
**Plastics piping systems for the supply
of gaseous fuels — Unplasticized
polyamide (PA-U) piping systems
with fusion jointing and mechanical
jointing —**

**Part 4:
Valves**

*Systèmes de canalisations en matières plastiques pour la distribution
de combustibles gazeux — Systèmes de canalisations en polyamide
non plastifié (PA-U) avec assemblages par soudage et assemblages
mécaniques —*

Partie 4: Robinets



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ISO 16486-4:2022

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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*, in collaboration with the European Committee for Standardization (CEN) Technical Committee CEN/TC 155, *Plastics piping systems and ducting systems*, in accordance with the Agreement on technical cooperation between ISO and CEN (Vienna Agreement).

This second edition cancels and replaces the first edition (ISO 16486-4:2016), which has been technically revised.

The main changes are as follows:

- the Scope highlights that this document is valid for On/Off valves;
- the Scope shows 16 bar¹⁾ as the regional CEN requirement for the limitation of the maximum operating pressure (MOP);
- in [7.3](#) and [7.4](#) the nominal diameter of spigot ends or electrofusion sockets has been expanded to d_n 400 mm;
- a new subclause, [5.2.4](#) Greases and lubricants, has been added;
- [subclause 5.2](#) for non-unplasticized polyamide parts has been redrafted to bring it in line with EN 1555-4. A NOTE for regional requirements has been introduced;
- [subclauses 6.3.1](#) General, [6.3.2](#) Valve body, [7.5](#) Dimensions of the operating device and [8.1](#) General have been redrafted;
- a new subclause, [6.3.3](#) Valve terminal ends, has been introduced for valve terminal ends;
- [subclauses 6.3.4](#) Operating device and [6.3.5](#) Seals have been modified to bring them in line with EN 1555-4;

1) 1 bar = 0,1 MPa = 10⁵ Pa; 1 MPa = 1 N/mm².

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- [subclause 7.2](#) Measurement of dimensions has been modified to bring it in line with EN 1555-4 with the exception that PA-U conditioning does not allow the use of test pieces earlier than 48 h after their manufacture;
- [subclause 8.4](#) Regional requirements has been added with reference to an extension of [subclause B.1.1](#) for CEN;
- in [Table 1](#), the number of test pieces has been added and new footnote ^b has been inserted relating to this addition;
- in [Table 1](#), the condition period has been changed to 16 h;
- in [Table 1](#), the test period has been changed to 1 000 h for hydrostatic strength (20 °C, 1 000 h);
- in [Table 1](#), the pressure drop test been deleted, as this is covered in the new [subclause 8.3.2](#);
- in [Table 1](#), the operating torque for $125 \text{ mm} < d_n \leq 400 \text{ mm}$ has been changed to $10 \text{ Nm} < M \leq 150$;
- in [Table 1](#), leaktightness after tensile load is added, including footnote ^j for limiting the diameter;
- a new subclause, [5.1.2](#) Fusion compatibility, substitutes the former subclause 6.4;
- a new [Clause 11](#) Technical File has become an individual paragraph in line with EN 1555-4;
- [subclause 12.1](#) General includes a NOTE for regional marking requirements on packaging, with reference to CEN/TS 12007-6, for CEN member countries, for example;
- [Table 3](#) for minimum required marking of valves has been modified in line with EN 1555-4;
- former subclause 12.5 Packaging has become [Clause 13](#) Delivery conditions, and has been modified and extended;
- [Annex A](#) has been updated in line with EN 1555-4;
- [Annex B](#) has been modified according longitudinal stress parameters in line with ISO 17885:2021, Table F.1;
- in [Clause B.2](#) Test piece, the definition for the length of test piece has been redrafted;
- in [Annex B](#), [subclause B.4.4](#) has been added including a regional requirement.

A list of all parts in the ISO 16486 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 valves used in a piping system made from unplasticized polyamide (PA-U) that is intended to be used for the supply of gaseous fuels.

General requirements for unplasticized polyamide (PA-U) materials used for a piping system and its components, intended for the supply of gaseous fuels, are specified in ISO 16486-1.

Requirements and test methods for pipes are specified in ISO 16486-2 and for fittings in ISO 16486-3.

Characteristics for fitness for purpose of the system and generic fusion parameters are specified in ISO 16486-5.

Recommended practice for installation is given in ISO 16486-6, which will not be implemented as a European Standard under the Vienna Agreement.

NOTE Recommended practice for installation is also given in CEN/TS 12007-6^[2], which has been prepared by Technical Committee CEN/TC 234, *Gas infrastructure*.

Assessment of conformity of the system is to form the subject of the future ISO/TS 16486-7:—²⁾.

For CEN member countries, all components are to conform to the relevant EN standard(s). Alternative standards may be applied in cases where the suitable EN standard(s) do not exist.

The ISO 16486 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 consideration their particular requirements and any relevant national regulations and installation practices or codes.

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2) Under preparation. Stage at the time of publication: ISO/WD TS 16486-7:2022.

Plastics piping systems for the supply of gaseous fuels — Unplasticized polyamide (PA-U) piping systems with fusion jointing and mechanical jointing —

Part 4: Valves

1 Scope

This document specifies the characteristics of valves made from unplasticized polyamide (PA-U) in accordance with ISO 16486-1, intended to be buried and used for the supply of gaseous fuels.

It is applicable to isolating unidirectional and bi-directional valves with spigot ends or electrofusion sockets intended to be fused with PA-U pipes or fittings conforming to ISO 16486-2 and ISO 16486-3 respectively.

Valves made from material other than unplasticized polyamide designed for the supply of gaseous fuels conforming to the relevant standards are permitted to be used in PA-U piping systems according to the ISO 16486 series provided they have relevant PA-U connections for butt fusion or electrofusion ends (see ISO 16486-3). The component, i.e. the complete valve, is required to fulfil the requirements of this document.

This document also specifies the test parameters for the test methods it describes.

In conjunction with ISO 16486-1, ISO 16486-2, ISO 16486-3 and ISO 16486-5, this document is applicable to PA-U valves and their joints and to joints with components of PA-U and other materials intended to be used under the following conditions:

- a) a maximum operating pressure (MOP) of up to and including 18 bar³⁾, or limited to 16 bar under regional CEN requirements, 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 of -20 °C to 40 °C;

NOTE 2 For operating temperatures between 20 °C and 40 °C, derating coefficients are specified in ISO 16486-5.

This document covers valves for 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 291, *Plastics — Standard atmospheres for conditioning and testing*

ISO 307, *Plastics — Polyamides — Determination of viscosity number*

3) 1 bar = 0,1 MPa = 10⁵ Pa; 1 MPa = 1 N/mm².

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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*

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 8233, *Thermoplastics valves — Torque — Test method*

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

ISO 16486-1, *Plastics piping systems for the supply of gaseous fuels — Unplasticized polyamide (PA-U) piping systems with fusion jointing and mechanical jointing — Part 1: General*

ISO 16486-2, *Plastics piping systems for the supply of gaseous fuels — Unplasticized polyamide (PA-U) piping systems with fusion jointing and mechanical jointing — Part 2: Pipes*

ISO 16486-3:2020, *Plastics piping systems for the supply of gaseous fuels — Unplasticized polyamide (PA-U) piping systems with fusion jointing and mechanical jointing — Part 3: Fittings*

ISO 16486-5, *Plastics piping systems for the supply of gaseous fuels — Unplasticized polyamide (PA-U) piping systems with fusion jointing and mechanical jointing — Part 5: Fitness for purpose of the system*

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

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

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 16486-1, 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* (3.1.4) 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* (3.1.4) or any component of a valve

3.1.4

valve body

main part of a valve which contains the obturating device (closing element), the seat, the packing seals and the operating stop, as applicable and provides the terminal ends for connection to the PA-U pipe/fittings

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, 3.3.1]^[4]

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, 3.3.2]^[4]

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* (3.2.1) [SOURCE: EN 736-3:2008, 3.3.3]^[4]

4 Symbols and abbreviated terms

For the purpose of this document, the symbols and abbreviated terms given in ISO 16486-1 apply.

5 Material

5.1 Compound for valve body

5.1.1 Compound

The compound from which the valve body with spigot or electrofusion socket is made shall be in accordance with ISO 16486-1.

The PA-U components of the valve shall be made from virgin material conforming to ISO 16486-1.

5.1.2 Fusion compatibility

Components made from PA-U 11 shall be heat fusion jointed only to components made from PA-U 11.

Components made from PA-U 12 shall be heat fusion jointed only to components made from PA-U 12.

Components made from PA-U are not fusion compatible with components made from other polymers.

5.2 Material for non-polyamide parts

5.2.1 General

All components shall conform to the relevant ISO International Standard(s). Alternative standards may be applied in cases where a suitable ISO International Standard does 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 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 PA-U pipes conforming to ISO 16486-2, with which they are intended to be used:

- a) during storage,
- b) under the effect of the fluids being conveyed, and
- c) taking into account the service environment and operating conditions.

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

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

The valve manufacturer shall ensure that any transition joint between polyamide and non-polyamide parts and the valve body fulfil the requirements of ISO 16486-3.

5.2.2 Metal parts

All 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.