BS EN 1555-3:2025

BSI Standards Publication

Plastics piping systems for the supply of gaseous fuels — Polyethylene (PE)

Part 3: Fittings

bsi.

National foreword

This British Standard is the UK implementation of EN 1555-3:2025. It supersedes BS EN 1555-3:2021, which is withdrawn.

The UK participation in its preparation was entrusted to Technical Committee PRI/88, Plastics piping systems.

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

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Published by BSI Standards Limited 2025

ISBN 978 0 539 31205 8

ICS 23.040.45; 91.140.40

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This British Standard was published under the authority of the Standards Policy and Strategy Committee on 31 October 2025.

Amendments/corrigenda issued since publication

Date	Text affected

EUROPEAN STANDARD

NORME EUROPÉENNE

EUROPÄISCHE NORM

EN 1555-3

October 2025

ICS 23.040.45

Supersedes EN 1555-3:2021

English Version

Plastics piping systems for the supply of gaseous fuels - Polyethylene (PE) - Part 3: Fittings

Systèmes de canalisations en plastique pour la distribution de combustibles gazeux - Polyéthylène (PE) - Partie 3 : Raccords

Kunststoff-Rohrleitungssysteme für die Gasversorgung - Polyethylen (PE) - Teil 3: Formstücke

This European Standard was approved by CEN on 11 August 2025.

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CEN-CENELEC Management Centre: Rue de la Science 23, B-1040 Brussels

Ref. No. EN 1555-3:2025 E

Contents

Page

European foreword

This document (EN 1555-3:2025) has been prepared by Technical Committee CEN/TC 155 "Plastics piping systems and ducting systems", the secretariat of which is held by NEN.

This European Standard shall be given the status of a national standard, either by publication of an identical text or by endorsement, at the latest by April 2026, and conflicting national standards shall be withdrawn at the latest by April 2026.

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

This document supersedes EN 1555-3:2021.

The main changes are as follows:

— reference to information related to the suitability of PE pipe systems for 100 % hydrogen and its admixtures with natural gas has been made;

— terms and definitions have been distributed over EN 1555-1, EN 1555-2 and EN 1555-3;

— symbols and their definitions for geometrical characteristics on electrofusion socket fittings, spigot end fittings and tapping tees have been harmonized with other standards in ISO;

— Clause 5 has been restructured;

— the minimum bore for electrofusion socket fittings have been harmonized with the minimum bore for spigot end fittings;

— test speeds have been added for testing the decohesive resistance;

— the performance requirements for joints have been mentioned more explicitly by adding Table 8;

— the technical file has been changed to technical information and fully revised.

System Standards are based on the results of the work being 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.

EN 1555 consists of the following parts:

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

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

— EN 1555-3, *Plastics piping systems for the supply of gaseous fuels — Polyethylene (PE) — Part 3: Fittings* (this document);

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

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

In addition, the following document provides guidance on the assessment of conformity:

— CEN/TS 1555-7, *Plastics piping systems for the supply of gaseous fuels — Polyethylene (PE) — Part 7: Guidance for assessment of conformity.*

NOTE EN 12007-2 prepared by CEN/TC 234 "Gas infrastructure", deals with the recommended practice for installation of plastics pipes system in accordance with EN 1555 (all parts).

Any feedback and questions on this document should be directed to the users' national standards body. A complete listing of these bodies can be found on the CEN website.

According to the CEN-CENELEC Internal Regulations, the national standards organisations of the following countries are bound to implement this European Standard: Austria, Belgium, Bulgaria, Croatia, Cyprus, Czech Republic, Denmark, Estonia, Finland, France, Germany, Greece, Hungary, Iceland, Ireland, Italy, Latvia, Lithuania, Luxembourg, Malta, Netherlands, Norway, Poland, Portugal, Republic of North Macedonia, Romania, Serbia, Slovakia, Slovenia, Spain, Sweden, Switzerland, Türkiye and the United Kingdom.

Introduction

The EN 1555 series specifies the requirements for a piping system and its components made from polyethylene (PE) compounds, which is intended to be used for the supply of gaseous fuels.

This document covers the characteristics of fittings.

Requirements and test methods for materials and components, other than fittings, are specified in EN 1555-1, EN 1555-2 and EN 1555-4.

Characteristics for fitness for purpose of the system are covered in EN 1555-5. CEN/TS 1555-7 gives guidance for assessment of conformity.

Recommended practice for design, handling and installation is given in EN 12007-2.

1 Scope

This document specifies the characteristics of fusion fittings made from polyethylene (PE) as well as of mechanical fittings for piping systems in the field of the supply of gaseous fuels.

NOTE 1 Additional information related to the installation of PE 100-RC systems is given in EN 1555-1:2025, Annex A.

NOTE 2 Additional information about the suitability of PE pipe systems for hydrogen and its admixtures is given in EN 1555-1:2025, Annex B.

It also specifies the test parameters for the test methods referred to in this document.

In conjunction with EN 1555-1, EN 1555-2, EN 1555-4 and EN 1555-5, this document is applicable to PE pipes, fittings and valves, their joints, and joints with components of PE and other materials intended to be used under the following conditions:

a) a maximum operating pressure, MOP, up to and including 10 bar[1], at a design reference temperature of 20 °C;

b) an operating temperature between −20 °C and 40 °C.

For operating temperatures between 20 °C and 40 °C, derating coefficients are specified in EN 1555-5.

The EN 1555 series covers a range of MOPs and gives requirements concerning colours.

This document is applicable for fittings of the following types:

a) electrofusion socket fittings;

b) electrofusion saddle fittings;

c) spigot end fittings (for butt fusion using heated tools and electrofusion);

d) mechanical fittings.

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.

NOTE 3 The fittings can be, for example, in the form of couplers, saddles, equal and reduced tees, reducers, elbows, bends or end caps.

2 Normative references

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

EN 682, *Elastomeric Seals — Materials requirements for seals used in pipes and fittings carrying gas and hydrocarbon fluids*

EN 1555-1:2025, *Plastics piping systems for the supply of gaseous fuels — Polyethylene (PE) — Part 1: General*

EN 1555-2:2025, *Plastics piping systems for the supply of gaseous fuels — Polyethylene (PE) — Part 2: Pipes*

[1] 1 bar = 0,1 MPa = 10^5 Pa; 1 MPa = 1 N/mm^2.

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

EN 10226-1, *Pipe threads where pressure tight joints are made on the threads — Part 1: Taper external threads and parallel internal threads — Dimensions, tolerances and designation*

EN 10226-2, *Pipe threads where pressure tight joints are made on the threads — Part 2: Taper external threads and taper internal threads — Dimensions, tolerances and designation*

EN ISO 228-1, *Pipe threads where pressure-tight joints are not made on the threads — Part 1: Dimensions, tolerances and designation (ISO 228-1)*

EN ISO 1133-1, *Plastics — Determination of the melt mass-flow rate (MFR) and melt volume-flow rate (MVR) of thermoplastics — Part 1: Standard method (ISO 1133-1)*

EN ISO 1167-1:2006, *Thermoplastics pipes, fittings and assemblies for the conveyance of fluids — Determination of the resistance to internal pressure — Part 1: General method (ISO 1167-1:2006)*

EN ISO 1167-4, *Thermoplastics pipes, fittings and assemblies for the conveyance of fluids — Determination of the resistance to internal pressure — Part 4: Preparation of assemblies (ISO 1167-4)*

EN ISO 3126, *Plastics piping systems — Plastics components — Determination of dimensions (ISO 3126)*

EN ISO 11357-6, *Plastics — Differential scanning calorimetry (DSC) — Part 6: Determination of oxidation induction time (isothermal OIT) and oxidation induction temperature (dynamic OIT) (ISO 11357-6)*

EN ISO 17778, *Plastics piping systems — Fittings, valves and ancillaries — Determination of gaseous flow rate/pressure drop relationships (ISO 17778)*

ISO 12176-5, *Plastics pipes and fittings — Equipment for fusion jointing polyethylene systems — Part 5: Two-dimensional data coding of components and data exchange format for PE piping systems*

ISO 13950, *Plastics pipes and fittings — Automatic recognition systems for electrofusion joints*

ISO 13951, *Plastics piping systems — Test method for the resistance of plastic pipe/pipe or pipe/fitting assemblies to tensile loading*

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 13956, *Plastics pipes and fittings — Decohesion test of polyethylene (PE) saddle fusion joints — Evaluation of ductility of fusion joint interface by tear test*

ISO 13957, *Plastics pipes and fittings — Polyethylene (PE) tapping tees — Test method for impact resistance*

ISO 17885:2021, *Plastics piping systems — Mechanical fittings for pressure piping systems — Specifications*

ISO 18488, *Polyethylene (PE) materials for piping systems — Determination of Strain Hardening Modulus in relation to slow crack growth — Test method*

3 Terms and definitions

For the purposes of this document, the terms and definitions given in EN 1555-1, EN 1555-2 and the following apply.

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

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

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

3.1
electrofusion socket fitting
fitting which contains one or more integrated heating elements, that are capable of transforming electrical energy into heat to realize a fusion joint with a spigot end or a pipe

3.2
electrofusion saddle fitting
fitting which contains one or more integrated heating elements, that are capable of transforming electrical energy into heat to realize a fusion joint onto a pipe

3.2.1
tapping tee
electrofusion saddle fitting (3.2) (top loading or wrap round) that contains a cutter to tap through the wall of the main pipe and remains in the body of this fitting

3.2.2
branch saddle
electrofusion saddle fitting (3.2) (top loading or wrap round) that requires an ancillary cutting tool for drilling a hole in the adjoining main pipe

3.3
spigot end fitting
fitting where the outside diameter of the spigot end is equal to the nominal outside diameter, d_n, of the corresponding pipe

3.4
mechanical fitting
fitting for assembling plastics pipes with each other or with a metal pipe or fitting, that includes one or more compression zones to provide pressure integrity, leak tightness and resistance to end loads

[SOURCE: ISO 17885:2021, 3.1.1]

4 Symbols and abbreviated terms

For the purposes of this document the symbols and abbreviated terms given in EN 1555-1, EN 1555-2 and the following apply.

A_d percentage of decohesion (area)

c_1 outside diameter of the terminal shroud

c_2 diameter of the contact area of the terminal

c_3 internal diameter of the terminal shroud

c_4 maximum overall diameter of the base of the contact area

D mean outside diameter of the fusion end piece

D_1 mean inside diameter in the fusion zone measured in a plane parallel to the plane of the mouth at a distance of $L_3 + 0{,}5L_2$ from that face

D_2 bore, i.e. the minimum diameter of the flow channel through the plastic body of the fitting

E fusion face wall thickness

E_1 wall thickness (at any point) of the fitting body

h internal depth of the terminal shroud

H height of the saddle, i.e. the distance from the top of the main pipe to the top of the tapping tee or saddle

h_1 distance between the upper part of the terminal shroud and the contact area

H_1 height of the service pipe, i.e. the distance from the top of the main pipe to the axis of the service pipe

H_2 height of the contact area

L_1 depth of penetration of the pipe or spigot end fitting

L_2 heated length within the socket, i.e. the nominal length of the fusion zone as declared by the manufacturer

L_3 distance between the mouth of the fitting and the start of the fusion zone, i.e. the nominal unheated entrance length of the fitting as declared by the manufacturer

L_4 cut-back length of the fusion end piece

L_5 tubular length of the fusion end piece

L_d percentage of decohesion (length)

W width of the tapping tee, i.e. the distance between the axis of the main pipe and the plane of the mouth of the service tee

5 Material

5.1 PE compound for fittings

The stress-bearing PE parts of injection moulded fittings or compression moulded plates, for example the main body of the fitting, shall only be made from virgin material conforming to EN 1555-1. The stress-bearing PE parts of fittings made from pipe shall be made from pipe conforming to EN 1555-2, except for the geometrical characteristics.

Other materials may be used for non-stress-bearing parts, e.g. clamps for electrofusion saddle fittings that only maintain a function during installation.

A fitting can only be designated as a PE 100-RC fitting if:

— the stress bearing part is produced from PE 100-RC materials which fulfil the requirements of EN 1555-1:2025, Tables 1 and 2, and are declared as PE 100-RC by the raw material producer;

— it fulfils the requirements of Table 4 of this document for PE 100-RC.

5.2 Material for non-polyethylene parts

5.2.1 General

All components shall conform to the relevant European standard(s). Alternative standards may be applied in cases where suitable European Standards do not exist.

The materials and the constituent elements used in making the fitting (including elastomers and any metal parts used) shall be as resistant to the external and internal environments as the other elements of the piping system.

Other materials used in fittings in contact with the PE pipe shall not adversely affect pipe performance or initiate stress cracking.

In all cases, fitness for purpose of the system of the components shall be demonstrated.

5.2.2 Metal parts

All metal parts susceptible to corrosion shall be adequately protected, providing this is necessary for the durability and function of the system.

When dissimilar metallic materials are used, galvanic corrosion shall be avoided.

5.2.3 Sealing materials

Elastomeric seals shall conform to EN 682.

Other sealing materials are permitted if proven suitable for gas supply systems.

5.2.4 Greases and lubricants

Greases or lubricants shall not exude onto fusion areas, and shall not affect the long-term performance of fitting materials.

5.2.5 Other materials

Other materials as stress bearing part of the fitting shall have an expected lifetime at least equal to that of the PE pipes conforming to EN 1555-2 with which they are intended to be used under the following conditions:

a) during storage;

b) under the effect of gaseous fuels conveyed therein (see EN 1555-1);

c) with respect to the service environment, e.g. for corrosion, mechanical resistance and material degradation;

d) during operation.

Non-stress-bearing fitting parts, e.g. clamps for electrofusion saddle fittings that only maintain a function during installation, may be made from other materials.

6 General characteristics

6.1 Appearance

When viewed without magnification, the internal and external surfaces of fittings shall be clean, and shall have no scoring, cavities or other surface defects to an extent that would prevent conformity to this document.

No component of the fitting shall show any signs of damage, scratches, pitting, bubbles, blisters, inclusions or cracks to an extent that would prevent conformity of the fittings to the requirements of this document.

6.2 Colour

The colour of the PE parts of the fitting shall be either black, yellow, or orange in accordance with EN 1555-1.

6.3 Design

The design of the fitting shall be such that, when assembling the fitting onto the pipe or other component, electrical coils and/or seals are not displaced.

Tapping tees may be provided with upper and lower end stops for the tapping cutter, or other means of indicating the cutter position according to the manufacturer's instructions.

Tapping tees may be provided with a means to prevent uncontrolled gas release during tapping.

6.4 Appearance of factory-made joints

The internal and external surfaces of the pipe and fitting after fusion jointing, examined visually without magnification, shall be free from melt exudation outside the confines of the fitting, apart from that which may be declared acceptable by the fitting manufacturer or used deliberately as a fusion marker.

There shall be no excessive creasing of the internal surfaces of the adjoining components.

6.5 Electrical characteristics for electrofusion fittings

The electrical protection that shall be provided by the fusion process depends on the voltage and the current used and on the characteristics of the electricity power source.

For voltages greater than 25 V, direct human contact with energized parts shall not be possible when the fitting is in the fusion cycle during assembly in accordance with the instructions of the manufacturers of the fittings and of the assembly equipment, as applicable.

NOTE 1 Electrofusion fittings are part of an electrical circuit when connected to the control units. Definitions of electrical circuits and applicable protections are found in the relevant IEC standards.

The tolerance on the electrical resistance of the fitting at 23 °C shall be stated by the manufacturer. The resistance shall be between nominal resistance (−10 %) and nominal resistance [(+10 %) + 0,1 Ω].

NOTE 2 0,1 Ω is the assumed value of the contact resistance.

The surface finish of the terminal pins shall allow a minimum contact resistance in order to satisfy the resistance tolerance requirements.

NOTE 3 See Annex A for examples of typical electrofusion terminal connections.

7 Geometrical characteristics

7.1 Measurement of dimensions

The dimensions of the fitting shall be measured in accordance with EN ISO 3126, and rounded to the next 0,1 mm. In case of dispute, the measurement shall be made at least 24 h after manufacture, and after being conditioned for at least 4 h at (23 ± 2) °C.

Additionally, for spigot end fittings provided with temporary supports, dimensional measurement shall be performed at least 1 h after removal of the supports.

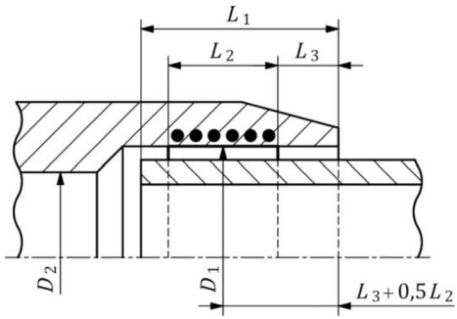
Indirect measurement at the stage of production is allowed at shorter time periods, provided that evidence is shown of correlation.

7.2 Dimensions of electrofusion socket fittings

7.2.1 Diameters and lengths of electrofusion sockets

For electrofusion sockets (see Figure 1) having a nominal diameter as given in Table 1, the socket diameter and lengths shall be given by the manufacturer and shall conform to Table 1 with the following condition: $L_3 \geq 5$ mm.

The value of L_1 is not greater than half the total length of the fitting in case of coupling without stop.



Key

D_1 mean inside diameter in the fusion zone measured in a plane parallel to the plane of the mouth at a distance of $L_3 + 0{,}5L_2$ from that face

D_2 bore, i.e. the minimum diameter of the flow channel through the plastic body of the fitting

L_1 depth of penetration of the pipe or spigot end fitting

L_2 heated length within the socket, i.e. the nominal length of the fusion zone as declared by the manufacturer

L_3 distance between the mouth of the fitting and the start of the fusion zone, i.e. the nominal unheated entrance length of the fitting as declared by the manufacturer

Figure 1 — Dimensions of electrofusion socket fittings

Table 1 — Dimensions of electrofusion socket fittings (see Figure 1)

Dimensions in millimetres

Nominal diameter d_n	Bore [b] D_2	Depth of penetration L_1		Fusion zone L_2
	min.	min.	max. [a]	min.
16	9	25	41	10
20	13	25	41	10
25	18	25	41	10
32	25	25	44	10
40	31	25	49	10
50	39	28	55	10
63	49	31	63	11
75	59	35	70	12
90	71	40	79	13
110	87	53	82	15
125	99	58	87	16
140	111	62	92	18
160	127	68	98	20
180	143	74	105	21
200	159	80	112	23
225	179	88	120	26
250	199	95	129	33
280	223	104	139	35
315	251	115	150	39
355	283	127	164	42
400	319	140	179	47
450	359	155	195	51
500	399	170	212	56
560	447	188	235	61
630	503	209	255	67

Nominal diameter d_n	Bore [b] D_2	Depth of penetration L_1		Fusion zone L_2
	min.	min.	max. [a]	min.
710	567	220	280	74
800	639	230	300	82

[a] An extended L_1 value may be agreed between the end user and the manufacturer. In this case, compatibility of such fittings is not given with components with a minimum tubular length of spigots L_2 according to Table 3.

[b] The requirement on D_2 is only applicable for SDR 11 or higher.

The mean inside diameter of the fitting in the middle of the fusion zone (see D_1 in Figure 1) shall not be less than d_n.

In the case of a fitting having sockets of differing nominal diameters, each one shall conform to the requirements for the nominal diameter of the corresponding component.

7.2.2 Wall thicknesses

In order to prevent stress concentrations, any changes in wall thickness of the fitting body shall be gradual.

a) The wall thickness at any point of the fitting body, E_1, shall be greater than or equal to e_{min} for the corresponding pipe at any part of the fitting located at a distance beyond a maximum of $2/3\ L_1$ from all entrance faces if the fitting and the corresponding pipe are made from a polyethylene having the same MRS.

   If the fitting is produced from a polyethylene having an MRS that is different from that of the corresponding pipe, the relation between the wall thickness of the fitting, E_1, and the pipe, e_{min}, shall be in accordance with Table 2.

b) In the case of a wall thickness design different from that according to a), fittings and associated fusion joints shall additionally meet the performance requirements given in 8.3.

Table 2 — Relation between fitting wall thickness, E_1, and pipe wall thickness, e_{min}

Pipe and fitting material		Relationship
Pipe	Fitting	
PE 80	PE 100 or PE 100-RC	$E_1 \geq 0{,}8\ e_{min}$
PE 100 or PE 100-RC	PE 80	$E_1 \geq 1{,}25\ e_{min}$

7.2.3 Out-of-roundness of the bore of a fitting (at any point)

When a fitting leaves the site of the manufacturer, the out-of-roundness of the bore of a fitting at any point shall not exceed 0,015 d_n.

7.2.4 Spigots

For fittings that contain spigot outlets (e.g. electrofusion equal tee with a spigot branch), the dimensions of the spigot shall conform to 7.4.

For technical and design reasons, the shape of the minimum bore cross-section area can be different from that of spigot fittings as given in 7.4.

7.2.5 Other dimensions

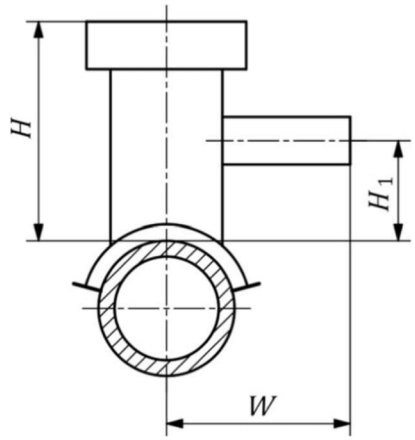
The dimensional characteristics appropriate to each manufacturer, such as the overall dimensions or mounting dimensions shall be specified in a technical file.

In the case of a coupling without an internal stop or with a removable centre register, the geometry of the fitting shall allow the penetration of the pipe through the fitting.

7.3 Dimensions of electrofusion saddle fittings

Outlets from tapping tees and branch saddles shall have spigots in accordance with 7.4 or an electrofusion socket in accordance with 7.2. The manufacturer shall specify the overall dimensions of the fitting in a technical file. These dimensions shall include the main pipe and outlet dimensions, maximum height of the saddle, H, and for tapping tees the height of the service pipe, H_1 (see Figure 2).

For technical and design reasons, the minimum bore diameter, D_2, may be different from that of spigot fittings as given in 7.4.



Key

H height of the saddle, i.e. the distance from the top of the main pipe to the top of the tapping tee or saddle

H_1 height of service pipe, i.e. the distance from the top of the main pipe to the axis of the service pipe

W width of the tapping tee, i.e. the distance between the axis of the main pipe and the plane of the mouth of the service tee

Figure 2 — Dimensions of tapping tees (electrofusion saddle fittings)

7.4 Dimensions of spigot end fittings

7.4.1 Diameters and lengths

The dimensions of spigot end fittings (see Figure 3) shall conform to the values given in Table 3.

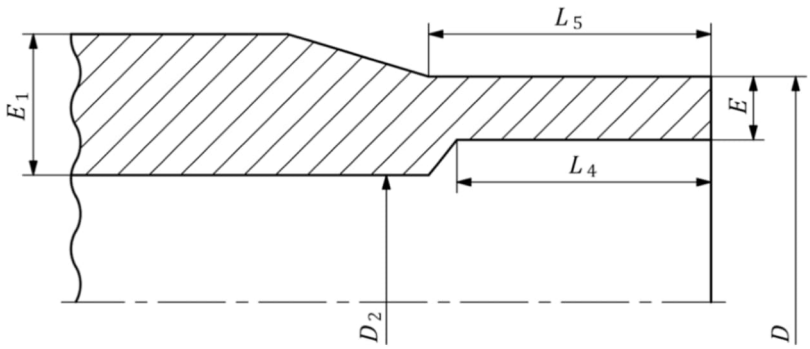
The mean outside diameter of the fusion end piece (D) is measured in any plane parallel to the plane of the mouth and at a distance not greater than the tubular length of the fusion end piece (L_5) from that plane.

The measurement of the bore (D_2) does not include the fusion bead B (if present).

The fusion face wall thickness (E) is measured at any point at a maximum distance of L_4 (cut-back length of the fusion end piece) from the entrance face and shall be equal to the pipe wall thickness and tolerance to which it is intended to be butt-fused, as specified in EN 1555-2. E is at least 3 mm.

The cut-back length of the fusion end piece (L_4) comprises the initial depth of the spigot end necessary for butt fusion or reweld and can be obtained by joining a length of pipe to the spigot end of the fitting, provided that the wall thickness of the pipe is equal to E for its entire length.

The tubular length of the fusion end piece (L_5) comprises the initial length of the fusion end piece and shall allow the following (in any combination): the use of clamps required in the case of butt fusion, assembly with an electrofusion fitting, the use of a mechanical scraper.



Key

D	mean outside diameter of the fusion end piece
D_2	bore, i.e. the minimum diameter of the flow channel through the plastic body of the fitting
E	fusion face wall thickness
E_1	wall thickness (at any point) of the fitting body
L_4	cut-back length of the fusion end piece
L_5	tubular length of the fusion end piece

Figure 3 — Dimensions of spigot end fittings

Table 3 — Diameters and lengths of spigot end fittings

Dimensions in millimetres

Nominal diameter d_n	Mean outside diameter of the fusion end piece D_1		Bore [b] D_2	Out-of-roundness	Cut-back length L_4	Tubular length [c] L_5
	min.	max. [a]	min.	max.	min.	min.
16	16,0	16,3	9	0,3	25	41
20	20,0	20,3	13	0,3	25	41
25	25,0	25,3	18	0,4	25	41
32	32,0	32,3	25	0,5	25	44
40	40,0	40,4	31	0,6	25	49
50	50,0	50,4	39	0,8	25	55
63	63,0	63,4	49	0,9	25	63
75	75,0	75,5	59	1,2	25	70
90	90,0	90,6	71	1,4	28	79
110	110,0	110,7	87	1,7	32	82
125	125,0	125,8	99	1,9	35	87
140	140,0	140,9	111	2,1	38	92
160	160,0	161,0	127	2,4	42	98
180	180,0	181,1	143	2,7	46	105
200	200,0	201,2	159	3,0	50	112
225	225,0	226,4	179	3,4	55	120
250	250,0	251,5	199	3,8	60	129
280	280,0	281,7	223	4,2	75	139
315	315,0	316,9	251	4,8	75	150
355	355,0	357,2	283	5,4	75	164
400	400,0	402,4	319	6,0	75	179
450	450,0	452,7	359	6,8	100	195
500	500,0	503,0	399	7,5	100	212
560	560,0	563,4	447	8,4	100	235
630	630,0	633,8	503	9,5	100	255
710	710,0	714,3	567	10,6	125	280
800	800,0	804,8	639	12,0	125	280

Nominal diameter	Mean outside diameter of the fusion end piece		Bore [b]	Out-of-roundness	Cut-back length	Tubular length [c]
d_n	D_1		D_2		L_4	L_5
	min.	max. [a]	min.	max.	min.	min.

[a] The tolerance grades conform to ISO 11922-1:2018 [5], Grade B.

[b] Minimum bore is for SDR 11. Other minimum bores have to be agreed between manufacturer and end user.

[c] Spigot end fittings may have a shorter tubular length L_5 for factory assemblies or in association with appropriate electrofusion fittings.

7.4.2 Wall thickness of the fusion end

The fusion face wall thickness of the fusion end, E, shall be at least equal to the minimum wall thickness of the pipe with a minimum value of 3 mm.

A thickness reduction (e.g. a chamfered edge) is permitted between the plane of the entrance face and a plane parallel to it, located at a distance not greater than $(0{,}01\ d_n + 1\ \text{mm})$.

The permissible tolerance of the wall thickness value, E, at any point shall conform to the tolerance given in EN 1555-2:2025, Table 2, for the same wall thickness.

7.4.3 Wall thickness of the fitting body

The wall thickness of the fitting body measured at any point, E_1, shall be at least equal to the nominal wall thickness, e_n, of the pipe.

Any changes in wall thickness inside the body of the fitting shall be gradual in order to prevent stress concentrations.

7.4.4 Other dimensions

The dimensional characteristics appropriate to each manufacturer, such as overall dimensions or clamping requirements, shall be stated in a technical file.

7.5 Design and dimensions of mechanical fittings

7.5.1 General

Mechanical fittings shall conform to ISO 17885 for application in gas supply systems. They shall be capable of assembly onto a PE pipe conforming to EN 1555-2, using instructions provided by the manufacturer.

If the insertion depth of the mechanical fitting does not allow for assembly with a spigot end according to this document, this shall be mentioned in the manufacturer's instructions.

The fittings shall not be assembled by thread cutting the PE pipe.

The fitting and tools should be designed to avoid any damage that can affect the performance of the assembly.

A stiffener can be used if required to provide a permanent support for a PE pipe to prevent creep in the pipe wall under radial compressive forces (see ISO 17885:2021, Annex B).

The fitting can allow either a dismountable or permanently assembled joint.

7.5.2 Mechanical fittings with polyethylene spigot ends

Polyethylene spigot ends shall conform to 7.4.

7.5.3 Mechanical fittings with polyethylene electrofusion sockets

Electrofusion sockets shall conform to 7.2.

7.5.4 Threads

Threads on metal ends shall conform to EN 10226-1, EN 10226-2 or EN ISO 228-1, as applicable.

8 Mechanical characteristics

8.1 General

Fittings shall be tested using pipes, which conform to EN 1555-2.

Jointed pipe and fitting test pieces shall be assembled in accordance with the technical instructions of the manufacturer. They shall take into account the manufacturing and assembly tolerances, and the extreme conditions of utilization described in EN 1555-5.

8.2 Requirements

Each assembly shall be prepared from components (pipes and fittings) of the same pressure class.

Unless otherwise specified by the applicable test method, the test pieces shall be conditioned at (23 ± 2) °C before testing in accordance with Table 4.

When tested in accordance with the test methods as specified in Table 4 using the indicated parameters, the fittings shall have mechanical characteristics conforming to the requirements given in Table 4 as applicable to the following types of fitting:

— (A) electrofusion socket fitting;

— (B) electrofusion saddle fitting;

— (C) spigot end fitting.

For mechanical fittings, the requirements of ISO 17885 shall apply.

For testing mechanical fittings in accordance with ISO 17885, the nominal pressure is determined by the MOP declared by the manufacturer multiplied by 1,6.

NOTE For the purpose of this document and the referring to ISO 17885 testing of leaktightness under pressure with air/nitrogen is appropriate for all gaseous fuels (e.g. methane and hydrogen) [9].

Table 4 — Mechanical characteristics

Characteristic	Requirement	Test parameters		Test method
		Parameter	Value	
Hydrostatic strength (20 °C, 100 h)	No failure during the test period of any test piece	End caps	Type A of EN ISO 1167-1:2006	EN ISO 1167-1:2006 and EN ISO 1167-4
		Orientation	Free	
		Conditioning time at test temperature	Shall conform to EN ISO 1167-1:2006	
		Number of test pieces [a]	3	
		Type of test [b]	Water internal and water external to the test piece ("water-in-water")	
		Circumferential (hoop) stress [c] in pipe for: PE 80 PE 100 and PE 100-RC	 10,0 MPa 12,0 MPa	
		Test period	≥ 100 h	
		Test temperature	20 °C	
Hydrostatic strength (80 °C, 165 h)	No failure during the test period of any test piece	End caps	Type A of EN ISO 1167-1:2006	EN ISO 1167-1:2006 and EN ISO 1167-4
		Orientation	Free	
		Conditioning time at test temperature	Shall conform to EN ISO 1167-1:2006	
		Number of test pieces [a]	3	
		Type of test [b]	Water internal and water external to the test piece ("water-in-water")	
		Circumferential (hoop) stress [c] in pipe for: PE 80 PE 100 and PE 100-RC	 4,5 MPa 5,4 MPa	
		Test period [d]	≥ 165 h	
		Test temperature	80 °C	

Characteristic	Requirement	Test parameters		Test method
		Parameter	Value	
Hydrostatic strength (80 °C, 1 000 h)	No failure during the test period of any test piece	End caps	Type A of EN ISO 1167-1:2006	EN ISO 1167-1:2006 and EN ISO 1167-4
		Orientation	Free	
		Conditioning time at test temperature	Shall conform to EN ISO 1167-1:2006	
		Number of test pieces [a]	3	
		Type of test [b]	Water internal and water external to the test piece ("water-in-water")	
		Circumferential (hoop) stress [c] in pipe for: PE 80 PE 100 and PE 100-RC	 4,0 MPa 5,0 MPa	
		Test period	≥ 1 000 h	
		Test temperature	80 °C	
Resistance to SCG for PE 100-RC Strain-hardening test (SHT) [l]	$<G_p> \geq 50{,}0$ MPa	Test sample [k]	Compression moulded sheet made from regrind from fitting body	ISO 18488
		Test temperature	80 °C	
		Thickness	300 µm	
		Test speed	Shall conform to ISO 18488	
		Number of test pieces	Shall conform to ISO 18488	
Decohesive resistance (A)	Length of initiation rupture ≤ $1/3 L_2$ in brittle failure [e]	Test temperature	23 °C	ISO 13954 [g] [h]
		Test speed	25 mm/min	
		Number of test pieces [a] [f]	Shall conform to ISO 13954	
		Test temperature	23 °C	ISO 13955 [g] [h]
		Test speed	100 mm/min	
		Number of test pieces [a]	Shall conform to ISO 13955	

Characteristic	Requirement	Test parameters		Test method
		Parameter	Value	
Evaluation of ductility of fusion joint interface (B)	Surface of rupture $L_d \leq 50$ % and $A_d \leq 25$ % [i] brittle failure	Test temperature	23 °C	ISO 13956 [g]
		Number of test pieces [a]	Shall conform to ISO 13956	
Tensile strength for butt fusion (C) [j]	Test to failure: — ductile: pass — brittle: fail	Test temperature	23 °C	ISO 13953
		Number of test pieces [a]	Shall conform to ISO 13953	
Impact resistance (B) Tapping tees	No failure, no leakage	Test temperature	0 °C	ISO 13957
		Test pressure	25 mbar	
		Falling height	2 m	
		Mass of the striker	2,5 kg	
		Number of test pieces [a]	1	
Pressure drop (B)	Air flow rate (value indicated by the manufacturer)	Test medium	Air source	EN ISO 17778
		Test pressure	25 mbar	
		Pressure drop: for $d_n \leq 63$ mm for $d_n > 63$ mm	0,5 mbar 0,1 mbar	
		Number of test pieces [a]	1	

[a] The number of test pieces given indicates the number required to establish a value for the characteristic described in this table. The number of test pieces required for batch release testing and product verification testing should be listed in the manufacturer's quality plan. Guidance on assessment of conformity can be found in CEN/TS 1555-7.

[b] Alternatively, for $d_n > 450$ mm, the test may be carried out in air. In case of dispute, the water-in-water test shall be used. For fitting type (B) $d_n > 450$ mm, alternative testing is allowed (e.g. pressurization through saddle outlet).

[c] The test pressure shall be calculated using the design SDR of the fitting.

[d] Only brittle failures shall be taken into account. If a ductile failure occurs before 165 h, the test can be repeated according to Table 5.

[e] Maximum length of brittle failure in any of the test samples with L_2 being the nominal length of the fusion zone of the electrofusion socket fitting.

[f] The test sample can be mechanically reduced in wall thickness for the testing purpose of large diameter fittings by keeping a minimum of 15 mm wall thickness of each component.

[g] For type A and type B fittings, alternatively the strip-bend test in accordance with ISO 21751 [7] may be used.

[h] In case of dispute, ISO 13954 shall apply.

[i] In case of use of the strip-bend test in accordance with ISO 21751 [7], only the L_d requirement of ≤ 50 % shall be considered.

[j] Applicable to d_n 90 mm and above.

[k] The sample for the SHT shall be taken across the fitting wall or the whole circumference in case of small diameter. The outer surface shall be scraped to remove any contamination present before regrinding.

[l] This test only applies to PE 100-RC materials.

Table 5 — Test parameters for the retest of the hydrostatic strength at 80 °C

PE 80		PE 100 and PE 100-RC	
Stress MPa	**Minimum test period** h	**Stress** MPa	**Minimum test period** h
4,5	165	5,4	165
4,4	233	5,3	256
4,3	331	5,2	399
4,2	474	5,1	629
4,1	685	5,0	1 000
4,0	1 000	—	—

8.3 Performance requirements

Where 7.2.2 b) applies, electrofusion socket fittings shall, additionally, be in accordance with Table 6.

Table 6 — Performance requirements

Characteristic	Requirement	Test parameters		Test method
		Parameter	Value	
Short-term internal pressure resistance	The failure pressure shall be greater than the pressure equivalent to 2 × MRS, calculated for the thickest-walled pipe for which the fitting has been designed.	Test piece	See Annex B	Annex B
		End caps	Type A of EN ISO 1167-1:2006	
		Orientation	Free	
		Conditioning time at the test temperature	According to Annex B	
		Type of test	Water internal and water external to the test piece ("water-in-water")	
		Minimum pressure: [a] PE 80 pipe, SDR 11 PE 100 pipe, SDR 11 PE 100-RC pipe, SDR 11	 32 bar 40 bar 40 bar	
		Pressure increase rate	According to Annex B	
		Test temperature	According to Annex B	

Characteristic	Requirement	Test parameters		Test method
		Parameter	Value	
Resistance to tensile load	No leakage or failure of the fusion joint after 25 % elongation of the test piece	Test temperature	23 °C	Annex C
NOTE 1 bar = 0,1 MPa = 10^5 Pa; 1 MPa = 1 N/mm^2. [a] Examples for SDR11 only. Other SDR pipes will have different pressures.				

9 Physical characteristics

9.1 Conditioning

Conditioning of the test pieces for MFR and OIT as specified in Table 7 is not applicable.

9.2 Requirements

When tested in accordance with the test methods as specified in Table 7 using the indicated parameters, the fittings shall have physical characteristics conforming to the requirements given in Table 7.

Table 7 — Physical characteristics

Characteristic	Requirement	Test parameters		Test method
		Parameter	Value	
Oxidation induction time (thermal stability)	≥ 10 min	Test temperature	210 °C [b]	EN ISO 11357-6
		Number of test pieces [a]	3	
		Test environment	Oxygen	
		Specimen mass	(15 ± 2) mg	
Melt mass-flow rate (MFR)	After processing maximum deviation of ± 20 % of the value measured on the batch used to manufacture the fitting [c]	Loading mass	5 kg	EN ISO 1133-1
		Test temperature	190 °C	
		Time	10 min	
		Number of test pieces [a]	Shall conform to EN ISO 1133-1	

[a] The number of test pieces given indicates the number required to establish a value for the characteristic described in the table. The number of test pieces required for batch release testing and product verification testing should be listed in the manufacturer's quality plan. Guidance on assessment of conformity can be found in CEN/TS 1555-7.

[b] Alternatively, the test may be carried out at 200 °C with a minimum requirement of ≥ 20 min. In case of dispute, testing at 210 °C is applicable. The sample thickness is free and not in accordance with EN ISO 11357-6.

[c] Value as measured on the fitting relative to the value measured on the compound used. The value given by the material supplier can be used, but in case of dispute, the measurement on granules shall be carried out by the fitting manufacturer.

10 Performance requirements

When fittings conforming to this document are assembled to each other or to components conforming to other parts of the EN 1555 series, the joints shall conform to EN 1555-5, see Table 8.

Table 8 — Fitness for purpose

Characteristic	Requirement	Test parameters		Test method
		Parameter	Value	
Hydrostatic strength (80 °C, 165 h) (C)	EN 1555-5	Under normal conditions	-	EN 1555-5
Decohesive resistance (A)	EN 1555-5	Under normal conditions Under extreme conditions	- -	EN 1555-5
Evaluation of ductility of fusion joint interface (B)	EN 1555-5	Under normal conditions Under extreme conditions	- -	EN 1555-5
Tensile strength for butt fusion (C)	EN 1555-5	Under normal conditions Under extreme conditions	- -	EN 1555-5

11 Technical information

The manufacturer of the fittings shall ensure the availability of technical information, which shall include:

a) field of application (e.g. gas);

b) temperature limits for processing during installation;

c) maximum operating pressure (MOP) as declared by the manufacturer;

d) applicable SDR fusion range of pipe;

e) maximum allowed out-of-roundness (ovality) of the pipe at installation;

f) assembly instructions (for socket fittings, saddle fittings, tapping tees, etc.) including the tools required and an explanation of the traceability coding;

g) fusion instructions.

12 Marking

12.1 General

Unless otherwise stated in Table 9, the marking elements shall be printed or formed directly on the fitting in such a way that after storage, weathering, handling and installation legibility is maintained during the use of the fitting.

NOTE The manufacturer is not responsible for marking being illegible, due to actions caused during installation and use such as painting, scratching, covering of the components or using detergents etc. on the components unless agreed or specified by the manufacturer.

Marking shall not initiate cracks or other types of defects which adversely influence the performance of the fitting.

If printing is used, the colour of the printed information shall differ from the basic colour of the fitting.

The size of the marking shall be such that it is legible without magnification.

There shall be no marking over the minimum tubular length of spigot end fittings.

12.2 Minimum required marking of fittings

The marking of an EN standard reference on a component requires conformance with all mandatory requirements of the standard, and that the component comes within the scope of standard.

The minimum required marking shall conform to Table 9.

Table 9 — Minimum required marking

Aspects	Mark or symbol
Reference to the EN 1555 series [a] Manufacturer's name and/or trademark	EN 1555 Name or symbol
Nominal outside diameter(s) of pipe, d_n	e.g. 110
Designation Design application series (i.e. design SDR) Applicable SDR fusion range of pipe [a] Manufacturer's information [c] Intended use [a] [b]	e.g. PE 100 PE 100-RC [a] e.g. SDR 11 e.g. SDR 11 to SDR 26 e.g. GAS
NOTE ISO 12176-4 [6] and ISO 12176-5 provide coded information about traceability. [a] This information may be printed on a label associated with the fitting or on an individual packaging. [b] Information on abbreviated terms is given in CEN/TR 15438 and/or in national rules. [c] For providing traceability, the following details shall be given: — the production period, year and month, in figures or in code; — a name or code for the production site if the manufacturer is producing the same product at different sites.	

12.3 Additional marking

Additional information relative to the fusion conditions (e.g. fusion and cooling time) and to the assembly torque, only for mechanical fittings, may appear on a label, which may be attached to a fitting or may be separate from the fitting.

Fittings conforming to this document, which are certified, may be marked accordingly.

12.4 Fusion system recognition

Fusion fittings should have a system, whether numerical, electromechanical or self-regulatory as described in ISO 13950 or ISO 12176-5, for recognizing the fusion parameters to facilitate the fusion process.

When automatic recognitions systems for electrofusion fittings are used, they shall be in accordance with ISO 13950 or ISO 12176-5 or both.

13 Delivery conditions

The fittings shall be packaged in bulk or individually protected where necessary in order to prevent deterioration and contamination. Whenever possible, they shall be placed in individual bags, cardboard boxes or cartons.

Constituents of fitting packaging shall not create contamination which can prevent normal jointing.

The cartons or individual bags shall bear at least one label with the manufacturer's name, type and dimensions of the product, number of units in the box, and any special storage conditions and storage time limits if any.

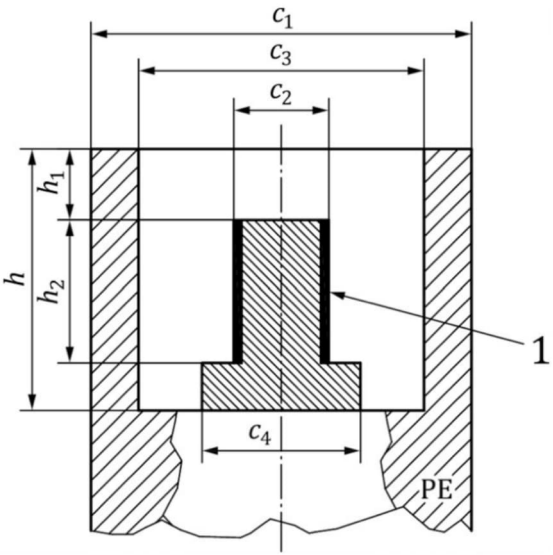
It is recommended that fittings are stored in their original packing, until ready for installation.

Annex A
(informative)

Examples of typical terminal connections for electrofusion fittings

A.1 Figures A.1 and A.2 illustrate examples of terminal connections suitable for use with voltages ≤ 48 V (types A and B).

Dimensions in millimetres

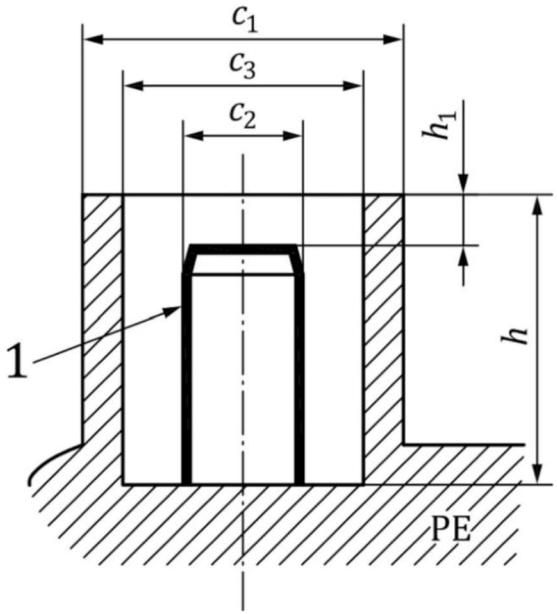


Key

1	contact area	
c_1	outside diameter of the terminal shroud	$c_1 \geq 11{,}8$
c_2	diameter of the contact area of the terminal	$c_2 = 4{,}00 \pm 0{,}1$
c_3	internal diameter of the terminal shroud	$c_3 = 9{,}5 \pm 1{,}0$
c_4	maximum overall diameter of the base of the contact area	$c_4 \leq 6{,}0$
h	internal depth of the terminal shroud	$h \geq 12{,}0$
h_1	distance between the upper part of the terminal shroud and the contact area	$h_1 = 3{,}2 \pm 0{,}5$
h_2	height of the contact area	$h_2 \geq 7$ $h_2 \leq h - h_1$

Figure A.1 — Typical type A connection

Dimensions in millimetres



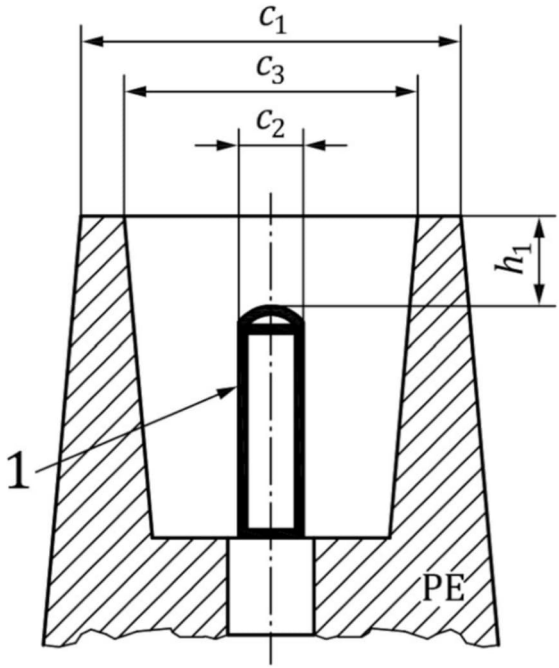
Key

1	contact area	
c_1	outside diameter of the terminal shroud	$C_1 = 13{,}00 \pm 0{,}5$
c_2	diameter of the contact area of the terminal	$C_2 = 4{,}70 \pm 0{,}1$
c_3	internal diameter of the terminal shroud	$C_3 = 10{,}0\ -0{,}1/+0{,}5$
h	internal depth of the terminal shroud	$h \geq 15{,}5$
h_1	distance between the upper part of the terminal shroud and the contact area	$h_1 = 4{,}5 \pm 0{,}5$

Figure A.2 — Typical type B connection

A.2 Figure A.3 illustrates an example of a typical terminal connection suitable for use with voltages up to 250 V (type C).

Dimensions in millimetres



Key

1	contact area [a]	
c_1	outside diameter of the terminal shroud	$c_1 \geq c_3 + 2{,}0$
c_2	diameter of the contact area of the terminal	$c_2 \geq 2{,}0 \pm 0{,}1$
c_3	internal diameter of the terminal shroud	$c_3 \geq c_2 + 4{,}0$
h_1	distance between the upper part of the terminal shroud and the contact area	h_1: sufficient to ensure a degree of protection of IP 2 X as specified in IEC 60529 [8]

a The height of the contact area, h_2, is such that $7{,}0 \leq h_2$.

Figure A.3 — Typical type C connection

Annex B
(normative)

Short-term pressure test method

B.1 Principle

A test piece, consisting of an electrofusion fitting assembled with one or more PE pipes having reduced free length sufficient to suppress pipe failure and create preferential failure in the fitting or in the connecting pipe-to-fitting joint, is placed in a controlled-temperature environment and subjected to an essentially continually increasing internal hydraulic pressure until failure occurs. The method is designed to establish the short-term failure pressure of the fitting/pipe assembly.

B.2 Apparatus

B.2.1 Constant-temperature water bath, in accordance with EN ISO 1167-1, capable of being maintained at (20 ± 2) °C.

B.2.2 Pressure test equipment, in accordance with EN ISO 1167-1, capable of applying a continuously increasing internal hydraulic pressure at a rate of (5 ± 1) bar/min until the test piece fails.

B.2.3 Pressure gauge, having an accuracy of ≤ 2 % of measured value and the capability to record the maximum pressure reached.

The gauge should preferably be equipped with a surge protection device.

The gauge shall be located in a position within the pressure system such that it indicates the internal pressure of the test piece without being affected by pressure transients within the pressure supply lines, etc.

B.3 Test piece

The test piece shall be an assembly of one or more electrofusion fittings connected to PE pipes, with a free pipe length between fittings not exceeding d_n.

The pipes used shall be the thickest-walled pipe for which the fitting has been designed.

The test piece shall be closed with type A end caps in accordance with EN ISO 1167-1:2006.

B.4 Procedure

Attach the end caps to the test piece and fill it with water at ambient temperature.

Connect the test piece to the pressure source, ensuring that no air is trapped in the test assembly.

Immerse the test piece in the constant-temperature bath and condition it at (20 ± 2) °C for at least as long as the period specified in EN ISO 1167-1 for the appropriate pipe wall thickness.

Increase the pressure uniformly at a rate of (5 ± 1) bar/min until failure of the test piece occurs.

Record the pressure at failure.

After testing, inspect the test piece and record the location and mode of failure.

B.5 Test report

The test report shall include the following information:

a) a dated reference to this document and the method of test used, i.e. EN 1555-3:2025, Annex B;

b) all details necessary for complete identification of the pipes and electrofusion socket fittings used, including the manufacturer, type of material and size of fitting and pipe;

c) the details of the fusion-jointing procedure used to assemble the test piece;

d) the pressure at failure;

e) the time to failure;

f) the failure location;

g) the mode of failure (e.g. ductile in fitting, brittle along fusion interface);

h) any factor that can have affected the results, such as any incidents or operating details not specified in this annex;

i) any deviation from the procedure;

j) any unusual features observed;

k) the date of test.

Annex C
(normative)

Tensile test for fitting/pipe assemblies

C.1 Principle

A test piece consisting of an electrofusion fitting and two connecting PE pipes is subjected to an increasing tensile load at a constant pulling rate until ductile pipe failure occurs. The test is conducted at a constant temperature and is intended to simulate the creation of longitudinal tensile loading along a pipeline as a consequence of external mechanical interference. Rupture of the fitting or the connecting fusion joints is not an acceptable failure mode.

C.2 Apparatus

Apparatus shall be in accordance with ISO 13951, with the additional requirement that the tensile-testing machine shall be capable of accommodating a test piece elongation of 25 % and of sustaining a constant test speed of (5 ± 1,25) mm/min.

C.3 Test piece

The test piece shall be in accordance with ISO 13951.

In cases where $d_n \geq 180$ mm and where the conduct of tensile tests on fitting/pipe assemblies is beyond the limits of the available test equipment, the testing of joint sections can be appropriate. Testing of sections of the test pieces shall not be undertaken unless a correlation with testing of complete pipe/joint assemblies has been established.

C.4 Procedure

The procedure shall be in accordance with ISO 13951, except for the requirement of the load to be constant. The pulling rate shall be 5 mm/min ± 25 %, sustained until a test piece elongation of 25 % is reached.

After elongation of the test piece, a leaktightness test as specified in ISO 13951 is carried out.

NOTE The leaktightness test is not applicable for test pieces in sections.

C.5 Test report

The test report shall include the following information:

a) a dated reference to this document and the method of test used, i.e. EN 1555-3:2025, Annex C;

b) all details necessary for complete identification of the pipes and electrofusion fittings used, including the manufacturer, type of material and size of fitting and pipe;

c) the details of the fusion-jointing procedure used to assemble the test piece;

d) the test temperature;

e) the leaktightness and integrity of the fitting and fusion joint after 25 % elongation of the test piece;

f) any factor that can have affected the results, such as an incident or operating detail not specified in this annex;

g) any deviation from the procedure;

h) any unusual features observed;

i) the date of test.

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