

INTERNATIONAL
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ISO
4422-3

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**Pipes and fittings made of unplasticized
poly(vinyl chloride) (PVC-U) for water
supply — Specifications —**

Part 3:
Fittings and joints

*Tubes et raccords en poly(chlorure de vinyle) non plastifié (PVC-U) pour
l'adduction d'eau — Spécifications —*

Partie 3: Raccords et assemblages

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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.

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.

International Standard ISO 4422-3 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*.

Together with the other parts, this part of ISO 4422 cancels and replaces ISO 4422:1990, which has been technically revised.

ISO 4422 consists of the following parts, under the general title *Pipes and fittings made of unplasticized poly(vinyl chloride) (PVC-U) for water supply — Specifications*:

- Part 1: *General*
- Part 2: *Pipes (with or without integral sockets)*
- Part 3: *Fittings and joints*
- Part 4: *Valves and ancillary equipment*
- Part 5: *Fitness for purpose of the system*

ISO 4422 is one of a series of system standards for plastics piping systems which are being prepared within ISO/TC 138. Each system standard is based on a specific material for a specific application.

They conform to a standard multi-part format, each part dealing with a specific aspect of the overall system.

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NOTE 1 At the present time, the reference document for the installation code is ISO/TR 4191, and this document will ultimately form part 6 of this International Standard.

Pipes and fittings made of unplasticized poly(vinyl chloride) (PVC-U) for water supply — Specifications —

Part 3: Fittings and joints

1 Scope

This part of ISO 4422 specifies the characteristics and properties of fittings (injection-moulded and post-formed) and joints made of unplasticized poly(vinyl chloride) (PVC-U), to be used for buried water mains and services and for water supplies above ground, both inside and outside buildings.

The fittings and joints covered by this part of ISO 4422 are intended for the conveyance of cold water under pressure at temperatures up to approximately 20 °C, for general purposes and for the supply of drinking water. This part of ISO 4422 is also applicable to water up to and including 45 °C (see figure 1 in ISO 4422-2:1996).

Fittings made by hot-gas fusion and hot-plate fusion techniques are not covered by this part of ISO 4422.

2 Normative references

The following standards contain provisions which, through reference in this text, constitute provisions of this part of ISO 4422. At the time of publication, the editions indicated were valid. All standards are subject to revision, and parties to agreements based on this part of ISO 4422 are encouraged to investigate the possibility of applying the most recent editions of the standards indicated below. Members of IEC and ISO maintain registers of currently valid International Standards.

ISO 264:1976, *Unplasticized polyvinyl chloride (PVC) fittings with plain sockets for pipes under pressure — Laying lengths — Metric series.*

ISO 580:1990, *Injection-moulded unplasticized poly(vinyl chloride) (PVC-U) fittings — Oven test — Test method and basic specifications.*

ISO 727:1985, *Fittings of unplasticized polyvinyl chloride (PVC-U), chlorinated polyvinyl chloride (PVC-C) or acrylonitrile/butadiene/styrene (ABS) with plain sockets for pipes under pressure — Dimensions of sockets — Metric series.*

ISO 1628-2:1988, *Plastics — Determination of viscosity number and limiting viscosity number — Part 2: Poly(vinyl chloride) resins.*

ISO 2045:1988, *Single sockets for unplasticized poly(vinyl chloride) (PVC-U) and chlorinated poly(vinyl chloride) (PVC-C) pressure pipes with elastic sealing ring type joints — Minimum depths of engagement.*

ISO 2048:1990, *Double-socket fittings for unplasticized poly(vinyl chloride) (PVC-U) pressure pipes with elastic sealing ring type joints — Minimum depths of engagement.*

ISO 2507-1:1995, *Thermoplastics pipes and fittings — Vicat softening temperature — Part 1: General test method.*

ISO 2507-2:1995, *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 2536:1974, *Unplasticized polyvinyl chloride (PVC) pressure pipes and fittings, metric series — Dimensions of flanges.*

ISO 4132:1979, *Unplasticized polyvinyl chloride (PVC) and metal adaptor fittings for pipes under pressure — Laying lengths and size of threads — Metric series.*

ISO 4422-1:1996, *Pipes and fittings made of unplasticized poly(vinyl chloride) (PVC-U) for water supply — Specifications — Part 1: General.*

ISO 4422-2:1996, *Pipes and fittings made of unplasticized poly(vinyl chloride) (PVC-U) for water supply — Specifications — Part 2: Pipes (with or without integral sockets).*

ISO 4422-5:—¹⁾, *Pipes and fittings made of unplasticized poly(vinyl chloride) (PVC-U) for water supply — Specifications — Part 5: Fitness for purpose of the system.*

ISO 4434:1977, *Unplasticized polyvinyl chloride (PVC) adaptor fittings for pipes under pressure — Laying length and size of threads — Metric series.*

ISO 6455:1983, *Unplasticized polyvinyl chloride (PVC) fittings with elastic sealing ring type joints for pipes under pressure — Dimensions of laying lengths — Metric series.*

ISO/TR 9080:1992, *Thermoplastics pipes for the transport of fluids — Methods of extrapolation of hydrostatic stress rupture data to determine the long-term hydrostatic strength of thermoplastics pipe materials.*

ISO 9853:1991, *Injection-moulded unplasticized poly(vinyl chloride) (PVC-U) fittings for pressure pipe systems — Crushing test.*

ISO 12092: —¹⁾, *Fittings, valves and other piping system components of unplasticized poly(vinyl chloride) (PVC-U) for pipes under pressure — Resistance to internal pressure — Test method.*

ISO 12162:1995, *Thermoplastics materials for pipes and fittings for pressure applications — Classification*

and designation — Overall service (design) coefficient.

3 Definitions

For the purposes of this part of ISO 4422, the definitions given in ISO 4422-1 apply.

4 Material

4.1 The material from which fittings are made shall conform to the requirements specified in ISO 4422-1 in addition to those specified in 4.2 and 4.3.

4.2 The fitting materials shall be unplasticized poly(vinyl chloride), designated PVC-U. Where the material has an MRS equal to or greater than 25 MPa, determined in accordance with ISO/TR 9080 and ISO 12162, this material shall be designated PVC-UH.

4.3 An injection-moulded test piece in the form of a pipe, with an outside diameter d_e of not less than 50 mm and a wall thickness of not less than series S10, nor greater than S6,3, appropriate to the diameter of the test piece, when subjected at 60 °C to a hydrostatic pressure test at a calculated induced stress level of 10 MPa, shall not fail by leaking or bursting in less than 1 000 h.

5 General characteristics of fittings

5.1 Appearance

When viewed without magnification, the internal and external surfaces of fittings shall be smooth, clean and free from scoring, cavities and other surface defects which would prevent conformity with this part of ISO 4422. The end(s) of fittings made from pipe shall be square to their axis.

5.2 Temperature derating

The temperature derating factor for working temperatures between 25 °C and 45 °C shall be the same as that specified for pipes in 5.4 of ISO 4422-2:1996.

6 Geometrical characteristics

6.1 Fittings for solvent-cementing

6.1.1 The laying lengths shall conform to ISO 264.

1) To be published.

6.1.2 The socket lengths and tolerances shall conform to ISO 727.

6.2 Fittings for elastomeric sealing ring type joints

6.2.1 The laying lengths shall conform to ISO 6455.

6.2.2 The minimum depth of engagement for single-socket fittings shall conform to ISO 2045.

6.2.3 The minimum depth of engagement for double-socket fittings shall conform to ISO 2048.

6.2.4 The minimum depth of engagement of sockets on moulded bends, tees and reducers shall conform to ISO 2048.

6.2.5 The inside diameter of the socket, the shape of the groove for the elastomeric sealing ring and the shape of the elastomeric sealing ring shall be such that the fittings conform to the requirements of all hydrostatic tests specified in clause 7.

6.3 Adaptor fittings

6.3.1 Where applicable, the laying length and size of thread for PVC-U adaptor fittings shall conform to ISO 4434.

6.3.2 Where applicable, the laying length and size of thread for PVC-U/metal adaptor fittings shall conform to ISO 4132.

6.4 Flanges

6.4.1 The basic dimensions of flanges shall conform to ISO 2536.

6.4.2 The flange adaptor dimensions shall conform to ISO 4132.

6.5 End-load-bearing double sockets

The basic dimensions shall be as specified by the manufacturer.

7 Mechanical characteristics

7.1 When tested in accordance with ISO 12092, using the combinations of test temperature and test pressure given in table 1, injection-moulded solvent-cement fittings shall not fail in less than the corresponding test times given in table 1.

7.2 When tested in accordance with ISO 12092, using the applicable combinations of test temperature and test pressure given in table 1, injection-moulded elastomeric sealing ring type fittings shall not fail in less than the corresponding test times given in table 1.

NOTE 2 Reinforcement of the mouth of the fitting to an extent sufficient to prevent creep of the socket and subsequent extrusion of the sealing ring is permissible.

7.3 When tested in accordance with ISO 9853, injection-moulded fittings which cannot be tested as specified in 7.1 or 7.2 shall not shatter when subjected to a deformation of 20 %.

7.4 Where fittings are manufactured from pipe, the pipe used shall conform to clauses 8 and 9 of ISO 4422-2:1996.

When tested in accordance with ISO 12092, the fittings shall not fail in less than 1 h at 20 °C, under the appropriate internal pressure given in table 1.

NOTE 3 The performance requirements for end-load-bearing double sockets are given in ISO 4422-5.

Table 1 — Test conditions for the resistance of fittings to hydrostatic pressure

Test specimen		Material	Test temperature °C	Test pressure ¹⁾ bar	Test time h
Injection-moulded fittings $d_n < 160$		PVC-U or PVC-UH	20	4,2 † PN 3,2 † PN	1 1 000
Injection-moulded fittings $d_n \geq 160$		PVC-UH	20	3,36 † PN 2,56 † PN	1 1 000
		PVC-U	20	4,2 † PN 3,2 † PN	1 1 000
Fittings made from pipe	$d_n \leq 90$	PVC-U	20	4,2 † PN	1
	$d_n > 90$		20	3,36 † PN	1

1) Where a mould previously used to manufacture a fitting of a selected nominal pressure PN for PVC-U material is subsequently used to manufacture a fitting from PVC-UH material, then either the nominal pressure of that fitting shall be increased by a factor of 1,25 or, if the nominal pressure is retained at its original value, the original test pressure for PVC-U material shall be maintained.

8 Physical characteristics

8.1 When determined in accordance with ISO 2507-1 and ISO 2507-2, the Vicat softening temperature shall be not less than 74 °C.

8.2 When tested in accordance with ISO 580, injection-moulded fittings shall meet the requirements of the specification, except that the requirement for the depth of any cracks or delaminations at the point of injection shall be not greater than 30 % of the wall thickness.

9 Marking

All fittings shall be permanently marked or labelled to show the following information:

- the manufacturer's name or trade mark;
- the fitting material, i.e. PVC-U, and, if applicable, the classification, i.e. PVC-UH;
- the size(s);
- the number ISO 4422;
- the nominal pressure PN.

NOTE 4 Other information, such as the pipe series designation, may be added.

ICS 83.140; 91.140.60

Descriptors: piping, water supply, plastics products, unplasticized polyvinyl chloride, pipe fittings, pipe joints, specifications, geometric characteristics, mechanical properties, physical properties, marking.

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