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English Version

Plastics piping systems for the supply of gaseous fuels - Polyethylene (PE) - Part 4: Valves

Systèmes de canalisations en plastique pour la distribution de combustibles gazeux - Polyéthylène (PE) - Partie 4: Robinets

Kunststoff-Rohrleitungssysteme für die Gasversorgung - Polyethylen (PE) - Teil 4: Armaturen

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Foreword

This document (prEN 1555-4:2008) has been prepared by Technical Committee CEN/TC 155 “Plastics piping systems and ducting systems”, the secretariat of which is held by NEN.

This document is currently submitted to the CEN Enquiry.

This document will supersede EN 1555-4:2002.

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

This standard 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.

EN 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* (this standard)

— *Part 5: Fitness for purpose of the system*

— *Part 7: Guidance for assessment of conformity* (CEN/TS).

NOTE The document dealing with recommended practice for installation which was initially submitted for CEN enquiry as prEN 1555-6 [1] was withdrawn when EN 12007-2:2000 [2], prepared by CEN/TC 234 Gas supply, was published with the title "Gas supply systems - Pipelines for maximum operating pressure up to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)".

Introduction

The System Standard, of which this is Part 4, specifies the requirements for a piping system and its components made from polyethylene (PE) and which is intended to be used for the supply of gaseous fuels.

Requirements and test methods for material and components, other than valves, are specified in prEN 1555-1:2008, prEN 1555-2:2008 and prEN 1555-3:2008. Characteristics for fitness for purpose are covered in prEN 1555-5:2008. CEN /TS 1555-7 gives guidance for assessment of conformity. Recommended practice for installation is given in EN 12007-2 [2] prepared by CEN /TC 234.

This part of EN 1555 covers the characteristics of valves.

1 Scope

This part of EN 1555 specifies the characteristics of valves made from polyethylene (PE) for piping systems in the field of the supply of gaseous fuels.

NOTE 1 Valves made from other material than polyethylene designed for the supply of gaseous fuels conforming to the relevant standards are permitted to be used in PE piping system according to EN 1555 provided they have relevant PE connection for butt fusion or electrofusion ends (see prEN 1555-3:2008).

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

In conjunction with the other parts of EN 1555, it is applicable to PE valves, their joints and to 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)];

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

NOTE 2 For other operating temperatures, derating coefficients should be used, see prEN 1555-5:2008.

c) an operating temperature between –20 °C and +40 °C.

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

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

It is applicable to bi-directional valves with spigot end or electrofusion socket intended to be fused with PE pipes conforming to prEN 1555-2:2008 without any fittings or with PE fittings conforming to prEN 1555-3:2008.

2 Normative references

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

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

EN 744:1995, *Plastics piping and ducting systems — Thermoplastics pipes — Test method for resistance to external blows by the round-the-clock method*

EN 917:1997, *Plastics piping systems — Thermoplastics valves — Test methods for resistance to internal pressure and leaktightness*

prEN 1555-1:2008, *Plastics piping systems for the supply of gaseous fuels — Polyethylene (PE) — Part 1: General*

prEN 1555-2:2008, *Plastics piping systems for the supply of gaseous fuels — Polyethylene (PE) — Part 2: Pipes*

prEN 1555-3:2008, *Plastics piping systems for the supply of gaseous fuels — Polyethylene (PE) — Part 3: Fittings*

[1)] 1 bar = 0,1 MPa

prEN 1555-5:2008, *Plastics piping systems for the supply of gaseous fuels — Polyethylene (PE) — Part 5: Fitness for purpose of the system*

EN 1680, *Plastics piping systems — Valves for polyethylene (PE) piping systems — Test method for leaktightness under and after bending applied to the operating mechanisms*

EN 1704, *Plastics piping systems — Thermoplastics valves — Test method for the integrity of a valve after temperature cycling under bending*

EN 1705, *Plastics piping systems — Thermoplastics valves — Test method for the integrity of a valve after an external blow*

EN 12100, *Plastics piping systems — Polyethylene (PE) valves — Test method for resistance to bending between supports*

EN 12117, *Plastics piping systems — Fittings, valves and ancillaries — Determination of gaseous flow rate/pressure drop relationships*

EN 12119, *Plastics piping systems — Polyethylene (PE) valves — Test method for resistance to thermal cycling*

EN 28233, *Thermoplastic valves — Torque — Test method (ISO 8233:1988)*

EN ISO 1133:2005, *Plastics — Determination of the melt mass-flow rate (MFR) and the melt volume-flow rate (MVR) of thermoplastics (ISO 1133:2005)*

EN ISO 3126, *Plastics piping systems — Plastics piping components — Measurement and determination of dimensions (ISO 3126:2003)*

ISO 5208, *Industrial valves — Pressure testing of valves*

ISO 10933, Polyethylene (PE) valves for gas distribution systems.

ISO/FDIS 11357-6:2008, *Plastics — Differential scanning calorimetry (DSC) — Part 6: Determination of oxidation induction time (isothermal OIT) and oxidation induction temperature (dynamic OIT)*

3 Terms and definitions, symbols and abbreviations

For the purposes of this European Standard, the terms and definitions, symbols and abbreviations given in prEN 1555-1:2008 apply, together with the following.

3.1
external leaktightness
tightness of a valve body enveloping the space containing the gas, with respect to the atmosphere

3.2
internal leaktightness
tightness between the inlet and the outlet of the valve, obtained by closing the operating mechanism

3.3
leaktightness test
test for both of the following characteristics:

a) the internal leaktightness of a valve's closing seat when closed and pressurized from either side;

b) the external leaktightness of a valve when half open

3.4
initiating torque
torque required to initiate movement of the obturator

3.5
running torque
torque required to achieve full opening or closing of the valve at maximum allowable operating pressure

3.6
leakage
emission of gas from a valve body, or any component of a valve

3.7
valve body
main part of a valve which contains the obturating device (rotating member, the seat, the packing seals and the operating stop), as applicable and provides the ends for connection to the PE pipe/fittings

3.8
operating cap
part of a valve for connection with the operating key which allows the opening and the closing of the valve

4 Material

4.1 Compound

The compound from which the valve body, with spigot end or electrofusion socket is made shall conform to prEN 1555-1:2008.

4.2 Material for non-polyethylene parts

4.2.1 General

All components shall conform to the relevant EN standard(s). Alternative standards may be applied in cases where the suitable EN standard(s) do not exist. In all cases fitness for purpose of the components shall be demonstrated.

The materials and the constituent elements used in making the valve (including rubber, greases and any metal parts as may be used) shall be as resistant to the external and internal environments as the other elements of the piping system and shall have a life expectancy under the following conditions at least equal to that of the PE pipes conforming to prEN 1555-2:2008 with which they are intended to be used:

a) during storage;

b) under the effect of the gas conveyed therein;

c) with respect to the service environment and operating conditions.

The requirements for the level of material performance of non-polyethylene parts shall be at least as stringent as that of the compound for the piping system.

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

Metal valve bodies for PE piping systems up to 10 bar shall conform to the relevant EN standard(s) where existing, or in their absence, to provisions acceptable in the country of use.

NOTE Standards covering metal valve bodies for the various types of valves are being developed by CEN/TC 69.

4.2.2 Metal parts

All metal parts susceptible to corrosion shall be adequately protected.

When dissimilar metallic materials are used which can be in contact with moisture, steps shall be taken to avoid the possibility of galvanic corrosion.

4.2.3 Elastomers

Elastomeric seals shall conform to EN 682.

Other sealing materials are permitted if proven suitable for gas service.

4.2.4 Other materials

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

Other materials conforming to 4.2.1 may be used provided that it is proven that the valves conform to this standard.

5 General characteristics

5.1 Appearance

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

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

5.2 Colour

The colour of the PE parts of valves shall be either yellow or black.

5.3 Design

5.3.1 General

The design of the valve shall be such that, when assembling the valve onto the corresponding component, electrical coils and/or seals or any other ancillary parts are not displaced.

PE valves bodies and their PE spigot end or electrofusion socket shall have a pressure rating of at least that of the pipe to which they are assembled. PE spigot ends or electrofusion sockets shall have sufficient fusion compatibility (see prEN 1555-5:2008) to the pipe to which it is fused to meet the requirements of this standard.

5.3.2 Valve body

The valve body shall be such that it cannot be dismantled on site without rendering it unusable.

5.3.3 Operating cap

The operating cap shall be integral with or connected to the stem in such a way that disconnection is impossible without special equipment.

The valve shall close by turning the operating cap clockwise. For a quarter-turn valve, the position of the shut-off disk shall be clearly indicated on the top side of the operating cap.

Stops shall be provided at the fully open and closed positions.

5.3.4 Seals

The seals shall be so mounted as to be resistant to normally occurring mechanical loads. Creep and cold flow effects shall be taken into account. Any mechanism that puts a loading on the seals shall be permanently locked. Line pressure shall not be used as the sole means of seal activation.

6 Geometrical characteristics

6.1 General

Each valve shall be characterised by its dimensions and associated end connections.

The technical description given by the manufacturer shall include at least the following information:

a) dimensional characteristics, by working drawings;

b) assembly instructions.

6.2 Measurement of dimensions

Dimensions shall be measured in accordance with EN ISO 3126 at (23 $\pm$ 2) °C, after being conditioned for at least 4 h. The measurement shall not be made less than 24 h after manufacture.

6.3 Wall thickness of the PE valve body

The wall thickness of the PE valve body, E, at any point that is subjected to line pressure shall be equal to or greater than the minimum wall thickness e_{min} of the corresponding SDR 11 series pipes unless either of the following conditions apply.

The relationship between the wall thickness of the valve body, E, and the pipe, e_n, shall conform to Table 1.

Table 1 — Relation between valve and pipe wall thicknesses

Pipe and valve material		Relation between valve body wall thickness, E, and pipe wall thickness, e_n
Pipe	Valve	
PE 80	PE 100	$E \geq 0{,}8e_n$
PE 100	PE 80	$E \geq e_n/0{,}8$

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

6.4 Dimensions of spigot ends for valves

The dimensions of spigot ends shall conform to Table 3 of prEN 1555-3:2008.

6.5 Dimensions of valves with electrofusion sockets

The dimensions of electrofusion sockets shall conform to Table 1 of prEN 1555-3:2008.

6.6 Dimensions of the operating cap

The dimension of the operating cap shall be designed so it can be operated with a $(50\,^{+0,5}_{0})$ mm square socket, (40 ± 2) mm depth.

7 Mechanical characteristics of assembled valves

7.1 General

All tests shall be carried out on valves assembled with pipe from the same series conforming to prEN 1555-2:2008, in accordance with the technical instructions and the extreme installation conditions recommended by the manufacturer.

NOTE The properties of an assembled valve depend on the properties of the pipes and the valve and on the conditions of their installation (i.e. geometry, temperature, type, method of conditioning, assembly and fusion procedures).

The technical descriptions of the manufacturer shall include at least the following information:

a) laying conditions (e.g. valve temperature limits);

b) assembly instructions;

c) for valves with electrofusion sockets, fusion instructions:

   1) power requirements;

   2) fusion parameters with limits.

7.2 Requirements

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

When tested in accordance with the test methods as specified in Table 2 using the indicated parameters, the valves shall have mechanical characteristics conforming to the requirements given in Table 2.

Table 2 — Mechanical characteristics of valves

Characteristic	Requirements	Test parameters		Test method
		Parameter	Value	
Hydrostatic strength (20 °C, 100 h)	No failure during the test period of any test piece	Conditioning time [a] Free length Number of test pieces [b] Type of test Circumferential (hoop) stress: PE 80 PE 100 Test period Test temperature	Shall conform to EN 917:1997 $2d_n$ 3 Water-in-water 10,0 MPa 12,4 MPa 100 h 20 °C	Method A of EN 917:1997
Hydrostatic strength (80 °C, 165 h)	No failure during the test period of any test piece [c]	Conditioning time [a] Free length Number of test pieces [b] Type of test Circumferential (hoop) stress: PE 80 PE 100 Test period Test temperature	Shall conform to EN 917:1997 2 d_n 3 Water-in-water 4,5 MPa 5,4 MPa 165 h 80 °C	Method A of EN 917:1997
Hydrostatic strength (80 °C, 1000 h)	No failure during the test period of any test piece	Conditioning time [a] Free length Number of test pieces [b] Type of test Circumferential (hoop) stress: PE 80 PE 100 Test period Test temperature	Shall conform to EN 917:1997 2 d_n 3 Water-in-water 4,0 MPa 5,0 MPa 1000 h 80 °C	Method A of EN 917:1997
Leaktightness of seat and packing	No leakage during the test period	Test temperature Type of test Number of test pieces [b] Test pressure Duration of the test	23 °C Air or nitrogen 1 25 mbar 24 h	ISO 5208
Leaktightness of seat and packing	No leakage during the test period	Test temperature Type of test Number of test pieces [b] Test pressure Medium (dependent on the rating) Duration of the test	23 °C Air or nitrogen 1 1,5 MOP For 1,5 MOP ≤ 6 bar: air, or for 1,5 MOP < 15 bar: water 30 s	ISO 5208
Pressure drop	Air flow rate (value indicated by the manufacturer)	Type of test Number of test pieces [b] Test pressure Pressure drop for $d_n \leq 63$ mm $d_n > 63$ mm	Air 1 25 mbar 0,5 mbar 0,1 mbar	EN 12117

(continued)

Table 2 — Mechanical characteristics of valves *(continued)*

Characteristic	Requirements	Test parameters		Test method
		Parameter	Value	
Operating torque [d]	Maximum value: - 35 Nm for $d_n \leq 63$ mm; - 70 Nm for 63 mm < $d_n \leq 125$ mm; - 150 Nm for 125 mm < $d_n \leq 225$ mm	Test temperatures Number of test pieces [b]	−20 °C and +23 °C and +40 °C 1	EN 28233
Stop resistance	a) No failure at stops, and b) No leakage at seat and packing	Torque Test temperatures Number of test pieces [b]	2 times the value of the max. measured operating torque with minimum 150 Nm, during 15 s −20 °C and +40 °C 1	a) EN 28233, followed by b) ISO 5208
Actuation mechanism resistance	Maximum value: 1,5 times the value of the maximum measured operating torque (see this table)	Pressure Number of test pieces [b]	6 bar 1	EN 28233
Resistance to bending between supports	No leakage and maximum value for operating torque (see examination of operating torque)	Load applied for: 63 mm < $d_n \leq 125$ mm 125 mm < $d_n \leq 225$ mm Number of test pieces [b]	 3,0 kN 6,0 kN 1	EN 12100
Thermal cycling resistance $d_n > 63$ mm	No leakage and maximum value for operating torque (see examination of operating torque)	Number of test pieces [b]	1	EN 12119
Leaktightness under bending with thermal cycling $d_n \leq 63$ mm	No leakage	Number of cycles Temperature of cycling Number of test pieces [b]	50 −20 °C/+40 °C 1	EN 1704
Leaktightness under tensile loading	No leakage and maximum value for operating torque (see examination of operating torque)	Number of test pieces [b]	1	ISO 10933
Leaktightness under and after bending applied to the operating mechanism	No leakage	Number of test pieces [b]	1	EN 1680
Impact loading resistance	No leakage and maximum value for operating torque (see examination of operating torque)	Position of sample Drop height Mass of the striker Type of the striker Test temperature Number of test pieces [b]	Vertical 2 m 2,5 kg d90 conforming to EN 744:1995 −20 °C 1	EN 1705

(continued)

Table 2 — Mechanical characteristics of valves *(concluded)*

Characteristic	Requirements	Test parameters		Test method
		Parameter	Value	
Multiple test after the internal pressure test [e]				
1) Resistance to long-term internal pressure loading	The test piece shall fulfil the requirements of the following characteristics:	Conditioning time [a] Free length Type of test Number of test pieces [b] Test pressure for: PE 80 PE 100 Test period Test temperature	Shall conform to EN 917 2 d_n Water-in-water 1 16,0 bar 20,0 bar 1000 h 20 °C	Method A of EN 917:1997
2) Leaktightness of seat and packing	No leakage during the test period	Test temperature Type of test Number of test pieces [b] Test pressure Duration of the test	23 °C Air or nitrogen 1 25 mbar 24 h	ISO 5208
2) Leaktightness of seat and packing	No leakage during the test period	Test temperature Type of test Number of test pieces [b] Test pressure Medium (dependent on the rating) Duration of the test	23 °C Air or nitrogen 1 1,5 MOP For 1,5 MOP ≤ 6 bar: air, or for 1,5 MOP < 15 bar: water 30 s	ISO 5208
3) Operating torque[d]	Maximum value: - 35 Nm for $d_n \leq 63$ mm; - 70 Nm for 63 mm < $d_n \leq 125$ mm; - 150 Nm for 125 mm < $d_n \leq 225$ mm	Test temperatures Number of test pieces [b]	−20 °C and +23 °C and +40 °C 1	EN 28233
4) Impact loading resistance	No leakage and maximum value for operating torque (see examination of operating torque)	Position of sample Drop height Mass of the striker Type of the striker Test temperature Number of test pieces [b]	Vertical 2 m 2,5 kg d90 conforming to EN 744:1995 −20 °C 1	EN 1705

[a] The valves shall not be pressurized within 24 h after fusion.

[b] The numbers of test pieces given indicate the numbers required to establish a value for the characteristic described in the table. The numbers of test pieces required for factory production control and process control should be listed in the manufacturer's quality plan. For guidance see CEN /TS 1555-7 [3].

[c] Only brittle failures shall be taken into account. If a ductile failure occurs before 165 h, the test may be repeated at a lower stress. The stress and the associated minimum test period shall be selected from Table 3 or from a line based on the stress/time points given in Table 3.

[d] Neither the initiating torque nor the running torque shall exceed the values given in this table. It shall not be possible to operate the valve by hand without the operating key.

[e] As soon as possible after the completion of the internal pressure test the other three tests shall be carried out on the valve in the order stated.

Table 3 — Circumferential (hoop) stress at 80 °C and associated minimum test period

PE 80		PE 100	
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	1000
4,0	1000	—	—

8 Physical characteristics

8.1 Conditioning

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.

8.2 Requirements

When tested in accordance with the test methods specified in Table 4 using the indicated parameters, the valves shall have physical characteristics conforming to the requirements given in Table 4.

Table 4 — Physical characteristics

Characteristic	Requirements	Test parameters		Test method
		Parameter	Value	
Oxidation induction time (Thermal stability)	> 20 min	Test temperature Number of test pieces [a]	200 °C [b] 3	ISO/DIS 11357-6
Melt mass-flow rate (MFR)	After processing maximum deviation of ± 20 % of the value measured on the batch used to manufacture the valve	Loading mass Test temperature Time Number of test pieces [a]	5 kg 190 °C 10 min Shall conform to EN ISO 1133:2005	EN ISO 1133:2005

a The numbers of test pieces given indicate the numbers required to establish a value for the characteristic described in the table. The numbers of test pieces required for factory production control and process control should be listed in the manufacturer's quality plan. For guidance see CEN/TS 1555-7 [3].

b Test may be carried out at 210 °C providing that there is a clear correlation to the results at 200 °C, in case of dispute the reference temperature shall be 200 °C.

9 Performance requirements

When valves conforming to this standard are assembled to each other or to components conforming to other parts of EN 1555, the joints shall conform to prEN 1555-5:2008.

10 Marking

10.1 General

10.1.1 Unless otherwise stated in Table 5, the marking elements shall be printed or formed directly on the valve in such a way that after storage, weathering, handling and installation legibility is maintained during use of the valve.

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.

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

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

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

10.2 Minimum required marking

The minimum required marking shall conform to Table 5.

Table 5 — Minimum required marking

Aspects	Mark or symbol
Number of the System Standard [a]	EN 1555
Manufacturer's name and/or trademark	Name or symbol
Nominal outside diameter(s)of pipe, d_n	e.g. 110
Material and designation	e.g. PE 80
Design application series	e.g. SDR 11
SDR fusion range [a]	e.g. SDR 11 - SDR 26
Manufacturer's information	[b]
Internal fluid [a]	Gas

[a] This information may be printed on a label associated with the valve or on an individual bag.

[b] 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 in different sites.

10.3 Additional marking

Valves conforming to this standard, which are third party certified by a certification body, may be marked accordingly.

11 Delivery conditions

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

NOTE It is recommended to protect the spigot end by external caps.

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

Bibliography

[1] prEN 1555-6, *Plastics piping systems for gaseous fuels supply — Polyethylene (PE) — Part 6: Recommended practice for installation*

[2] EN 12007-2:2000, *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)*

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