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Plastics piping systems — Mechanical fittings for pressure piping systems — Specifications

Systèmes de canalisations en plastiques — Raccords mécaniques pour les canalisations sous pression — Spécifications

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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 4, *Plastics pipes and fittings for the supply of gaseous fuels*.

This second edition cancels and replaces the first edition (ISO 17885:2015), which has been technically revised. It also incorporates the Amendment ISO 17885:2015/Amd 1:2016.

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

— a clarification for the relation between the nominal pressure and the MOP declared by the manufacturer is given;

— the term 'weathering' is used instead of 'ultraviolet radiation', to be in line with PE pipe standards;

— a clarification that the own reprocessable material of glass reinforced materials with a fibre length up to 3 mm may be used;

— the diameter for various pipe materials for the 'Resistance of plastic pipe/pipe or pipe/fitting assemblies to tensile loading at 23 °C has been increased from 63 mm to 250 mm;

— unplasticized polyamide (PA-U) is included in Table 7;

— errors in Table D.1 regarding the viscosity number of unplasticized polyamide (PA-U) are resolved;

— the requirement for the melt mass flow rate for PB in Table D.1 is aligned with ISO 15494;

— the requirement for the depth of dezincification for Cu in Table D.1 is aligned with EN 1254-3, -6 and -8;

— Formulae (1) and (2) and Annex C are corrected;

— the test pressures for unplasticized polyamide (PA-U) in Table F.1 are increased;

— the test procedure in Annex G is clarified.

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 mechanical fittings for joining plastic piping systems for the supply of gaseous fuels, the supply of water for human consumption and other purposes, as well as for industrial application.

It provides a unified set of test methods to check the performance of the fittings, depending on their intended use.

It is the responsibility of the purchaser or specifier to select the appropriate fitting, taking into account their particular requirements and any relevant national guidance or regulations and installation practices or codes.

Plastics piping systems — Mechanical fittings for pressure piping systems — Specifications

1 Scope

This document specifies the requirements and test methods for mechanical fittings intended to join plastic pressure piping systems including transition fittings to metal pipes for the following:

— supply of gaseous fuels (GAS);

— supply of water for human consumption (W), including raw water prior to treatment and for the supply of water for general purposes, as well as underground drainage and sewerage under pressure (P);

— supply of water for irrigation (I);

— industrial applications (IS).

This document is applicable only to mechanical fittings with operating-temperature and pressure limits as indicated in the relevant systems standards.

NOTE A list of International Standards for plastic pipes for which mechanical fittings can be used can be found in Annex A.

Flanges are not covered by this document.

Mechanical fittings for hot and cold water systems inside buildings, as well as for district heating applications, are not covered by this document.

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 7-1, *Pipe threads where pressure-tight joints are made on the threads — Part 1: Dimensions, tolerances and designation*

ISO 75-2, *Plastics — Determination of temperature of deflection under load — Part 2: Plastics and ebonite*

ISO 228-1, *Pipe threads where pressure-tight joints are not made on the threads — Part 1: Dimensions, tolerances and designation*

ISO 306, *Plastics — Thermoplastic materials — Determination of Vicat softening temperature (VST)*

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

ISO 472, *Plastics — Vocabulary*

ISO 580:2005, *Plastics piping and ducting systems — Injection-moulded thermoplastics fittings — Methods for visually assessing the effects of heating*

ISO 1043-1, *Plastics — Symbols and abbreviated terms — Part 1: Basic polymers and their special characteristics*

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 1167-2, *Thermoplastics pipes, fittings and assemblies for the conveyance of fluids — Determination of the resistance to internal pressure — Part 2: Preparation of pipe test pieces*

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 2507-1, *Thermoplastics pipes and fittings — Vicat softening temperature — Part 1: General test method*

ISO 2507-2, *Thermoplastics pipes and fittings — Vicat softening temperature — Part 2: Test conditions for unplasticized poly(vinyl chloride) (PVC-U) or chlorinated poly(vinyl chloride) (PVC-C) pipes and fittings and for high impact resistance poly (vinyl chloride) (PVC-HI) pipes*

ISO 3451-4, *Plastics — Determination of ash — Part 4: Polyamides*

ISO 3458, *Plastics piping systems — Mechanical joints between fittings and pressure pipes — Test method for leaktightness under internal pressure*

ISO 3459, *Plastic piping systems — Mechanical joints between fittings and pressure pipes — Test method for leaktightness under negative pressure*

ISO 3501, *Plastics piping systems — Mechanical joints between fittings and pressure pipes — Test method for resistance to pull-out under constant longitudinal force*

ISO 3503, *Plastics piping systems — Mechanical joints between fittings and pressure pipes — Test method for leaktightness under internal pressure of assemblies subjected to bending*

ISO 4633, *Rubber seals — Joint rings for water supply, drainage and sewerage pipelines — Specification for materials*

ISO 6509-1, *Corrosion of metals and alloys — Determination of dezincification resistance of copper alloys with zinc — Part 1: Test method*

ISO 6957, *Copper alloys — Ammonia test for stress corrosion resistance*

ISO 6993-1, *Buried, high-impact poly(vinyl chloride) (PVC-HI) piping systems for the supply of gaseous fuels — Part 1: Pipes for a maximum operating pressure of 1 bar (100 kPa)*

ISO 6993-2, *Buried, high-impact poly(vinyl chloride) (PVC-HI) piping systems for the supply of gaseous fuels — Part 2: Fittings for a maximum operating pressure of 200 mbar (20 kPa)*

ISO 6993-3, *Buried, high-impact poly(vinyl chloride) (PVC-HI) piping systems for the supply of gaseous fuels — Part 3: Fittings and saddles for a maximum operating pressure of 1 bar (100 kPa)*

ISO 7686, *Plastics pipes and fittings — Determination of opacity*

ISO 9080, *Plastics piping and ducting systems — Determination of the long-term hydrostatic strength of thermoplastics materials in pipe form by extrapolation*

ISO 10147, *Pipes and fittings made of crosslinked polyethylene (PE-X) — Estimation of the degree of crosslinking by determination of the gel content*

ISO 12162, *Thermoplastics materials for pipes and fittings for pressure applications — Classification, designation and design coefficient*

ISO 13783, *Plastics piping systems — Unplasticized poly(vinyl chloride) (PVC-U) end-load-bearing double-socket joints — Test method for leaktightness and strength while subjected to bending and internal pressure*

ISO 13844, *Plastics piping systems — Elastomeric-sealing-ring-type socket joints for use with plastic pressure pipes — Test method for leaktightness under negative pressure, angular deflection and deformation*

ISO 13845, *Plastics piping systems — Elastomeric-sealing-ring-type socket joints for use with thermoplastic pressure pipes — Test method for leaktightness under internal pressure and with angular deflection*

ISO 13951, *Plastics piping systems — Test method for the resistance of plastic pipe/pipe or pipe/fitting assemblies to tensile loading*

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

ISO 16486-1:2020, *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 17778, *Plastics piping systems — Fittings, valves and ancillaries — Determination of gaseous flow rate/pressure drop relationships*

ISO 19899, *Plastics piping systems — Polyolefin pipes and mechanical fitting assemblies — Test method for the resistance to end load (AREL test)*

ISO 23711, *Elastomeric seals — Requirements for materials for pipe joint seals used in water and drainage applications — Thermoplastic elastomers*

3 Terms, definitions, symbols and abbreviated terms

3.1 Terms and definitions

For the purposes of this document, the terms and definitions given in ISO 472, ISO 1043-1, and the following apply.

ISO and IEC maintain terminological 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/

3.1.1
mechanical fitting
fitting for assembling plastics pipes with each other or with a metal pipe or fitting, that includes one or more compression zones to provide pressure integrity, leak tightness and resistance to end loads

3.1.2
full-end-load resistance
combination of component and joint design and characteristics such that under any load condition the plastic pipe will fail first

3.1.3
end-load resistance
resistance to end load transmitted via the connecting pipe and generated by internal pressure, pipeline external interference, and thermally induced pipe stresses in any combination

3.1.4
non-end-load resistance
lack of resistance to axial loads without additional external mechanical axial support

3.1.5
lower confidence limit of predicted hydrostatic strength
σ_{LPL}
quantity, with the dimensions of stress, which represents the 97,5 % lower confidence limit of the predicted hydrostatic strength at a temperature θ and time t

Note 1 to entry: It is expressed in megapascals.

Note 2 to entry: Temperature, θ, is expressed in degrees Celsius and time, t, is expressed in years.

[SOURCE: ISO 12162:2009, 3.2]

3.1.6
minimum required strength
MRS
value of σ_{LPL} (3.1.5) at 20 °C and 50 years, rounded down to the next smaller value of the R10 series when σ_{LPL} is below 10 MPa, or to the next lower value of the R20 series when σ_{LPL} is 10 MPa or greater

Note 1 to entry: The R10 series conforms to ISO 3 and the R20 series conforms to ISO 497.

[SOURCE: ISO 4437-1:2014, 3.3.2]

3.1.7
design coefficient
C
coefficient with a value greater than 1, which takes into consideration service conditions, as well as properties of the components of a piping system other than those represented in the lower confidence limit

Note 1 to entry: The minimum value of C, C_{min}, is defined and given for various thermoplastics pipe systems in ISO 12162 and Annex C.

[SOURCE: ISO 12162:2009, 3.5, modified — The original notes 1 and 2 to entry have been replaced by a new note 1 to entry.]

3.1.8
gaseous fuel
fuel which is in the gaseous state at a temperature of 15 °C and a pressure of 1 bar

Note 1 to entry: 1 bar = 0,1 MPa = 10^5 Pa; 1 MPa = 1 N/mm^2.

[SOURCE: ISO 4437-1:2014, 3.4.1, modified — Note 1 to entry has been added.]

3.1.9
standard dimension ratio
SDR
numerical designation of a pipe series, which is a convenient round number, approximately equal to the dimension ratio of the nominal outside diameter, d_n, and the nominal wall thickness, e_n

[SOURCE: ISO 4437-1:2014, 3.1.15]

3.1.10
nominal pressure
PN
numerical designation, which is a convenient rounded number for reference purposes

Note 1 to entry: For plastic piping systems conveying water, it corresponds to the maximum continuous operating pressure, expressed in bar, which can be sustained with water at 20 °C, based on the minimum *design coefficient* (3.1.7).

3.1.11
virgin material
material in a form such as granules or powder that has not been subjected to use or processing other than that required for its manufacture and to which no reprocessable or recyclable materials have been added

3.1.12
own reprocessable material
material, of the same grade, prepared from clean rejected unused components, that will be reprocessed in a manufacturer's plant after having been previously processed by the same manufacturer in the production of same components by, for example, injection moulding

3.1.13
recycled material
material comprising one of the following:

a) material from used pipes or fittings which have been cleaned and crushed or ground

b) material from used thermoplastic products other than pipes or fittings which have been cleaned and crushed or ground

3.2 Symbols and abbreviated terms

3.2.1 Materials

3.2.1.1 Plastics

ABS	acrylonitrile-butadiene-styrene
ECTFE	ethylene chlorotriflourethylene
PA-U	unplasticized polyamide
PB	polybutene
PE	polyethylene
PE-RT	polyethylene of raised temperature resistance
PE-X	crosslinked polyethylene
POM	polyoxymethylene, polyformaldehyde
PP-B	polypropylene block-copolymer
PP-H	polypropylene homopolymer
PP-R	polypropylene random-copolymer
PP-RCT	polypropylene random-copolymer with modified crystallinity
PPSU	poly(phenylene sulfone)
PSU	polysulfone
PVC-C	chlorinated poly(vinyl chloride)
PVC-HI	high-impact poly(vinyl chloride)
PVC-O	oriented unplasticized poly(vinyl chloride)
PVC-U	unplasticized poly(vinyl chloride)
PVDF	poly(vinylidene fluoride)