ISO/FDIS 16486-3~~:2024(en)~~

ISO-/TC- 138/SC- 4

Secretariat:- NEN

Date: 2024-~~07-23~~09-11

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

Part 3: Fittings

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 3: Raccords*~~

Partie 3: Raccords

FDIS stage

ISO copyright office
CP 401 • Ch. de Blandonnet 8
CH-1214 Vernier, Geneva
Phone: + 41 22 749 01 11

Fax: +41 22 749 09 47

EmailE-mail: copyright@iso.org
Website: www.iso.orgwww.iso.org

Published in Switzerland

© ISO 2024 – All rights reserved

Contents

Foreword v
Introduction vii
1 Scope 1
2 Normative references 1
3 Terms and definitions 3
4 Material 3
4.1 PA-U compound 3
4.2 Material for non-unplasticized polyamide parts 3
5 General characteristics 4
5.1 Appearance 4
5.2 Design 4
5.3 Colour 4
5.4 Electrical characteristics for electrofusion fittings 4
5.5 Appearance of factory-made fusion joints 5
5.6 Fusion compatibility 5
5.7 Appearance of transition fittings 5
6 Geometrical characteristics 6
6.1 Measurement of dimensions 6
6.2 Dimensions of electrofusion sockets 6
6.3 Dimensions of spigot end fittings 8
6.4 Dimensions of tapping tees 10
6.5 Dimensions of transition fittings to other materials 11
7 Mechanical characteristics 11
7.1 General 11
7.2 Conditioning 12
7.3 Mechanical requirements 12
7.4 Additional requirements for transition fittings 14
8 Physical characteristics 14
8.1 Conditioning 14
8.2 Requirements 14
9 Chemical resistance of fittings in contact with chemicals 15
10 Performance requirements 15
11 Marking 15
11.1 General 15
11.2 Minimum required marking of fittings 16
11.3 Additional information required on fitting or label 16
11.4 Fusion system recognition 16
12 Delivery conditions 16
Annex A (informative) Examples of typical terminal connections for electrofusion 18
Annex B (normative) Short-term pressure test method 23
Annex C (normative) Tensile test fitting/pipe assemblies 25
Bibliography 27

4.1 PA-U compound 3
4.2 Material for non-unplasticized polyamide parts 3
4.2.1 General 3
4.2.2 Metal parts 4
4.2.3 Elastomers 4
4.2.4 Other materials 4
5.1 Appearance 4
5.2 Design 4
5.3 Colour 4
5.4 Electrical characteristics for electrofusion fittings 4
5.5 Appearance of factory-made fusion joints 5
5.6 Fusion compatibility 5
5.7 Appearance of transition fittings 5
6.1 Measurement of dimensions 6
6.2 Dimensions of electrofusion sockets 6
6.2.1 Diameters and lengths of electrofusion sockets 6
6.2.2 Wall thickness 6
6.3 Dimensions of spigot end fittings 8
6.4 Dimensions of tapping tees 10
6.5 Dimensions of transition fittings to other materials 10
7.1 General 10
7.2 Conditioning 11
7.3 Mechanical requirements 11
7.4 Additional requirements for transition fittings 13
8.1 Conditioning 13
8.2 Requirements 13
11.1 General 14
11.2 Minimum required marking of fittings 14
11.3 Additional information required on fitting or label 15
11.4 Fusion system recognition 15

© ISO 2024 – All rights reserved

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~~document 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~~ISO draws attention to the possibility that ~~some of~~ the ~~elements~~implementation of this document may ~~be~~involve the ~~subject~~use of (a) patent(s). ISO takes no position concerning the evidence, validity or applicability of any claimed patent rights~~.~~ in respect thereof. As of the date of publication of this document, ISO had not received notice of (a) patent(s) which may be required to implement this document. However, implementers are cautioned that this may not represent the latest information, which may be obtained from the patent database available at www.iso.org/patents. 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~~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 4, *Plastics pipes and fittings for the supply of gaseous fuels,* 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 third edition cancels and replaces the second edition (ISO~~-~~_16486~~-~~-3:~~2021~~2020), which has been technically revised.

The main changes ~~compared to the previous edition~~ are as follows:

— the references in the Introduction have been updated;

— ~~—~~a ~~note~~Note has been added in the ~~scope~~Introduction for information related to the suitability of PA-U pipe systems for 100 % hydrogen and its admixtures with natural gas;

~~— the references in the Introduction have been updated;~~

— ~~—~~ISO 3183 has been added to the normative references;

— ~~—~~ ~~in~~ Table 3,in Table 3, row “315”, cut back length, the value “758” has been corrected to “75”;

— a noteNote has been added in subclause 7.47.4 for the testing of leaktightness under pressure with air/nitrogen, appropriate for all gaseous fuels (e.g. methane and hydrogen);

— the Note in subclause 11.311.3 concerning coding of traceability data has been changed and in subclause 11.4,11.4, reference to ISO 12176-5 has been made;

— in Figure A.1,Figure A.1, the illustration is replaced by a sketch that shows the value $H_2$$h_2$ (= height of the active part).

A list of all parts in the ISO 16486 series can also 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.htmlwww.iso.org/members.html.

Introduction

This document specifies the requirements for a piping system and its components made from unplasticized polyamide (PA-U), which is intended to be used for the supply of gaseous fuels.

NOTE 1 Additional information about the suitability of PA-U pipe systems for hydrogen and its admixtures is given in ISO 16486-1:2023, Annex D.

Requirements and test methods for material and components, other than fittings of the piping system, are specified in ISO 16486-1, ISO 16486-2, and ISO 16486-4 [1].

Characteristics for fitness for purpose of the system and generic fusion parameters are covered 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.

Assessment of conformity of the system is given in ISO/TS 16486-7 [2].

NOTE 2 Recommended practice for installation is also given in CEN/TS 12007-6 [3],[3] which has been prepared by Technical Committee CEN/TC 234, *Gas infrastructure*.

Assessment of conformity of the system is covered in ISO/TS 16486-7 .

ISO 16486-1, ISO 16486-2, ISO 16486-3, ISO 16486-5 and , ISO 16486-6 and, ISO/TS 16486-7, and ISO/TS 16486-8 have been prepared by ISO/TC 138/SC 4. ISO 16486-4 has been prepared by ISO/TC 138/SC 7.

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

Part 3: Fittings

1 Scope

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

NOTE Additional information about the suitability of PA-U pipe systems for hydrogen and its admixtures is given in ISO 16486-1:2023 [4], Annex D.

It also specifies the test parameters for the test methods to which it refers.

The ISO 16486 series is applicable to PA-U piping systems, the components of which are connected by fusion jointing and/or mechanical jointing.

In addition, itIn particular, this document lays down dimensional characteristics and requirements for the marking of fittings.

In conjunction with the other parts of the ISO 16486 series, this document is applicable to PA-U fittings, their joints, joints with components of PA-U and joints with mechanical fittings of other materials, and to the following fitting types:

— fusion fittings (electrofusion fittings and butt fusion fittings), and

— transition fittings.

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*

ISO 1133-2, *Plastics — Determination of the melt mass-flow rate (MFR) and melt volume-flow rate (MVR) of thermoplastics — Part 2: Method for materials sensitive to time-temperature history and/or moisture*

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 3183, *Petroleum and natural gas industries — Steel pipe for pipeline transportation systems*

ISO 4433-1, *Thermoplastics pipes — Resistance to liquid chemicals — Classification — Part 1: Immersion test method*

ISO 11922-1, *Thermoplastics pipes for the conveyance of fluids — Dimensions and tolerances — Part 1: Metric series*

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 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 16486-5, *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*

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

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

IEC 60529, *Degrees of protection provided by enclosures (IP Code)*

API 5L, *Specification for Line Pipe*

© ISO 2024 – All rights reserved
2

3 Terms and definitions

For the purposes of this document, the terms and definitions given in ISO 16486-1 and the following apply.

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

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

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

3.1
electrofusion socket fitting
polyamide (PA-U) fitting which contains one or more integral heating elements that are capable of transforming electrical energy into heat to realize a fusion joint with a spigot end and/or a pipe

3.2
electrofusion saddle fitting
unplasticized polyamide (PA-U) fitting which contains one or more integral heating elements that are capable of transforming electrical energy into heat to realize fusion onto a pipe

3.3
tapping tee
electrofusion saddle fitting ~~(3.2)~~(3.2) (top loading or wraparound) which contains an integral cutter, used to cut through the wall of the main pipe, and which holds the coupon inside the cutter

Note 1 to entry: The cutter remains in the body of the saddle after installation.

3.4
spigot end fitting
unplasticized polyamide (PA-U) fitting where the outside diameter of the spigot length is equal to the nominal outside diameter, d_n, of the corresponding pipe

3.5
transition fitting
factory made fitting that makes a transition joint between an unplasticized polyamide (PA-U) piping and a metallic pipe

Note 1 to entry: The metallic parts of the fitting may be assembled to metallic pipes by screw threads, compression joints, welded or flanged connections. The fitting can allow for either a dismountable or permanently assembled joint. In some cases, the supporting ring can also act as a grip ring.

4 Material

4.1 PA-U compound

The fittings shall be made from virgin material.

The compound from which the fittings are made shall be in accordance with ISO 16486-1.

4.2 Material for non-unplasticized polyamide parts

4.2.1 General

The materials and constituent elements used in making the fitting shall be resistant to the external and internal environments in which they are intended to be used: