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Plastics piping systems for hot and cold water installations — Polyethylene of raised temperature resistance (PE-RT) —

Part 3: Fittings

Systèmes de canalisations en plastique pour les installations d'eau chaude et froide — Polyéthylène de meilleure résistance à la température (PE-RT) —

Partie 3: Raccords

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ISO copyright office
Case postale 56 • CH-1211 Geneva 20
Tel. + 41 22 749 01 11
Fax + 41 22 749 09 47
E-mail copyright@iso.org
Web www.iso.org

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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.

International Standards are drafted in accordance with the rules given in the ISO/IEC Directives, Part 2.

The main task of technical committees is to prepare International Standards. Draft International Standards adopted by the technical committees are circulated to the member bodies for voting. Publication as an International Standard requires approval by at least 75 % of the member bodies casting a vote.

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.

ISO 22391-3 was prepared by Technical Committee ISO/TC 138, *Plastics pipes, fittings and valves for the transport of fluids*, Subcommittee SC 2, *Plastics pipes and fittings for water supplies*.

ISO 22391 consists of the following parts, under the general title *Plastics piping systems for hot and cold water installations — Polyethylene of raised temperature resistance (PE-RT)*:

— *Part 1: General*

— *Part 2: Pipes*

— *Part 3: Fittings*

— *Part 5: Fitness for purpose of the system*

Introduction

ISO 22391, the system standard, specifies the requirements for a piping system and its components when made from polyethylene of raised temperature resistance (PE-RT). The piping system is intended to be used for hot and cold water installations.

In respect of potential adverse effects on the quality of water intended for human consumption caused by the products covered by ISO 22391:

a) no information is provided as to whether the products may be used without restriction;

b) existing national regulations concerning the use and/or characteristics of the products remain in force.

This part of ISO 22391 specifies the characteristics of fittings. At the time of its publication, system standards for piping systems of other plastics materials used for the same application are

— ISO 15874:2003, *Plastics piping systems for hot and cold water installations — Polypropylene (PP)*,

— ISO 15875:2003, *Plastics piping systems for hot and cold water installations — Crosslinked polyethylene (PE-X)*,

— ISO 15876:2003, *Plastics piping systems for hot and cold water installations — Polybutylene (PB)*, and

— ISO 15877:2003, *Plastics piping systems for hot and cold water installations — Chlorinated poly(vinyl chloride) (PVC-C)*.

Plastics piping systems for hot and cold water installations — Polyethylene of raised temperature resistance (PE-RT) —

Part 3: Fittings

1 Scope

This part of ISO 22391 specifies the characteristics of fittings for piping systems made from polyethylene of raised temperature resistance (PE-RT), intended to be used for hot and cold water installations within buildings for the conveyance of water — whether or not the water is intended for human consumption (domestic systems) or heating systems — under the design pressures and temperatures appropriate to the class of application according to ISO 22391-1.

It covers a range of service conditions (classes of application), design pressures and pipe dimension classes, and also specifies test parameters and test methods. When used in conjunction with the other parts of ISO 22391, it is applicable to fittings made from PE-RT, as well as to those made from other materials, intended to be fitted to pipes conforming to ISO 22391-2 for hot and cold water installations, the joints of which are in accordance with ISO 22391-5.

This part of ISO 22391 is applicable to the following types of fitting:

— mechanical fittings;

— socket fusion fitting;

— electrofusion fittings;

— fittings with incorporated inserts.

It is not applicable for values of design temperature, maximum design temperature or malfunction temperature in excess of those specified in ISO 22391-1.

NOTE 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.

2 Normative references

The following referenced documents are indispensable for the application 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 228-1, *Pipe threads where pressure-tight joints are not made on the threads — Part 1: Dimensions, tolerances and designation*

ISO 1133:2005, *Plastics — Determination of the melt mass-flow rate (MFR) and the melt volume-flow rate (MVR) of thermoplastics*

ISO 1167-1:2006, *Thermoplastics pipes, fittings and assemblies for the conveyance of fluids — Determination of the resistance to internal pressure — Part 1: General method*

ISO 1167-2:2006, *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 3126:2005, *Plastics piping systems — Plastics components — Determination of dimensions*

ISO 7686:2005, *Plastics pipes and fittings — Determination of opacity*

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

ISO 12092, *Fittings, valves and other piping system components made of unplasticized poly(vinyl chloride) (PVC-U), chlorinated poly(vinyl chloride) (PVC-C), acrylonitrile-butadiene-styrene (ABS) and acrylonitrile-styrene-acrylester (ASA) for pipes under pressure — Resistance to internal pressure — Test method*

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

ISO 22391-1, *Plastics piping systems for hot and cold water installations — Polyethylene of raised temperature resistance (PE-RT) — Part 1: General*

ISO 22391-2:2006, *Plastics piping systems for hot and cold water installations — Polyethylene of raised temperature resistance (PE-RT) — Part 2: Pipes*

ISO 22391-5, *Plastics piping systems for hot and cold water installations — Polyethylene of raised temperature resistance (PE-RT) — Part 5: Fitness for purpose of the system*

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 1254-3:1998, *Copper and copper alloys — Plumbing fittings — Part 3: Fittings with compression ends for use with plastics pipes*

EN 10088-1:1995, *Stainless steels — Part 1: List of stainless steels*

EN 12107, *Plastics piping systems — Injection-moulded thermoplastics fittings, valves and ancillary equipment — Determination of the long-term hydrostatic strength of thermoplastics materials for injection moulding of piping components*

3 Terms, definitions, symbols and abbreviated terms

For the purposes of this document, the terms, definitions, symbols and abbreviated terms given in ISO 22391-1 and the following apply.

3.1
fitting
component of a piping system which connects two or more pipes and/or fittings together, without any further function

3.2 Mechanical fittings

3.2.1
compression fitting
fitting in which the joint is made by the compression of a ring or sleeve on the outside wall of the pipe with or without additional sealing elements and with internal support

3.2.2
crimped fitting
fitting in which the joint is made by crimping of the fitting and/or a ring on the outside wall of the pipe by means of a special tool

3.2.3
flanged fitting
fitting in which the pipe connection consists of two mating flanges which are mechanically pressed together and sealed by the compression of an elastomeric sealing element between them

3.2.4
flat seat union fitting
fitting in which the pipe connection consists primarily of two components, at least one of which normally incorporates a flat sealing surface, which are mechanically pressed together by means of a screwed nut or similar and sealed by the compression of an elastomeric sealing element between them

3.3 Fittings for heat fusion

3.3.1
socket fusion fitting
fitting in which the joint with the pipe is made by melting together the outer part of the pipe with the inner part of the fitting by means of heat induced by a heated tool

3.3.2
electrofusion fitting
fitting in which the joint with the pipe is made by melting together the outer part of the pipe and the inner part of the fitting by means of heat induced by current flowing in an appropriate resistor inserted in the fitting body

3.4
fitting with incorporated inserts
fitting in which the joint is made by means of connecting threads or other outlets, inserted in the plastics body, combined with fusion ends for socket welding or electrofusion

4 Material characteristics

4.1 Plastics fitting material

4.1.1 Fitting material identical to PE-RT pipe material

The material from which fittings are made shall be in accordance with the requirements for pipes according to ISO 22391-2.

When tested using the test method and the test parameters in accordance with Table 1, injection moulded tubular test pieces shall withstand the hydrostatic (hoop) stress without bursting or leakage.

Table 1 — Mechanical characteristics of tubular test pieces made of PE-RT by injection moulding

Characteristic	Requirement	Test parameters				Test methods
		For individual tests				
Resistance to internal pressure	No bursting or leakage during test period	**Hydrostatic (hoop) stress** MPa	**Test temperature** °C	**Test period** h	**Number of test pieces**	ISO 1167-1 and ISO 1167-2 (together with EN 12107)
		9,9	20	1	3	
		3,4	95	1 000	3	
		For all tests				
		Sampling procedure		Not specified		
		Type of end cap		Type a)		
		Orientation of test piece		Not specified		
		Type of test		Water-in-water		

4.1.2 PE-RT fitting material not identical to PE-RT pipe material

4.1.2.1 Evaluation of σ_{LCL} values and control points

The fitting material, in the form of injection-moulded tubular test pieces, shall be evaluated in accordance with ISO 9080 or equivalent, with internal pressure tests being carried out in accordance with ISO 1167-1 and ISO 1167-2, together with EN 12107, in order to determine the σ_{LCL} values. The σ_{LCL} values thus determined shall be used to determine the design stress, σ_{DF} (see ISO 22391-2:2006, Annex A) and values of hydrostatic stress, σ_F, corresponding to the temperature and time control points given in Table 2.

NOTE 1 One equivalent way of evaluation is to calculate the σ_{LCL} value for each temperature (for example 20 °C, 60 °C and 95 °C), individually.

If evaluation according to ISO 9080 or equivalent is available from long-term internal pressure tests relative to extruded pipes of the same compound as is used for the fitting, the injection-moulded tubular test pieces shall conform to the times for failure at the hydrostatic stress levels for the materials corresponding to the test temperature and the control points given in Table 2.

The relevant test temperature shall be higher than or equal to the maximum design temperature, T_{max}, for the service condition class.

Table 2 — Control points for testing fitting materials with tubular test pieces relative to classification of service conditions

	Application class(es)				
	All	**1**	**2**	**4**	**5**
Maximum design temperature, T_{max}, °C	—	80	80	70	90
Test temperature, T_{test}, °C	20	95 [a]	95 [a]	80	95
Test duration, t, h	1	1 000	1 000	1 000	1 000

[a] Conducted at 95 °C to match existing test facilities.

It is recommended that the nominal diameter of the injection-moulded tubular test pieces be in the range of the nominal diameters of fittings normally produced by the manufacturer.

4.1.2.2 Thermal stability

The thermal stability shall be tested by means of hydrostatic pressure testing in accordance with ISO 1167-1 and ISO 1167-2 at 110°C for 8760 h, using a test piece in pipe form or a fitting connected to pipes. The test piece shall withstand the test without bursting. The test shall be conducted in water-in-air at an internal pressure equivalent to the hydrostatic stress used in the pipe material thermal stability test.

If a fitting connected to pipes is used as a test piece and the pipe connection fails, then the thermal stability test shall be repeated using a test piece in pipe form.

4.1.3 Plastics fitting material other than PE-RT

Plastics material other than PE-RT for fittings intended to be used in PE-RT piping systems for hot and cold water installations within buildings for the conveyance of water — whether or not the water is intended for human consumption (domestic systems) or heating systems — shall be in accordance with 4.1.2.

4.2 Metallic fitting material

Metallic material for fittings intended to be used with components conforming to ISO 22391 shall be in accordance with EN 1254-3 or EN 10088-1, as applicable.

4.3 Influence on water intended for human consumption

The material shall be in accordance with ISO 22391-1.

5 General characteristics

5.1 Appearance

When viewed without magnification, the internal and external surfaces of fittings shall be smooth, clean and free from an extent of scoring, cavities and other surface defects that would prevent conformance with this part of ISO 22391. The material shall not contain visible impurities. Slight variations in the appearance of the colour are permitted. Each end of a fitting shall be square to its axis.

5.2 Opacity

Fittings that are declared to be opaque shall not transmit more than 0,2 % of visible light when tested in accordance with ISO 7686.

NOTE This test is not necessary when the fitting body material is of the same opaque PE-RT compound as the pipe.

6 Geometrical characteristics

6.1 General

Dimensions shall be measured in accordance with ISO 3126.

6.1.1 Nominal diameter(s), d_n

The nominal diameter(s), d_n, of a fitting shall correspond to, and be designated by, the nominal outside diameter(s) of the pipe(s) conforming to ISO 22391-2 for which they are designed.