

Plastic piping systems for water supply — Polyethylene (PE) —

Part 4: Valves

The European Standard EN 12201-4:2001 has the status of a
British Standard

ICS 23.060.01

National foreword

This British Standard is the official English language version of EN 12201-4:2001.

The UK participation in its preparation was entrusted by Technical Committee PRI/88, Plastic piping systems, to Subcommittee PRI/88/2, Pressure for plastic piping systems, which has the responsibility to:

- aid enquirers to understand the text;
- present to the responsible international/European committee any enquiries on the interpretation, or proposals for change, and keep the UK interests informed;
- monitor related international and European developments and promulgate them in the UK.

A list of organizations represented on this subcommittee can be obtained on request to its secretary.

Cross-references

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**Plastics piping systems for water supply - Polyethylene (PE) -
Part 4: Valves**

Systèmes de canalisations en plastique pour l'alimentation
en eau - Poléthylène (PE) - Partie 4: Robinets

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

This European Standard was approved by CEN on 19 January 2001.

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This European Standard exists in three official versions (English, French, German). A version in any other language made by translation under the responsibility of a CEN member into its own language and notified to the Management Centre has the same status as the official versions.

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Contents

	page
<u>Introduction</u>	4
<u>1 Scope</u>	5
<u>2 Normative references</u>	5
<u>3 Definitions symbols and abbreviations</u>	6
<u>4 Material</u>	6
4.1 Compound	6
4.2 Material for non-polyethylene parts	7
<u>5 General characteristics</u>	7
5.1 Appearance of the valve	7
5.2 Design	7
5.3 Colour	8
5.4 Effect on water quality	8
<u>6 Geometric characteristics</u>	8
6.1 General	8
6.2 Measurement of dimensions	8
6.3 Wall thickness at any point of the PE valve body	8
6.4 Dimensions of spigot ends for valves	9
6.5 Dimensions of valves with electrofusion sockets	9
6.6 Dimensions of the operating cap	9
<u>7 Mechanical characteristics for assembled valves</u>	9
7.1 General	9
7.2 Conditioning	9
7.3 Requirements	9
7.4 Retest in case of failure of hydrostatic strength at 80 °C	11
<u>8 Physical characteristics</u>	12
8.1 Conditioning	12
8.2 Requirements	12
<u>9 Performance requirements</u>	13
<u>10 Marking</u>	13
10.1 General	13
10.2 Minimum required marking of valves	13
10.3 Marking on a label	14
<u>11 Packaging</u>	14

Foreword

This European Standard 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 June 2002, and conflicting national standards shall be withdrawn at the latest by December 2003.

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 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 standards on general functional requirements and standards on recommended practice for installation.

prEN 12201 consists of the following Parts, under the general title *Plastics piping systems for water supply — 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 the assessment of conformity (to be published as an ENV)

NOTE It was decided not to publish a Part 6: Recommended practice for installation. Instead, existing national practices would be applicable.

This Part of EN 12201 includes the following:

- Bibliography

System Standards for piping systems of other plastics materials used for the conveyance of water under pressure include the following:

- EN 1452, Plastics piping systems for water supply — Unplasticized poly(vinyl chloride) (PVC-U)
- prEN 1796, Plastics piping systems for water supply with or without pressure — Glass-reinforced thermoplastics (GRP) based on polyester resin (UP)

For components which have conformed to the relevant national standard before December 2001, as shown by the manufacturer or by a certification body, the national standard may continue to be applied until December 2003.

According to the CEN/CENELEC Internal Regulations, the national standards organizations of the following countries are bound to implement this document: Austria, Belgium, the Czech Republic, Denmark, Finland, France, Germany, Greece, Iceland, Ireland, Italy, Luxembourg, Netherlands, Norway, Portugal, Spain, Sweden, Switzerland and the United Kingdom.

EN 12201-4:2001 (E)

Introduction

The System Standard, of which this is Part 4, specifies the requirements of a piping system and its components made from polyethylene (PE). It is intended to be used for water supply intended for human consumption, including the conveyance of raw water prior to treatment.

In respect of potential adverse effects on the quality of water intended for human consumption, caused by the product covered by this standard:

- a) This standard provides no information as to whether the product may be used without restriction in any of the Member States of the EU or EFTA;
- b) It should be noted that, while awaiting the adoption of verifiable European criteria, existing national regulations concerning the use and/or the characteristics of this product remain in force.

Requirements and test methods for material and components, other than valves, are specified in prEN 12201-1, prEN 12201-2 and prEN 12201-3. Characteristics for fitness of purpose are covered in prEN 12201-5 and prEN 12201-7 gives guidance for the assessment of conformity.

This Part of prEN 12201 covers the characteristics of valves.

1 Scope

This Part of EN 12201 specifies the characteristics of valves or valve bodies made from polyethylene (PE) intended for the conveyance of water intended for human consumption, including raw water prior to treatment.

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

NOTE 1 Valves made from material other than polyethylene (PE) designed for the supply of water intended for human consumption to a relevant standard(s) can be used in PE piping systems conforming to prEN 12201 when they have relevant PE connection ends for butt fusion or electrofusion (see prEN 12201-3).

In conjunction with other Parts of prEN 12201 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 25 bar;
- b) an operating temperature of 20 °C as reference temperature.

NOTE 2 For applications operating at constant temperatures greater than 20 °C and up to 40 °C, see annex A of prEN 12201-1:1999.

prEN 12201 covers a range of maximum operating pressures and gives requirements concerning colours and additives.

NOTE 3 It is the responsibility of the purchaser 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.

This Part of EN 12201 covers valves for pipes with a nominal outside diameter $d_n \leq 225$ mm.

2 Normative references

This standard 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 standard only when incorporated in it by amendment or revision. For undated references the latest edition of the publication referred to applies (including amendments).

EN 681-1, *Elastomeric seals — Materials requirements for pipe joint seals used in water and drainage applications — Part 1: Vulcanized rubber*

EN 681-2, *Elastomeric seals — Materials requirements for pipe joint seals used in water and drainage applications — Part 2: Thermoplastic elastomers*

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

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

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

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

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

prEN 12201-1:2001, *Plastics piping systems for water supply — Polyethylene (PE) — Part 1: General*

prEN 12201-2, *Plastics piping systems for water supply — Polyethylene (PE) — Part 2: Pipes*

prEN 12201-3:2001, *Plastics piping systems for water supply — Polyethylene (PE) — Part 3: Fittings*

prEN 12201-5, *Plastics piping systems for water supply — Polyethylene (PE) — Part 5: Fitness for purpose of the system*

EN 12201-4:2001 (E)

EN 28233:1990, *Thermoplastic valves — Torque — Test method*

EN ISO 1133:1999, *Plastics — Determination of the melt mass-flow rate (MFR) and the melt volume-flow rate (MVR) of thermoplastics (ISO 1133 : 1997)*

prEN ISO 3126:1999, *Plastics piping systems — Plastics piping components — Measurement and determination of dimensions (ISO/DIS 3126:1999)*

ISO 5208:1993, *Industrial valves — Pressure testing for valves*

ISO 10933:1997, *Polyethylene (PE) valves for gas distribution systems*

3 Definitions symbols and abbreviations

For the purposes of this European standard, the definitions, symbols and abbreviations given in prEN 12201-1:2001 apply, together with the following.

3.1

external leaktightness

Leaktightness of the body enveloping the space containing the water, with respect to the atmosphere

3.2

internal leaktightness

Leaktightness between the inlet and the outlet of the valve, with the valve in the closed position

3.3

leaktightness test

test for both of the following characteristics:

- a) the internal leaktightness of the valve's seat when closed and pressurised from either side;
- b) the external leaktightness of the 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

seepage of water through the valve body, or any component of the valve

3.7

valve body

main part of a valve which contains the obdurating device (rotating member, the seat, the packing seals and the operating stop), as applicable and provides the terminal 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 closing of the valve

4 Material

4.1 Compound

The compound from which the body of the valve, with spigot end or electrofusion socket is made shall conform to prEN 12201-1:2001.

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 utilised in cases where suitable EN standard(s) do not exist provided a fitness for purpose can be demonstrated.

The materials and the constituent elements used in making the valves (including elastomers, greases and any metal parts as may be used) shall be as resistant to the external and internal environment 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 12201-2 with which they are intended to be used:

- a) during storage;
- b) under the effect of the water being conveyed;
- c) with respect to the service environment and operating conditions.

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

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

NOTE Metal valve bodies for PE piping systems up to 25 bar should conform to the relevant standard of CEN/TC 69 *Industrial valves*.

4.2.2 Metal parts

All metal parts susceptible to corrosion shall be adequately protected.

When dissimilar metallic materials are used which may 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 681-1 or EN 681-2, as applicable.

4.2.4 Other materials

Greases or lubricants shall not exude on to fusion areas and shall not affect the long-term performance of the PE valve or valve body nor have any adverse effect on the quality of the water.

4.2.5 Assembly

Valves shall be assembled according to manufacturer's procedures and any component used in the assembly shall not prevent conformity of the valve to this standard.

5 General characteristics

5.1 Appearance of the valve

When viewed without magnification, the internal and external surfaces of valves shall be smooth, clean and free from scoring, cavities and other surface defects to an extent that would prevent conformity of the valve to this standard.

5.2 Design

5.2.1 General

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

EN 12201-4:2001 (E)

5.2.2 Valve body

The valve body may be manufactured either as one piece or from pieces assembled together.

The body of the valve shall be such that it cannot be dismantled on site without the use of special tools.

5.2.3 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 position of the obturator shall be clearly indicated on the top side of the operating cap.

Stops shall be provided at the fully open and closed positions and shall conform to the stop resistance requirements given in Table 2.

5.2.4 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.

5.3 Colour

The PE body shall be blue or black.

NOTE For above ground installations, all blue components should be protected from direct UV light.

5.4 Effect on water quality

Attention is drawn to the requirements of national regulations (see introduction).

6 Geometric characteristics

6.1 General

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

Technical data given by the manufacturer shall include the following information:

- a) the dimensional characteristics, by working drawings;
- b) the assembling instructions.

6.2 Measurement of dimensions

The dimensions of the valve shall be measured in accordance with prEN ISO 3126:1999. In the case of dispute the measurement of dimensions shall be made not less than 24 h after manufacture after being conditioned for at least 4 h at $(23 \pm 2) ^\circ\text{C}$.

6.3 Wall thickness at any point of the PE valve body

The wall thickness of the PE valve body at any point E , shall be equal to or greater than $e_{\min}$ for the corresponding pipe when the valve body and the corresponding pipe are made from a polyethylene with the same designation. If the valve body is produced from a polyethylene with an MRS designation different from that of the corresponding pipe, the preferred relationship between the wall thickness of the valve body E , and the pipe $e_{\min}$ shall conform to Table 1:

Table 1 — Relationship between pipe and valve wall thicknesses

Material		Relationship between valve wall thickness, E , and pipe wall thickness, $e_{\min}$
Pipe	Valve	
PE 80	PE 100	$E \geq 0,8e_{\min}$
PE 100	PE 80	$E \geq 1,25e_{\min}$

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

6.4 Dimensions of spigot ends for valves

The dimensions of spigots shall conform to Table 3 of prEN 12201-3:2001.

6.5 Dimensions of valves with electrofusion sockets

The dimensions of electrofusion sockets shall conform to Table 1 of prEN 12201-3:2001.

6.6 Dimensions of the operating cap

The operating cap shall be so designed that it can be operated effectively using a socket nominally 50 mm square and nominally 40 mm deep.

7 Mechanical characteristics for assembled valves

7.1 General

All tests shall be carried out on valves assembled with pipe(s) conforming to prEN 12201-2, where the pipe shall be of the same pressure rating as the valve. Assembly of the valve and pipe(s) shall be in accordance with the technical instructions and the extreme installation conditions recommended by the manufacturer. The limit conditions (geometry, ovality, tolerances of pipe and valve, temperature and welding characteristics) shall be stated 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 (e.g. geometry, temperature, type and method of conditioning, assembling and fusion procedures).

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

- laying conditions (e.g. valve temperature limits);
- assembly instructions;
- for valves with electrofusion sockets, the fusion instructions (power requirements or fusion parameters with limits).

7.2 Conditioning

Unless otherwise specified by the applicable test method, test pieces shall be conditioned at $(23 \pm 2) ^\circ\text{C}$ before testing in accordance with Table 2.

7.3 Requirements

When tested in accordance with the test methods specified and using the test parameters given in Table 2, the valves shall conform to the requirements given in Table 2.

NOTE Attention is drawn to the requirements specified in prEN 1074-1 and prEN 1074-2.

Table 2 — Mechanical characteristics for assembled valve

Characteristics	Requirements	Test parameters		Test method
		Parameters	Value	
Hydrostatic strength at 20 °C	No failure during test period	Number of test pieces ¹⁾ Conditioning (24 h after fusion) Free length Type of test Test temperature Circumferential hoop stress for PE 40 PE 63 PE 80 PE 100	3 Shall conform to EN 917:1997 2 d_n Water-in-water 20 °C 7 MPa 8 MPa 10 MPa 12,4 MPa	Method A of EN 917:1997
Hydrostatic strength at 80 °C	No failure during test period	Number of test pieces ¹⁾ Conditioning (24 h after fusion) Free length Type of test Test temperature Test period Circumferential hoop stress for: PE 40 PE 63 PE 80 PE 100	3 Shall conform to EN 917:1997 2 d_n Water- in- water 80 °C 165 h ²⁾ 2,5 MPa 3,5 MPa 4,6 MPa 5,5 MPa	Method A of EN 917:1997
Hydrostatic strength at 80 °C	No failure during test period	Number of test pieces ¹⁾ Conditioning (24 h after fusion) Free length Type of test Test temperature Test period Circumferential (hoop) stress for: PE 40 PE 63 PE 80 PE 100	3 Shall conform to EN 917:1997 2 d_n Water-in-water 80 °C 1000 h 2 MPa 3,2 MPa 4,0 MPa 5,0 MPa	Method A of EN 917:1997
Leak tightness of seat and packing	No leakage during test period	Number of test pieces ¹⁾ Test temperature Type of test Test pressure Duration of test Test pressure Duration of test	Shall conform to ISO 5208:1993 23 °C Air or nitrogen 25 mbar 24 h 1,5 × PN 30 s	ISO 5208:1993
Operating torque	Max. operating torque ³⁾ for $d_n \leq 63$: 35 N·m $63 < d_n \leq 125$: 70 N·m $125 < d_n \leq 225$: 150 N·m	Test temperature Number of test pieces ¹⁾	0 °C/40 °C 1	EN 28233:1990
Stop resistance	The test piece shall fulfil No failure at stops	Test temperature Number of test pieces ¹⁾ Torque	0 °C/40 °C 1 2 times the value of the maximum measured operating torque measured with minimum 150 N.m during 15 s.	EN 28233:1990

Continued

Table 2 — Mechanical characteristics for assembled valve (concluded)

Characteristics	Requirements	Test parameters		Test method
		Parameters	Value	
Resistance to bending between supports	No leakage and maximum value for operating torque	Load applied for: 63 < d _n ≤ 125 125 < d _n ≤ 225 Number of test pieces ¹⁾	3 kN 6 kN 1	EN 12100
Leaktightness under tensile load	No leakage and maximum value for operating torque	Test temperature Test pressure Number of test pieces ¹⁾	23 °C 25 mbar Shall conform to ISO 10933:1997	ISO 10933:1997
Actuation mechanism resistance	1,5 × value of the operating torque	Test pressure Test temperature Number of test pieces ¹⁾	6 bar 23 °C 1	EN 28233:1990
Leaktightness under and after bending applied to the operating mechanism	No leakage	Number of test pieces ¹⁾	1	EN 1680
Impact loading	No leakage and maximum value for operating torque	Drop height Mass of the striker Test temperature Number of test pieces ¹⁾	2 m 2,5 kg 0 °C 1	EN 1705
Multiple test ⁴⁾				
1) Resistance to long term internal pressure loading	No leakage and maximum value for operating torque	Test temperature Test period Free length Type of test Number of test pieces ¹⁾ Test pressure for: PE 63 PE 80 PE 100	23 °C 1000 h 2 d _n Water-in-water 1 1,25 × PN 1,25 × PN 1,25 × PN	EN 917:1997
2) Leak tightness of seat and packing	Shall conform to the requirements given in this table			ISO 5208:1993
3) Operating torque	Shall conform to the requirements given in this table			EN 28233:1990
4) Impact loading	Shall conform to the requirements given in this table			EN 1705
1) The number of test pieces given indicate the quantity required to establish a value for the characteristic described in the table. The number of test pieces required for factory production control and process control should be listed in the manufacturer's quality plan for guidance see ENV 12201-7 ^[3] .				
2) Premature ductile failures are not taken into account. For retest procedure see 7.4.				
3) 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.				
4) 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.				

7.4 Retest in case of failure of hydrostatic strength at 80 °C

A fracture in a brittle mode in less than 165 h shall constitute a failure, however if a sample in the 165 h test fails in a ductile mode in less than 165 h, a retest shall be performed at a selected lower stress in order to achieve the minimum required time for the selected stress obtained from the line through the stress/time points given in Table 3.

Table 3 — Test parameters for the retest of the hydrostatic strength at 80°C

PE 40		PE 63		PE 80		PE 100	
Stress MPa	Test period h	Stress MPa	Test period h	Stress MPa	Test period h	Stress MPa	Test period h
2,5	165	3,5	165	4,6	165	5,5	165
2,4	230	3,4	295	4,5	219	5,4	233
2,3	323	3,3	538	4,4	293	5,3	332
2,2	463	3,2	1000	4,3	394	5,2	476
2,1	675	--	--	4,2	533	5,1	688
2,0	1000	--	--	4,1	727	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 $(23 \pm 2) ^\circ\text{C}$ before testing in accordance with Table 4.

8.2 Requirements

When tested in accordance with the test methods specified and using the test parameters given in Table 4, the valves shall conform to the requirements given in Table 4.

Table 4 — Physical characteristics of PE valves

Characteristics	Requirements	Test parameters		Test method
		Parameters	Value	
Oxidation induction time	≥ 20 min	Test temperature Number of test pieces ²⁾	200 °C ¹⁾ 3	EN 728
Melt mass-flow rate MFR for PE 40	Change of MFR by processing ± 20 °C ³⁾	Load Test temperature Test Period Number of test pieces	2,16 kg 190 °C 10 min Shall conform to EN ISO 1133:1999	EN ISO 1133:1999 condition D
Melt mass-flow rate MFR for PE 63, PE 80 and PE 100	Change of MFR by processing ± 20 % ³⁾	Load Test temperature Time Number of test pieces ²⁾	5 kg 190 °C 10 min Shall conform to EN ISO 1133:1999	EN ISO 1133:1999 condition T
Effect on water quality ⁴⁾	Shall conform to existing national regulations			
1) Tests may be carried out as an indirect test at 210 °C providing there is clear correlation of the results to those at 200 °C, in cases of dispute the reference temperature shall be 200 °C. 2) The number of test pieces given indicate the quantity required to establish a value for the characteristic described in the table. The number of test pieces required for factory production control and process control should be listed in the manufacturer's quality plan, for guidance see ENV 12201-7^[3]. 3) Value as measured on the valve relative to the value measured on the compound used. 4) Test methods, parameters and requirements for all properties are under preparation. Until these EN's are published National Regulations apply (see introduction).				

9 Performance requirements

When valves conforming to this standard are assembled to each other or to other components conforming to prEN 12201, the joints shall conform to the requirements of prEN 12201-5.

10 Marking

10.1 General

10.1.1 All valves shall be permanently and legibly marked either by printing or formed directly on the valve or on a plate which is securely fixed to the valve. If the mark is imprinted on the valve the marking shall not initiate cracks or other types of failure.

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

10.1.3 The marking shall be such that it is legible without magnification.

10.2 Minimum required marking of valves

The minimum required marking shall conform to Table 5.

NOTE Attention is drawn to the possible need to include CE marking when required for legislative purposes.

Table 5 — Minimum required marking on valves

Aspects required	Mark or symbol
Manufacturers name or trade mark	Name or code
Nominal diameter and pipe series/SDR	e.g. 110/S 5 or 110/SDR 11
Manufacturer's information	1)
SDR fusion range	e.g SDR 11 – SDR 26
1) In clear figures or in code providing traceability to production period within year and month and the production site if manufacturer is producing at different sites nationally and/or internationally.	

10.3 Marking on a label

Unless marked on the valve the information given in Table 6 shall be printed on a label, with one label per valve. The label shall be of sufficient quality to be intact and legible at the time of installation.

Table 6 — Minimum required marking on a label

Aspects	Marking or symbol
Standard number	EN 12201
Material and designation	e.g. PE 80
Pressure class in bars ¹⁾	e.g. PN 12,5

11 Packaging

The valves shall be packaged in bulk or individually protected where necessary in order to prevent deterioration and contamination.

The packaging shall bear at least one label with the manufacturer's name, type and dimensions of the part, number of units and any special storage conditions.

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

Bibliography

- [1] prEN 1074-1, *Valves for water supply — Specification for use and appropriate verification tests — Part 1: General specifications*
- [2] prEN 1074-2, *Valves for water supply — Fitness for purpose requirements and appropriate verification tests — Part 2: Isolating valves*
- [3] prEN 12201-7¹⁾, *Plastics piping systems for water supply — Polyethylene (PE) — Part 7: Assessment of conformity*

1) This document is intended to be published as ENV 12201-7: *Plastics piping systems for water supply — Polyethylene (PE) — Part 7: Guidance for the assessment of conformity*.

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