INTERNATIONAL STANDARD

ISO 4437-4

Second edition
2022-11

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

Part 4: **Valves**

Systèmes de canalisations en plastique pour la distribution des combustibles gazeux — Polyéthylène (PE) —

Partie 4: Robinets

Reference number
ISO 4437-4:2022(E)

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Published in Switzerland

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Foreword

ISO (the International Organization for Standardization) is a worldwide federation of national standards bodies (ISO member bodies). The work of preparing International Standards is normally carried out through ISO technical committees. Each member body interested in a subject for which a technical committee has been established has the right to be represented on that committee. International organizations, governmental and non-governmental, in liaison with ISO, also take part in the work. ISO collaborates closely with the International Electrotechnical Commission (IEC) on all matters of electrotechnical standardization.

The procedures used to develop this document and those intended for its further maintenance are described in the ISO/IEC Directives, Part 1. In particular, the different approval criteria needed for the different types of ISO documents should be noted. This document was drafted in accordance with the editorial rules of the ISO/IEC Directives, Part 2 (see www.iso.org/directives).

Attention is drawn to the possibility that some of the elements of this document may be the subject of patent rights. ISO shall not be held responsible for identifying any or all such patent rights. Details of any patent rights identified during the development of the document will be in the Introduction and/or on the ISO list of patent declarations received (see www.iso.org/patents).

Any trade name used in this document is information given for the convenience of users and does not constitute an endorsement.

For an explanation of the voluntary nature of standards, the meaning of ISO specific terms and expressions related to conformity assessment, as well as information about ISO's adherence to the World Trade Organization (WTO) principles in the Technical Barriers to Trade (TBT), see www.iso.org/iso/foreword.html.

This document was prepared by Technical Committee ISO/TC 138, *Plastics pipes, fittings and valves for the transport of fluids*, Subcommittee SC 7, *Valves and auxiliary equipment of plastics materials*.

This second edition cancels and replaces the first edition (ISO 4437-4:2015), which has been technically revised.

The main changes are as follows:

— PE 100-RC type materials with enhanced resistance to slow crack growth have been added;

— an improved description of the leaktightness test has been given. Annex B has been added to describe the leaktightness test after the tensile test, following the withdrawal of ISO 10933;

— test methods have been updated including new methods for PE 100-RC materials.

A list of all parts in the ISO 4437 series can be found on the ISO website.

Any feedback or questions on this document should be directed to the user's national standards body. A complete listing of these bodies can be found at www.iso.org/members.html.

Introduction

This document specifies the requirements for a piping system and its components made from polyethylene (PE) and intended to be used for the supply of gaseous fuels.

Requirements and test methods for material and components, other than valves, are specified in ISO 4437-1, ISO 4437-2 and ISO 4437-3.

Characteristics for fitness for purpose are covered in ISO 4437-5. CEN/TS 1555-7[2] gives guidance for assessment of conformity. Recommended practice for installation is given in ISO/TS 10839[1].

This document covers the characteristics of valves.

The ISO 4437 series covers a range of maximum operating pressures and gives requirements concerning colours. 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.

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

Part 4: Valves

1 Scope

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

It is applicable to unidirectional and bi-directional isolating valves with spigot ends or electrofusion sockets intended to be fused with PE pipes or fittings conforming to ISO 4437–2 and ISO 4437-3 respectively.

Valves made from materials other than PE, designed for the supply of gaseous fuels conforming to the relevant standards can be used in PE piping systems according to ISO 4437 series, provided that they have PE connections for butt fusion or electrofusion ends, including integrated material transition joints, conforming to ISO 4437-3.

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

In conjunction with parts 1, 2, 3 and 5 of the ISO 4437 series, this document 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)] at a reference temperature of 20 °C for design purposes;

NOTE 1 For the purpose of this document and the references to ISO 8233, MOP is considered to be nominal pressure.

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

NOTE 2 For operating temperatures between 20 °C and 40 °C, derating coefficients are defined in ISO 4437-5.

This document covers valve bodies designed for connection with pipes with a nominal outside diameter $d_n \leq 400$ mm.

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.

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

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*

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

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

ISO 3127, *Thermoplastics pipes — Determination of resistance to external blows — Round-the-clock method*

ISO 4437-1, *Plastics piping systems for the supply of gaseous fuels — Polyethylene (PE) — Part 1: General*

ISO 4437-2, *Plastics piping systems for the supply of gaseous fuels — Polyethylene (PE) — Part 2: Pipes*

ISO 4437-3, *Plastics piping systems for the supply of gaseous fuels — Polyethylene (PE) — Part 3: Fittings*

ISO 4437-5, *Plastics piping systems for the supply of gaseous fuels — Polyethylene (PE) — Part 5: Fitness for purpose of the system*

ISO 8233, *Thermoplastics valves — Torque — Test method*

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

ISO 16010, *Elastomeric seals — Material requirements for seals used in pipes and fittings carrying gaseous fuels and hydrocarbon fluids*

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

EN 736-1, *Valves — Terminology — Part 1: Definition of types of valves*

EN 736-2, *Valves — Terminology — Part 2: Definition of components of valves*

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

3 Terms and definitions

For the purposes of this document, the terms and definitions given in ISO 4437-1, EN 736-1, EN 736-2 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 General

3.1.1
external leaktightness
leaktightness of the valve body enveloping the space containing the gas, with respect to the atmosphere

3.1.2
internal leaktightness
leaktightness between the inlet and the outlet of the valve, with the valve in the closed position

3.1.3
leakage
emission of gas from a valve body, or any component of a valve

3.1.4
valve body
main part of a valve which consists of an operating stop system and contains the obturator, seat(s), stem(s) or shaft(s) and packing seals, and provides the terminal ends for connection to the PE pipe/fittings as applicable

3.1.5
operating device
part of a valve for connection with the operating key which allows the opening and the closing of the valve

3.2 Terms relating to design

3.2.1
full bore valve
valve with a flow section equal to or greater than 80 % of the section corresponding to the nominal inside diameter of the body end port

[SOURCE: EN 736-3:2008]

3.2.2
clearway valve
valve designed to have an unobstructed flow way, which allows for the passage of a theoretical sphere with a diameter that is not less than the nominal inside diameter of the body end port

[SOURCE: EN 736-3:2008]

3.2.3
reduced bore valve
valve with a flow section equal to or greater than 36 % of the section corresponding to the nominal inside diameter of the body end port and which does not correspond to the full bore valve

[SOURCE: EN 736-3:2008]

4 Symbols and abbreviations

For the purposes of this document, the symbols and abbreviated terms given in ISO 4437-1 apply.

5 Material

5.1 Material for polyethylene parts

The PE compound from which the valve body with spigot or electrofusion socket ends is made, shall be virgin material conforming to ISO 4437-1.

The other components of the valve made in PE shall be made only from material conforming to ISO 4437-1.

5.2 Material for non-polyethylene parts

5.2.1 General

All components shall conform to the relevant ISO standard(s). Alternative standards may be applied in cases where the suitable ISO 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 elastomers, 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 an expected lifetime under the following conditions at least equal to that of the PE pipes conforming to ISO 4437-2, 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 PE compound for the piping system. Reworked materials shall not be used for stress-bearing polymeric parts.

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

The valve manufacturer shall ensure that any transition joint between polyethylene and non-polyethylene parts and the valve body fulfil the requirements of ISO 4437-3.

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 which can be in contact with moisture, steps shall be taken to avoid the possibility of galvanic corrosion.

5.2.3 Sealing materials

Elastomeric seals shall conform to ISO 16010.

If other sealing materials are used, they need to be proven 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 the valve materials.

5.2.5 Assembly

Ancillary components of 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 document.

6 General characteristics

6.1 Appearance of the valve

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 document.

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 document.

6.2 Colour

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

6.3 Design

6.3.1 General

The maximum operating pressure (MOP) of the valve shall be defined by the manufacturer according to the design standard dimension ratio (SDR), design coefficient and material classification.

6.3.2 Valve body

The valve body shall be such that it cannot be dismantled.

An operating stop system shall be provided at the fully open and closed positions.

6.3.3 Valve ends

PE spigot ends or electrofusion sockets shall conform to the requirements of ISO 4437-3.

6.3.4 Operating device

The operating device 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 device clockwise. For a quarter-turn valve, the position of the obturator shall be clearly indicated on the top side of the operating device.

It is recommended that the position of the obturator be marked on the access point for a quarter turn valve.

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

6.3.5 Seals

The seals shall be mounted in a manner as to be resistant to normally occurring mechanical loads, see 5.2.3. 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.

7 Geometrical characteristics

7.1 General

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