0,2 mm from the weathered surface shall be taken off before sampling. The diameter of the test pipes shall be given in the test report.

<sup>f</sup> Three samples for oxidation induction time with one measurement per sample/ Three samples for hydrostatic strength with one measurement per sample / Five samples for elongation at break with one measurement per sample.

**Table 3 — Characteristics of pipes that require type testing (TT)  
per compound by the pipe manufacturer**

Characteristic	Reference to Part and clause of prEN 1555	Sampling procedure <sup>a</sup>	Number of test pieces <sup>b</sup>	Number of measurements per test piece
Appearance	2-5.1	Two diameters/ size group	1	1
Colour	2-5.2	Two diameters/ size group	1	1
Geometrical characteristics	2-6	Two diameters/ size group	8 <sup>c</sup>	1
Circumferential reversion	2-6.4	Two diameters/ size group	1	1
Hydrostatic strength (20 °C, 100 h)	2-7.2	Two diameters/ size group	3	1
Hydrostatic strength (80 °C, 165 h)	5-4.2.1.2	One diameter/ size group	3	1
Hydrostatic strength (80 °C, 1000 h)	2-7.2	Two diameters/ size group	3	1
Elongation at break	2-7.2	Two diameters/ size group	Shall conform to ISO 6259-1	1
Resistance to slow crack growth $e \leq 5$ mm (Cone test)	2-7.2	Two diameters/ size group	3	1
Resistance to slow crack growth $e > 5$ mm (Notch test)	2-7.2	Two diameters/ size group	3	1
Resistance to rapid crack propagation (critical pressure, $p_c$ ) <sup>d</sup>	2-7.2	One diameter/ size group (maximum wall thickness of the manufacturer's range)	Shall conform to ISO 13477	Shall conform to ISO 13477
	5-5	One diameter/ size group (maximum wall thickness of the manufacturer's range)		
Oxidation induction time (Thermal stability)	2-8.2	Two diameters/ size group	3 <sup>e</sup>	1
Melt mass-flow rate (MFR)	2-8.2	Two diameters/ size group	3	1
Longitudinal reversion	2-8.2	Two diameters/ size group	1	1
Resistance to weathering	2-8.2	Tested on the compound in the form of pipe by the compound manufacturer		
Marking	2-10.2	Two diameters/ size group	1	1
Tensile strength for butt fusion	5-4.2.1.1	One diameter/ size group <sup>f</sup>	1	Shall conform to ISO 13953
	5-4.2.1.2	One diameter/ size group <sup>f</sup>	1	

<sup>a</sup> Evenly distributed diameters over the product range shall be chosen. The product range in each size group shall be defined by the manufacturer. Samples shall comprise the smallest and largest diameter of the range manufactured. The successful testing will validate pipe with the same  $d_n$  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.

<sup>b</sup> The number of test pieces given in the table is the minimum. All test pieces shall pass the relevant test(s).

<sup>c</sup> Test pieces may be subsequently used in the destructive test listed in this table.

<sup>d</sup> If applicable (See Table 4 of prEN 1555-2:2002).

<sup>e</sup> With one from the inner surface, one from the outside surface, and one from the middle of the wall for size groups 2 and 3, and according to EN 728 for size group 1.

<sup>f</sup> Results of tests in accordance with 4.3 of prEN 1555-1:2002 done by the compound manufacturer should be taken into consideration.

In case of change of compound, all type tests shall apply. For minor changes in accordance with A.3.2, the pipe manufacturer shall only carry out PVT and BRT tests.

**Table 4 — Characteristics of the fittings that require type testing (TT) per compound by the fitting manufacturer**

Characteristic	Reference to Part and clause of prEN 1555	Sampling procedure	Change of PE compound <sup>a</sup>	Change in design <sup>b</sup>		Number of test pieces <sup>c</sup>	Number of measurements per test piece
				X	Y		
Appearance	3-5.1	Once/size/ product type/cavity <sup>d</sup>	One diameter/size group/ product type/cavity <sup>d</sup>	-	-	1	1
Colour	3-5.2	Once/size/ product type/ cavity <sup>d</sup>	One diameter/ size group/ product type/cavity <sup>d</sup>	-	-	1	1
Geometrical characteristics	3-6	Once/size/ product type/ cavity <sup>d</sup>	One diameter/size group/product type/cavity <sup>d</sup>	+	+	8 <sup>e</sup>	1
Hydrostatic strength (20 °C, 100 h)	3-7.2	Once/size/ product type	Two diameters/size group/ product type	-	-	3	1
Hydrostatic strength (80 °C, 165 h) (C)	5-4.2.1.2	Once/size group/ product type	Once/size group/ product type	-	+	3	1
Hydrostatic strength (80 °C, 1000 h)	3-7.2	Once/size/ product type	Two diameters/ size group/product type	+	+	3	1
Decohesive resistance (A)	3-7.2	Once/size/ product type	Two diameters/ size group/ product type	-	+	2	Shall conform to ISO 13954 ISO 13955
	5-4.2.2.1	Once/size/ product type	Two diameters/ size group/ product type	-	+	1	
	5-4.2.2.2	Once/size/ product type	Two diameters/ size group/ product type	-	+	2	
Cohesive strength (B)	3-7.2	Once/size/ product type	Two diameters/size group/product type	-	+	2	Shall conform to ISO/DIS 13956
	5-4.2.2.1	Once/size/ product type	Two diameters/ size group/ product type	-	+	1	
	5.4.2.2.2	Once/size/ product type	Two diameters/ size group/ product type	-	+	2	
Tensile strength for butt fusion (C)	3-7.2	Once/size/ product type	Two diameters/size group/ product type	-	+	1	Shall conform to ISO 13953
	5-4.2.1.1	One diameter/ size group/ product type <sup>f</sup>	One diameter/ size group/ product type	-	+	1	
	5-4.2.1.2	One diameter/ size group/ product type <sup>f</sup>	One diameter/ size group/ product type	-	+	1	
Impact resistance (B)	3-7.2	Once/size/product type	One diameter/ size group	+	+	1	1
Pressure drop (B)	3-7.2	Once/ size group/ product type	-	+	-	1	1
Oxidation induction time (thermal stability) <sup>g</sup>	3-8.2	Once/size group	One diameter/ size group	-	-	3	1
Melt mass-flow rate (MFR)	3-8.2	Once/size group	One diameter/ size group	-	-	3	1
Marking	3-10.2	Once/size/ product type/ cavity <sup>d</sup>	One diameter/ size group/ product type/ cavity <sup>d</sup>	-	-	1	1

<sup>a</sup> In case of change of MRS, all type tests shall apply with the sampling procedure.

<sup>b</sup> According to 4.2.2.1.

"+" denotes test to be carried out ;

"-" denotes test not to be carried out.

The sampling frequency in case of any change in design shall be two diameters/size group/product type.

<sup>c</sup> The number of test pieces given in the table is the minimum. All test pieces shall pass the relevant test(s). Where applicable, test assemblies shall be prepared in accordance with prEN 1555-5.

<sup>d</sup> Only applicable for moulds with more than one cavity.

<sup>e</sup> Test pieces may be subsequently used in the destructive test listed in this table.

<sup>f</sup> Results of tests in accordance with prEN 1555-1:2002, 4.3 done by the compound manufacturer should be taken into consideration.

<sup>g</sup> The determination of the oxidation induction time should be carried out on test pieces taken from surfaces, especially those forming part of a fusion joint.

**Table 5 — Characteristics of valves that require type testing (TT) per compound by valve manufacturer**

Characteristic	Reference to Part and clause of prEN 1555	Sampling procedure	Change of PE compound <sup>a</sup>	Change in design <sup>b</sup>		Number of test pieces <sup>c</sup>	Number of measurements per test piece
				X	Y		
Appearance	4-5.1	Once/size/product type	One diameter/ size group/ product type	-	-	1	1
Colour	4-5.2	Once/size/product type	One diameter/ size group/	-	-	1	1
Geometrical characteristics	4-6	Once/size/product type	One diameter/ size group/ product type	+	+	8 <sup>d</sup>	1
Hydrostatic strength (20 °C, 100 h)	4-7.2	Once/size/product type	Two diameters/ size group/ product type	-	-	3	1
Hydrostatic strength (80 °C, 165 h)	5-4.2.1.2	Once/size group/product type	Once/size group/ product type	-	+	3	1
Hydrostatic strength (80 °C, 1000 h)	4-7.2	Once/size/product type	Two diameters/ size group/ product type	+	+	3	1
Leaktightness of seat and packing	4-7.2	Once/body type	-	+	-	1	1
Pressure drop	4-7.2	Once/size/product type	-	+	-	1	1
Operating torque	4-7.2	Once/body type	-	+	-	1	2
Stop resistance	4-7.2	Once/body type	Once/body type	+	-	1	2
Actuation mechanism resistance	4-7.2	Once/body type	Once/body type	+	-	1	1
Resistance to bending between supports	4-7.2	Once/size/product type	Once/ size group/ product type	+	+	1	1
Thermal cycling resistance $d_n > 63$ mm	4-7.2	Once/size/product type	Once/ size group/ product type	+	-	1	1
Leaktightness under bending with thermal cycling, $d_n \leq 63$ mm	4-7.2	Once/size/product type	Once/ size group/ product type	+	+	1	1
Leaktightness under tensile loading	4-7.2	Once/size/product type	Once/ size group/ product type	+	+	1	1
Leaktightness under and after bending applied to the operating mechanism	4-7.2	Once/size/product type	Once/ size group/ product type	+	-	1	1
Impact loading resistance	4-7.2	Once/body type	Once/body type	+	-	1	1
Resistance to long term internal pressure loading	4-7.2	Once/body type	Once/body type	+	-	1	1
Oxidation induction time (thermal stability)	4-8.2	Once/size	Once/size	-	-	3	1
Melt mass-flow rate (MFR)	4-8.2	Once/size	Once/size	-	-	3	1
Marking	4-10.2	Once/size/ product type	Once/ size/ product type	-	-	1	1
Tensile strength for butt fusion	5-4.2.1.1	One diameter/ size group/ product type <sup>e</sup>	One diameter/ size group/ product type	-	+	1	Shall conform to ISO 13953
	5-4.2.1.2	One diameter/ size group/ product type <sup>e</sup>	One diameter/ size group/ product type	-	+	1	

<sup>a</sup> In case of change of MRS, all type tests shall apply with the sampling procedure.

<sup>b</sup> According to 4.2.2.1.

"+" denotes test to be carried out;

"-" denotes test not to be carried out.

The sampling frequency in case of any change in design shall be two diameters/size group/product type.

<sup>c</sup> The number of test pieces given in the table is the minimum. All test pieces shall pass the relevant test(s). Where applicable, test assemblies shall be prepared in accordance with prEN 1555-5.

<sup>d</sup> Test pieces may be subsequently used in the destructive test listed in this table.

<sup>e</sup> Results of tests in accordance with prEN 1555-1:2002, 4.3 done by the compound manufacturer should be taken into consideration.

For valves with electrofusion sockets additional tests for fittings type (A) according to Table 4 shall be performed.

#### 4.2.2.2 Preliminary type testing (PTT)

The manufacturer shall demonstrate that the products conform to all requirements of the characteristics given in Tables 3 to 5, as applicable.

The compound manufacturer shall demonstrate the conformity to all requirements given in Table 2.

#### 4.2.2.3 Initial type testing (ITT)

If third party certification is involved, the certification body shall assess the conformity of a product to all requirements for the characteristics given in Tables 2 to 5, as applicable.

The assessment shall be performed by validation or testing, using the sampling procedure given in Tables 2 to 5, as applicable, and grouping according to 4.2.1, in an approved testing laboratory or by witness testing.

Results from preliminary type testing including long-term characteristics, supplied by the manufacturer and traceable to material or compound and process, validated by the certification body shall be taken into account for initial type testing.

#### 4.2.3 Batch release tests (BRT)

Those characteristics specified in prEN 1555-1, prEN 1555-2, prEN 1555-3, prEN 1555-4 and prEN 1555-5 and listed in Tables 6 to 9 shall be batch release tested with the minimum sampling frequency as given in Tables 6 to 9, as applicable.

**Table 6 — Characteristics and minimum sampling frequencies for BRT by the compound manufacturer**

Characteristic	Reference to Part and clause of prEN 1555	Minimum sampling frequency	Number of samples <sup>a</sup>	Number of measurements per sample
Conventional density	1-4.2.3.1	Once/batch/week	1	1
Oxidation induction time (thermal stability)	1-4.2.3.1	Once/batch/week	1	1
Melt mass-flow rate (MFR)	1-4.2.3.1	Once/batch/week	1	1
Volatile content	1-4.2.3.1	Once/batch/week	1	1
Water content <sup>b</sup>	1-4.2.3.1	Once/batch/week	1	1
Carbon black content <sup>c</sup>	1-4.2.3.1	Once/batch/week	1	1
Carbon black dispersion <sup>c</sup>	1-4.2.3.1	Once/batch/week	1	6
Pigment dispersion <sup>d</sup>	1-4.2.3.1	Once/batch/week	1	6
<sup>a</sup> The number of samples given in the table is the minimum. All samples shall pass the relevant test(s). <sup>b</sup> Only applicable if the requirement for volatile content is not conformed to. In case of dispute the requirement for water content shall apply. <sup>c</sup> Only applicable for black compound. <sup>d</sup> Only applicable for yellow compound.				

**Table 7 — Characteristics and minimum sampling frequencies for BRT by the pipe manufacturer**

Characteristic	Reference to Part and clause of prEN 1555	Minimum sampling frequency	Number of test pieces <sup>a</sup>	Number of measurements per test piece
Appearance	2-5.1	At least every 4 h. If duration of production of an item > 4 h, every item <sup>b</sup>	1	1
Colour	2-5.2	At least every 4 h. If duration of production of an item > 4 h, every item <sup>b</sup>	1	1
Geometrical characteristics	2-6	Continuously <sup>c</sup> or at every 4 h. If duration of production of an item > 4 h, every item <sup>b</sup>	1	1
Hydrostatic strength (80 °C, 165 h)	2-7.2	Once/batch (size group 3) Once/batch/week (size groups 1 and 2)	1	1
Elongation at break	2-7.2	Once/batch/week (size group 1)	Shall conform to ISO 6259-3	1
Oxidation induction time (thermal stability) <sup>c</sup>	2-8.2	Once/batch (size group 3) Once/batch/week (size groups 1 and 2)	1 (to inside surface)	1
Melt mass-flow rate (MFR) <sup>d</sup>	2-8.2	Once/batch (size group 3) Once/batch/week (size groups 1 and 2)	1	1
Marking	2-10.2	At start up and every 4 h	1	1

NOTE Attention is drawn for hydrostatic strength characteristic (80 °C, 165 h) for BRT by the pipe manufacturer to the fact that the test requirements/parameters may be modified when revising this Technical Specification when the results of work being undertaken in ISO/TC 138 or CEN/TC 155 are known.

<sup>a</sup> The number of test pieces given in the table is the minimum. All test pieces shall pass the relevant test(s).

<sup>b</sup> An item is a coiled or a straight pipe, as it is manufactured.

<sup>c</sup> By indirect testing.

<sup>d</sup> The test is not applicable in case of use 100 % of virgin material.



**Table 8 — Characteristics and minimum sampling frequencies for BRT by the fitting manufacturer**

Characteristic	Reference to Part and clause of prEN 1555	Minimum sampling frequency	Number of test pieces <sup>a</sup>	Number of measurements per test piece
Appearance	3-5.1	Every 4 h per size, after the fitting meets the requirements	1 <sup>b</sup>	1 <sup>b</sup>
Colour	3-5.2	Every 4 h per size, after the fitting meets the requirements	1 <sup>b</sup>	1 <sup>b</sup>
Geometrical characteristics	3-6	Every 4 h per size, after the fitting meets the requirements	1 <sup>b</sup>	1 <sup>b</sup>
Hydrostatic strength (80 °C, 165 h)	3-7.2	Once/batch (size group 3) Once/batch/week (size groups 1 and 2)	1	1
Oxidation induction time (thermal stability) <sup>c</sup>	3-8.2	Once/batch (size group 3) Once/batch/week (size groups 1 and 2)	1	1
Melt mass-flow rate (MFR) <sup>c</sup>	3-8.2	Once/batch (size group 3) Once/batch/week (size groups 1 and 2)	1	1
Electrical resistance (A) , (B)	3-5.5	Each fitting	1	1
Marking	3-10.2	Once/batch	1	1
NOTE Attention is drawn for hydrostatic strength characteristic (80 °C, 165 h) for BRT by the fitting manufacturer to the fact that the test requirements/parameters may be modified when revising this Technical Specification when the results of work being undertaken in ISO/TC 138 or CEN/TC 155 are known.				
<sup>a</sup> The number of test pieces given in the table is the minimum. All test pieces shall pass the relevant test(s).				
<sup>b</sup> Alternatively a sampling procedure conforming to ISO 2859-1 may be used, taking into account an AQL of 2,5 and an inspection level S3.				
<sup>c</sup> The test is not applicable in case of use 100 % of virgin material. Clear indication of the use of own reprocessed material shall be given in the technical file (see 4.3).				

**Table 9 — Characteristics and minimum sampling frequencies for BRT by the valve manufacturer**

Characteristic	Reference to Part and clause of prEN 1555	Minimum sampling frequency	Number of test pieces <sup>a</sup>	Number of measurements per test piece
Appearance	4-5.1	Every 4 h per size, after the valve meets the requirements	1 <sup>b</sup>	1 <sup>b</sup>
Colour	4-5.2	Every 4 h per size, after the valve meets the requirements	1 <sup>b</sup>	1 <sup>b</sup>
Geometrical characteristics	4-6	Every 4 h per size, after the valve meets the requirements	1 <sup>b</sup>	1 <sup>b</sup>
Hydrostatic strength (80 °C, 165 h)	4-7.2	Once/batch (size group 3) Once/batch/week (size groups 1 and 2)	1	1
Operating torque	4-7.2	Each valve	1 <sup>b</sup>	1 <sup>b</sup>
Leaktightness of seat and packing. At 1,5 MOP (not to exceed 6 bar)	4-7.2	Each valve	1	1
Leaktightness of seat and packing. At 25 mbar	4-7.2	Once/batch/week	1	1
Oxidation induction time (thermal stability) <sup>c</sup>	4-8.2	Once/batch (size group 3) Once/batch/week (size groups 1 and 2)	1	1
Melt mass-flow rate (MFR) <sup>c</sup>	4-8.2	Once/batch (size group 3) Once/batch/week (size groups 1 and 2)	1	1
Marking	4-10.2	Once/batch	1	1
NOTE Attention is drawn for hydrostatic strength characteristic (80 °C, 165 h) for BRT by the valve manufacturer to the fact that the test requirements/parameters may be modified when revising this Technical Specification when the results of work being undertaken in ISO/TC 138 or CEN/TC 155 are known.				
<sup>a</sup> The number of test pieces given in the table is the minimum. All test pieces shall pass the relevant test(s).				
<sup>b</sup> Alternatively a sampling procedure conforming to ISO 2859-1 may be used, taking into account an AQL of 2,5 and an inspection level S3. For operating torque, this alternative sampling frequency is recommended for valves that have no capability for adjusting the operating torque during production, and is not needed for valves which are designed for no varying torque with the manufacturing and assembly process.				
<sup>c</sup> The test is not applicable in case of use 100 % of virgin material. Clear indication of the use of own reprocessed material shall be given in the technical file (see 4.3).				

The manufacturer shall specify a batch or a lot in his quality plan.

A batch or a 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 conformed to.

If a product fails in respect of any characteristics given in Tables 6 to 9, 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 conform to Tables 6 to 9 and shall be either procedure A or procedure B as follows.

— Procedure A

Find the last product which conforms to the requirements as specified in prEN 1555-1 to prEN 1555-5. Release all products produced before that point and reject the products produced after that point.

— Procedure B

Use a sampling procedure in accordance with ISO 2859-1 or ISO 2859-2, as applicable, with the AQL and inspection level as specified in Tables 8 and 9.

NOTE 1 Retest procedures in accordance with ISO 2859-1 are only applicable when also ISO 2859-1 has been used for BRT. If the retest requirements are conformed to, then release the batch or lot. If they are not conformed to, then reject the batch or lot.

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

NOTE 2 The minimum sampling frequencies indicated should adapt to the size and the number of lots manufactured. These frequencies allow the manufacturer to maintain the conformity of the products to the requirements of prEN 1555-1 to prEN 1555-5. Deviations can cause an increase in the test frequency.

#### 4.2.4 Process verification tests (PVT)

Those characteristics contained in prEN 1555-1, prEN 1555-2, prEN 1555-3, prEN 1555-4 and prEN 1555-5 and listed in Tables 10 to 13, shall be process verification tested with the minimum sampling frequency given in Tables 10 to 13, as applicable.

**Table 10 — Characteristics and minimum sampling frequencies for PVT by the compound manufacturer**

Characteristic	Reference to Part and clause of prEN 1555	Minimum sampling frequency	Number of samples <sup>a</sup>	Number of measurements per sample
Classification <sup>b</sup>	1-4.4	Once/two years/compound/production site	6	1
Resistance to rapid crack propagation (critical pressure, $p_c$ , $e \geq 15$ mm)	1-4.2.3.2 5-5	Once/two years/compound/production site	1	1
Resistance to slow crack growth ( $d_n$ : 110 mm or 125 mm - SDR 11)	1-4.2.3.2	Once/year/ compound/production site	1	1

<sup>a</sup> The number of samples given in the table is the minimum. All samples shall pass the relevant test(s).  
<sup>b</sup> Test shall be performed on size group 1 pipe. Check two stress levels at 20 °C taken from the predicted LCL curve of the original classification dataset, corresponding to 2 500 h and at least 100 h respectively. Test three test pieces at each stress level. The corresponding times shall be exceeded without failure.

**Table 11 — Characteristics and minimum sampling frequencies for PVT by the pipe manufacturer**

Characteristic	Reference to Part and clause of prEN 1555	Minimum sampling frequency <sup>a</sup>	Number of test pieces <sup>b</sup>	Number of measurements per test piece
Hydrostatic strength (20 °C, 100 h) <sup>c</sup>	2-7.2	Once/size group/year/ compound designation/production site	3	1
Hydrostatic strength (80 °C, 1000 h)	2-7.2	Once/size group/year/ compound designation/ production site	3	1
Resistance to slow crack growth $e \leq 5$ mm (Cone test)	2-7.2	Once/size group/year/ compound designation/production site	1	1
Resistance to slow crack growth $e > 5$ mm (Notch test)	2-7.2	Once/size group/year/ compound designation/production site	1	1
Oxidation induction time (thermal stability)	2-8.2	Once/size group/year/ compound designation/production site	1	1
Longitudinal reversion	2-8.2	Once/size group/year/ compound designation/production site	1	1
Circumferential reversion	2-6.4	Once/size group/year/ compound designation/production site	1	1

<sup>a</sup> Rotate sizes, SDR and compound, as applicable.  
<sup>b</sup> The number of test pieces given in the table is the minimum. All test pieces shall pass the relevant test(s).  
<sup>c</sup> Only applicable for pipes of size group 1.

**Table 12 — Characteristics and minimum sampling frequencies for PVT by the fitting manufacturer**

Characteristic	Reference to Part and clause of prEN 1555	Minimum sampling frequency <sup>a</sup>	Number of test pieces <sup>b</sup>	Number of measurements per test piece
Hydrostatic strength (80 °C, 1000 h)	3-7.2	Once/size group/year/production site	3	1
Decohesive resistance (A)	3-7.2	Once/size/year/production site	1	Shall conform to ISO 13954 ISO 13955
Cohesive strength (B)	3-7.2	Once/size/year/production site	1	Shall conform to ISO/DIS 13956
Tensile strength for butt fusion (C)	3-7.2	Once/size group/year/production site	1	1
Impact resistance (B)	3-7.2	Once/size/year/production site	1	1
<sup>a</sup> Change of sizes and SDR every year. <sup>b</sup> The number of test pieces given in the table is the minimum. All test pieces shall pass the relevant test(s).				

**Table 13 — Characteristics and minimum sampling frequencies for PVT by the valve manufacturer**

Characteristic	Reference to Part and clause of prEN 1555	Minimum sampling frequency <sup>a</sup>	Number of test pieces <sup>b</sup>	Number of measurements per test piece
Hydrostatic strength (80 °C, 1000 h)	4-7.2	Once/size group/year/production site	3	1
Stop resistance	4-7.2	Once/body type/year/production site	1	1
Actuation mechanism resistance	4-7.2	Once/body type/year/production site	1	1
Resistance to bending between supports	4-7.2	Once/size group/year/production site	1	1
Leaktightness under tensile loading	4-7.2	Once/size group/year/production site	1	1
Impact loading resistance	4-7.2	Once/body type/year/production site	1	1
<sup>a</sup> Change of sizes and SDR every year. <sup>b</sup> The number of test pieces given in the table is the minimum. All test pieces shall pass the relevant test(s).				

If a product does not conform to the requirements in respect of any characteristics given in Tables 10 to 13, the retest procedures detailed in the manufacturer's quality plan shall be performed. If third party 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 in the manufacturer's quality plan.

NOTE The minimum sampling frequencies indicated should adapt according to the size and the number of batch manufactured. These frequencies allow the manufacturer to maintain the conformity of the products to the requirements of prEN 1555-1 to prEN 1555-5. Deviations can cause an increase in the test frequency.

#### 4.2.5 Audit tests (AT)

If third party certification is involved, those characteristics specified in prEN 1555-1 to prEN 1555-5 may be subject to auditing. In such cases the selection of the tests shall be agreed between the manufacturer and the certification body and shall at least consist of those characteristics listed in Tables 14 to 17, taking into consideration that PVT can be accepted as part of audit tests if they are witnessed by the certification body or its representative.

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

**Table 14 — Characteristics and minimum sampling frequencies for AT for the compound**

Characteristic	Reference to Part and clause of prEN 1555	Minimum sampling frequency	Number of samples <sup>a</sup>	Number of measurements per sample
Classification <sup>b</sup>	1-4.4	Once/two years/ compound/production site	6	1
Resistance to rapid crack propagation (critical pressure, $p_c$ ) ( $e \geq 15$ mm)	1-4.2.3.2 5-5	Once/two years/ compound/production site	1	1
Resistance to slow crack growth ( $d_n$ : 110 mm or 125 mm - SDR 11)	1-4.2.3.2	Once/year/compound/ production site	1	1

<sup>a</sup> The number of samples given in the table is the minimum. All samples shall pass the relevant test(s).  
<sup>b</sup> Test shall be performed on size group 1 pipe. Check two stress levels at 20 °C taken from the predicted LCL curve of the original classification dataset, corresponding to 2500 h and at least 100 h respectively. Test three test pieces at each stress level. The corresponding times shall be exceeded without failure.

Table 15 — Characteristics and minimum sampling frequencies for AT for pipes

Characteristic	Reference to Part and clause of prEN 1555	Minimum sampling frequency <sup>a</sup>	Number of test pieces <sup>b</sup>	Number of measurements per test piece
Appearance	2-5.1	Once/size group/ 2 years/production site	1	1
Colour	2-5.2	Once/size group/ 2 years /production site	1	1
Geometrical characteristics	2-6	Once/size group/ 2 years /production site	8 <sup>c</sup>	1
Hydrostatic strength (20 °C, 100 h)	2-7.2	Once/size group/ 2 years /production site	3 (size groups 1 and 2) 1 (size group 3)	1
Hydrostatic strength (80 °C, 1000 h)	2-7.2	Once/size group/ 2 years /production site	3	1
Resistance to rapid crack propagation (critical pressure, $p_c$ ) <sup>d</sup>	2-7.2 5-5	Once/size group/ 2 years /production site	1	1
Resistance to slow crack growth $e \leq 5$ mm (Cone test)	2-7.2	Once/size group/ 2 years /production site	1	1
Resistance to slow crack growth $e > 5$ mm (Notch test)	2-7.2	Once/size group/ 2 years /production site	1	1
Elongation at break	2-7.2	Once/size group/ 2 years /production site	3 (size group 1) 5 (size group 2) 7 (size group 3)	1
Oxidation induction time (thermal stability)	2-8.2	Once/size group/ 2 years /production site	1	1
Melt mass-flow rate (MFR)	2-8.2	Once/size group/ 2 years /production site	1	1
Longitudinal reversion	2-8.2	Once/size group/ 2 years /production site	1	1

<sup>a</sup> Change of sizes and SDR every year.

<sup>b</sup> The number of test pieces given in the table is the minimum. All test pieces shall pass the relevant test(s).

<sup>c</sup> Test pieces may be subsequently used in the destructive test listed in this table.

<sup>d</sup> If applicable (See Table 4 in prEN 1555-2:2002).

**Table 16 — Characteristics and minimum sampling frequencies for AT for fittings**

Characteristic	Reference to Part and clause of prEN 1555	Minimum sampling frequency <sup>a</sup>	Number of test pieces <sup>b</sup>	Number of measurements per test piece
Appearance	3-5.1	Once/size group/ 2 years/production site	1	1
Colour	3-5.2	Once/size group/ 2 years/production site	1	1
Geometrical characteristics	3-6	Once/size group/ 2 years/production site	8 <sup>c</sup>	1
Hydrostatic strength (20 °C, 100 h)	3-7.2	Once/size group/ 2 years /production site	3 (size groups 1 and 2) 1 (size group 3)	1
Hydrostatic strength (80 °C, 1000 h)	3-7.2	Once/size group/ 2 years /production site	3	1
Decohesive resistance (A)	3-7.2	Once/size/2 years / production site	1	Shall conform to ISO 13954 ISO 13955
Cohesive strength (B)	3-7.2	Once/size/2 years / production site	1	Shall conform to ISO/DIS 13956
Tensile strength for butt fusion (C)	3-7.2	Once/size group/ 2 years /production site	1	1
Impact resistance (B)	3-7.2	Once/size/2 years / production site	1	1

<sup>a</sup> Rotate sizes, SDR and product types.

<sup>b</sup> The number of test pieces given in the table is the minimum. All test pieces shall pass the relevant test(s).

<sup>c</sup> Test pieces may be subsequently used in the destructive test listed in this table.

**Table 17 — Characteristics and minimum sampling frequencies for AT for valves**

Characteristic	Reference to Part and clause of prEN 1555	Minimum sampling frequency <sup>a</sup>	Number of test pieces <sup>b</sup>	Number of measurements per test piece
Appearance	4-5.1	Once/size group/2 years / production site	1	1
Colour	4-5.2	Once/size group/2 years / production site	1	1
Geometrical characteristics	4-6	Once/size group/2 years / production site	8 <sup>c</sup>	1
Hydrostatic strength (20 °C, 100 h)	4-7.2	Once/size group/2 years / production site	3 (size groups 1 and 2) 1 (size group 3)	1
Hydrostatic strength (80 °C, 1000 h)	4-7.2	Once/size group/2 years / production site	3	1
Stop resistance	4-7.2	Once/body type/2 years / production site	1	1
Actuation mechanism resistance	4-7.2	Once/body type /2 years / production site	1	1
Resistance to bending between supports	4-7.2	Once/size group/2 years / production site	1	1
Thermal cycling resistance, $d_h > 63$ mm	4-7.2	Once/size group/2 years / production site	1	1
Leaktightness under bending with thermal cycling, $d_h \leq 63$ mm	4-7.2	Once/size group/2 years / production site	1	1
Leaktightness under tensile loading	4-7.2	Once/size group/2 years / production site	1	1
Impact loading resistance	4-7.2	Once/body type /2 years / production site	1	1
<sup>a</sup> Change of sizes and SDR every year. <sup>b</sup> The number of test pieces given in the table is the minimum. All test pieces shall pass the relevant test(s). <sup>c</sup> Test pieces may be subsequently used in the destructive test listed in this table.				

**4.2.6 Indirect tests (IT)**

Generally testing shall be performed according to the test methods referred to in prEN 1555-1 to prEN 1555-5.

Indirect testing may be used for BRT and PVT characteristics as given in Tables 6 to 13, as applicable. Indirect testing shall not be applied to TT and AT.

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

In case of dispute the BRT or PVT as specified in Tables 6 to 13, as applicable, shall be used.

If third party certification is involved, the IT shall be acceptable to the certification body.

NOTE Indirect testing can be used to reduce the frequency of the specified BRT and PVT, but it is not intended to replace these tests completely.

**4.2.7 Inspection records and test records**

Unless otherwise specified all records shall be maintained for a minimum of ten years.



### 4.3 Technical file

The compound manufacturer shall maintain a technical file, which is confidential, and available for inspection by agreement, with all relevant data to prove the conformity of the compounds to prEN 1555-1. It shall include all results of the type testing (TT) in accordance with this Technical Specification.

The pipe manufacturer shall maintain a technical file, which is confidential, and available for inspection by agreement, with all relevant data to prove the conformity of the pipes to prEN 1555-2 and to prEN 1555-5. It shall include all results of the type testing (TT) in accordance with this Technical Specification.

The fitting manufacturer shall maintain a technical file, which is confidential, and available for inspection by agreement, with all relevant data to prove the conformity of the fittings to prEN 1555-3 and to prEN 1555-5. It shall include all results of the type testing (TT) in accordance with this Technical Specification.

The valve manufacturer shall maintain a technical file, which is confidential, and available for inspection by agreement, with all relevant data to prove the conformity of the valves to prEN 1555-4 and to prEN 1555-5. It shall include all results of the type testing (TT) in accordance with this Technical Specification.

## **Annex A** **(normative)**

### **Change of compound**

#### **A.1 General**

For the purposes of this Technical Specification the following definitions of the changes of compound formulation 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 manufacturer, 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<sup>3</sup>.

NOTE If decrease of MFR 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 10 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-stabilisers) level by > 30 %.

**A.2.4.3** Decrease of UV-stabilisers 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 2.

### 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 2 of this Technical Specification.

Failure of the specified requirements is not acceptable.

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

Characteristic	Change						
	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 <sup>a</sup>	+	+	+	+	+	+	+
Resistance to slow crack growth	+	+	+	+	+	+	+
Resistance to rapid crack propagation	+	+	+	+	+	–	–
Tensile strength for butt fusion	+	–	–	+	+	+	+
Resistance to weathering	–	–	–	–	+	–	+
Hydrostatic strength <sup>b</sup> (20°C)	+	+	+	–	+	–	–
Hydrostatic strength <sup>c</sup> (80°C)	+	+	+	+	+	+	+
<p>" + " denotes test to be carried out.  " – " denotes test not to be carried out.</p> <p><sup>a</sup> As defined in Table 2 of this Technical Specification (Conventional density, Oxidation induction time, Water content, Carbon black content and dispersion, Pigment dispersion, MFR).</p> <p><sup>b</sup> Test shall be performed on size group 1 pipe. Check two stress levels at 20 °C taken from the predicted LCL curve of the original classification dataset, corresponding to 2 500 h and at least 100 h respectively. Test three test pieces at each stress level. The corresponding times shall be exceeded without failure.</p> <p><sup>c</sup> Test shall be performed on size group 1 pipe. Check two stress levels at 80 °C taken from the predicted LCL curve of the original classification dataset, corresponding to 2 500 h and at least 100 h respectively. Test three test pieces at each stress level. The corresponding times shall be exceeded without failure.</p>							

## Bibliography

- [1] EN 12007-2, *Gas supply systems — Gas pipelines for maximum operating pressure up to and including 16 bar — Part 2: Specific functional recommendations for polyethylene (MOP up to and including 10 bar)*.
- [2] EN ISO 9001, *Quality management systems — Requirements (ISO 9001:2000)*.
- [3] EN 45011, *General requirements for bodies operating product certification systems (ISO/IEC Guide 65:1996)*.
- [4] EN 45012, *General requirements for bodies operating assessment and certification/registration of quality systems (ISO/IEC Guide 62:1996)*.
- [5] ISO 10838-1, *Mechanical fittings for polyethylene piping systems for the supply of gaseous fuels — Part 1: Metal fittings for pipes of nominal outside diameter less than or equal to 63 mm*.
- [6] ISO 10838-2, *Mechanical fittings for polyethylene piping systems for the supply of gaseous fuels — Part 2: Metal fittings for pipes of nominal outside diameter greater than 63 mm*.
- [7] ISO 10838-3, *Mechanical fittings for polyethylene piping systems for the supply of gaseous fuels — Part 3: Thermoplastics fittings for pipes of nominal outside diameter less than or equal to 63 mm*.
- [8] EN ISO 9000, *Quality management systems — Fundamentals and vocabulary (ISO 9000:2000)*.