International Standard

ISO 16422-5

First edition
2024-02

Pipes and joints made of oriented unplasticized poly(vinyl chloride) (PVC-O) for the conveyance of water under pressure —

Part 5: Fitness for purpose of the system

Tubes et assemblages en poly(chlorure de vinyle) non plastifié orienté (PVC-O) pour le transport de l'eau sous pression —

Partie 5: Aptitude à l'emploi du système

Reference number
ISO 16422-5:2024(en)

© ISO 2024



COPYRIGHT PROTECTED DOCUMENT

© ISO 2024
All rights reserved. Unless otherwise specified, or required in the context of its implementation, no part of this publication may be reproduced or utilized otherwise in any form or by any means, electronic or mechanical, including photocopying, or posting on the internet or an intranet, without prior written permission. Permission can be requested from either ISO at the address below or ISO's member body in the country of the requester.

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

Published in Switzerland

Contents

Page

Foreword ..... **iv**
Introduction ..... **v**
1 Scope **1**
2 Normative references **1**
3 Terms and definitions **2**
4 Fitness for purpose of joints and the system **2**
4.1 General 2
4.2 Assemblies with non-end-load-bearing joints 2
4.3 Assemblies with end-load-bearing joints 3
5 Test methods **4**
5.1 Short-term test for leaktightness under internal pressure with angular deflection 4
5.1.1 Test procedure 4
5.1.2 Test pressure 6
5.2 Short-term test for leaktightness under negative pressure with angular deflection and deformation 6
5.3 Long-term leaktightness under internal water pressure 7
5.3.1 Test procedure 7
5.4 Short-term positive pressure test for leaktightness of assemblies 7
5.5 Short-term negative pressure test for leaktightness of assemblies 8
Annex A (normative) **Pressure test for leaktightness of assemblies with end-load-bearing joints** **9**
Bibliography **11**

© 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 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).

ISO draws attention to the possibility that the implementation of this document may involve the 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.

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 2, *Plastics pipes and fittings for water supplies.*

This first edition of ISO 16422-5, together with ISO 16422-1 and ISO 16422-2, cancels and replaces the second edition of ISO 16422:2014, which has been technically revised.

The main changes are as follows:

— ISO 16422:2014 has been split into several parts, under the general title "*Pipes and joints made of oriented unplasticized poly(vinyl chloride) (PVC-O) for the conveyance of water under pressure*". The information previously included in ISO 16422:2014 has been divided into ISO 16422-1, ISO 16422-2 and ISO 16422-5 (this document), with the following addition to ISO 16422-5:

  — new pressure tests for leaktightness of assemblies have been introduced in place of those from ISO 13783.

A list of all parts in the ISO 16422 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.

© ISO 2024 – All rights reserved

Introduction

Molecular orientation of thermoplastics results in the improvement of physical and mechanical properties. Orientation is carried out at temperatures well above the glass transition temperature.

Orientation of PVC-U pipe-material can be induced by different processes.

In general, the following production process is common.

— A thick-wall tube is extruded (feedstock) and conditioned at the desired temperature.

— The orientation process is activated primarily in circumferential direction under controlled conditions. Axial orientation can also be activated in the product.

— After the orientation process, the pipe is cooled down quickly to ambient temperature.

The orientation of the molecules creates a laminar structure in the material of the pipe wall. This structure gives the ability to withstand brittle failure emanating from minor flaws in the material matrix or from scratches at the surface of the pipe wall.

Improved hoop strength allows reduced wall thickness with material and energy savings. It also results in improved resistance to impact and fatigue.

The classification of the pipe depends on material compound/formulation and stretch ratios used. Therefore, with the classification, these characteristics may be specified or determined.

Regarding potential adverse effects on the quality of water intended for human consumption caused by the products covered by this document, this document provides no information as to whether or not the products can be used without restriction.

© ISO 2024 – All rights reserved

Pipes and joints made of oriented unplasticized poly(vinyl chloride) (PVC-O) for the conveyance of water under pressure —

Part 5:
Fitness for purpose of the system

1 Scope

This document specifies the characteristics of the fitness for purpose of oriented unplasticized poly(vinyl chloride) (PVC-O) solid wall piping intended to be used underground or above-ground where protected from direct sunlight, for water supply, buried drainage, sewerage, treated wastewater and irrigation under pressure. It also specifies the test parameters for the test methods referred to in this document.

This document is not intended for on-site testing of pipe systems.

In conjunction with ISO 16422-1, ISO 16422-2, ISO/TS 16422-3 and ISO 1452-3, this document is applicable to PVC-O pipes and PVC-O fittings, as well as to their joints and to joints with components of other plastics and non-plastics materials intended to be used for the following:

a) water mains and services lines;

b) conveyance of water for both outside and inside buildings;

c) drainage, sewerage and treated wastewater under pressure;

d) irrigation under pressure.

This document is applicable to piping systems intended for the supply of water under pressure up to and including 25 °C (cold water), intended for human consumption and for general purposes as well as for wastewater under pressure.

This document is also applicable to components for the conveyance of water and wastewater up to and including 45 °C. For temperatures between 25 °C and 45 °C, see ISO 16422-2:2023, Figure C.1.

The piping system according to this document is intended for the conveyance of cold water up to pressures of 25 bar[1)] and especially in those applications where special performance requirements are needed, such as impact loads and pressure fluctuations, up to pressure of 25 bar.

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 16422-1, *Pipes and joints made of oriented unplasticized poly(vinyl chloride) (PVC-O) — Part 1: General*

ISO 16422-2, *Pipes and joints made of oriented unplasticized poly(vinyl chloride) (PVC-O) — Part 2: Pipes*

ISO/TS 16422-3, *Pipes and joints made of oriented unplasticized poly(vinyl chloride) (PVC-O) for the conveyance of water under pressure — Part 3: Fittings*

1) 1 bar= 0,1 MPa = 10^5 Pa; 1 MPa= 1 N/mm^2

© ISO 2024 – All rights reserved

ISO 472, *Plastics — Vocabulary*

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

ISO 1452-3, *Plastics piping systems for water supply and for buried and above-ground drainage and sewerage under pressure — Unplasticized poly(vinyl chloride) (PVC-U) — Part 3: Fittings*

ISO 1452-4, *Plastics piping systems for water supply and for buried and above-ground drainage and sewerage under pressure — Unplasticized poly(vinyl chloride) (PVC-U) — Part 4: Valves*

ISO 13844, *Plastics piping systems — Elastomeric-sealing-ring-type socket joints for use with plastic 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 13846, *Plastics piping systems — End-load-bearing and non-end-load-bearing assemblies and joints for thermoplastics pressure piping — Test method for long-term leaktightness under internal water pressure*

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

3 Terms and definitions

For the purposes of this document, the terms and definitions given in ISO 472 and ISO 1043-1, ISO 16422-1 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
end-load-bearing joint
joint that can resist axial loads without additional external mechanical support

3.2
non-end-load-bearing joint
joint that cannot resist axial loads without additional external mechanical axial support

4 Fitness for purpose of joints and the system

4.1 General

Joints shall meet their own standards in addition to the fitness of purpose requirements specified in this document

4.2 Assemblies with non-end-load-bearing joints

The following types of assemblies of non-end-load-bearing joints shall fulfil the fitness for purpose requirements for the test methods specified in Table 1:

a) integrally socketed PVC-O pipe to pipe assemblies with elastomeric ring seal joints conforming to ISO 16422-2;

b) PVC-O and PVC-U fitting and pipe assemblies with elastomeric ring seal joints conforming to ISO/TS 16422-3, ISO 1452-3 and ISO 16422-2, respectively;

c) PVC-U valve and PVC-O pipe assemblies with elastomeric ring seal joints conforming to ISO 1452-4 and ISO 16422-2, respectively;

© ISO 2024 – All rights reserved