
**Hydraulic fluid power — Filter
elements — Verification of fabrication
integrity and determination of the
first bubble point**

*Transmissions hydrauliques — Éléments filtrants — Vérification de la
conformité de fabrication et détermination du point de première bulle*

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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 on 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 the following URL: www.iso.org/iso/foreword.html. (standards.iteh.ai)

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ISO 2942:2018

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This fifth edition cancels and replaces the fourth edition (ISO 2942:2004) which has been technically revised.

This revision permits the use of test fluids other than 2-propanol for determination of fabrication integrity. Specifically:

- a) in [4.2](#), acceptable test fluids for determination of fabrication integrity are defined;
- b) in [5.2.1](#), a formula to calculate the minimum allowed fabrication integrity pressure for an element in the test liquid is provided;
- c) in [5.3.1](#), a formula is provided to calculate the pressure normalized to the surface tension of 2-propanol;
- d) in [Annex A](#), the manufacturer's minimum specified fabrication integrity is now listed, as well as the first bubble point in the test liquid and the normalized first bubble point; and
- e) in [Annex B](#), the theoretical underpinning for relating bubble point data obtained in one fluid to the bubble point that would be obtained using a different fluid is presented.

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

In hydraulic fluid power systems, power is transmitted and controlled through a liquid under pressure within an enclosed circuit. Filters maintain fluid cleanliness by removing insoluble contaminants.

The ability of a filter to achieve and maintain the required level of performance depends, among other parameters, upon its filtration rating and structural integrity. Any imperfections in the structure, either through poor manufacturing techniques or lack of strength, allow by-passing of unfiltered fluid.

The integrity of the element after manufacture can be evaluated using a non-destructive filter integrity test. This test determines whether flaws are present which would allow the fluid to bypass the filtering process and provides for quality control. The test is also used to evaluate whether damage has been sustained by the element during both service and laboratory tests.

The first bubble point test is used for investigative product development or production process evaluation. The acceptability of filtration performance cannot be determined by the first bubble point test.

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Hydraulic fluid power — Filter elements — Verification of fabrication integrity and determination of the first bubble point

1 Scope

This document specifies a bubble-point test method applicable to filter elements used in hydraulic fluid power systems. It can be used both to verify the fabrication integrity of a filter element (by checking the absence of bubbles) and to permit the localization of the largest pore of the filter element by determining the first bubble point.

NOTE Verification of fabrication integrity is used to define the acceptability of the filter elements for further use or testing.

The first bubble point is established through continuation of the fabrication integrity test. It is under no circumstances a functional characteristic of a filter element; in particular, it cannot be used to estimate filtration rating, efficiency or retention capacity and is intended to be used for information only.

This document specifies a method to normalise fabrication integrity and bubble point data to a standard value of surface tension when test fluids other than 2-propanol are used.

2 Normative references (standards.iteh.ai)

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 304, *Surface active agents — Determination of surface tension by drawing up liquid films*

ISO 5598, *Fluid power systems and components — Vocabulary*

3 Terms and definitions

For the purposes of this document, the terms and definitions given in ISO 5598 and the following apply.

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

- ISO Online browsing platform: available at <http://www.iso.org/obp>
- IEC Electropedia: available at <http://www.electropedia.org/>

3.1

filter element

porous device that performs the actual process of filtration

Note 1 to entry: This definition differs from that given in ISO 5598, which reads: “The porous part of a filter which performs the actual process of filtration.”

3.2

fabrication integrity

physical acceptability of a filter element to meet the specification designated by the filter manufacturer

3.3
first bubble point

pressure at which the first bubble stream appears when a filter element is tested using the method specified in this document

Note 1 to entry: In the absence of manufacturing defects, this value is indicative of the largest pore of the filtering medium.

3.4
surface tension

tension acting in the surface of a phase, directed towards the interior of the phase, caused by intermolecular attractions between the molecules at the surface and those located below the surface

4 Apparatus and materials

4.1 Bubble-point testing apparatus, as shown in [Figure 1](#), is comprised of the elements [4.1.1](#) to [4.1.5](#).

4.1.1 Compressed-air supply, with filter(s) and pressure regulator(s), adjustable up to 10 kPa.

4.1.2 Pressure-measuring device, with an accuracy of ± 5 % of the reading.

4.1.3 Temperature-measuring device, with an accuracy of $\pm 1,0$ °C.

4.1.4 Test container, for containing the test liquid (see [4.2](#)) in which to submerge the filter element under test.

4.1.5 Element retention and rotation fixture, for restraining the filter element during immersion to the required depth and allowing rotation about the element's major axis either manually or with an automatic mechanism. The fixture shall include sealing bungs of a material compatible with the test liquid (see [4.2](#)) for sealing the compressed air supply line to the open end cap(s) of the filter element. One bung shall have an orifice which allows the transmission of the air pressure through an open end cap and if required a second sealing bung without an orifice to seal the opposite end cap of the filter element.

4.2 Test liquid

The test liquid shall be clean 2-propanol (isopropyl alcohol) or an alternative liquid designated by the filter element manufacturer with a surface tension between 14 mN/m and 33 mN/m. Its cleanliness shall be consistent with subsequent test requirements. Its surface tension shall be regularly checked in accordance with the requirements of ISO 304. The liquid shall be replaced when its surface tension has changed by more than 15 % of its original value.

If the test filter element has been exposed to other hydraulic fluids prior to being subjected to the fabrication integrity test, then it is permissible to use the same type of hydraulic fluid as the fabrication integrity test liquid, provided that the surface tension requirements of this subclause are met. If this is not possible, all residual previous liquid shall be removed by appropriate means before testing. This is to ensure correct and consistent wetting of the element's media.

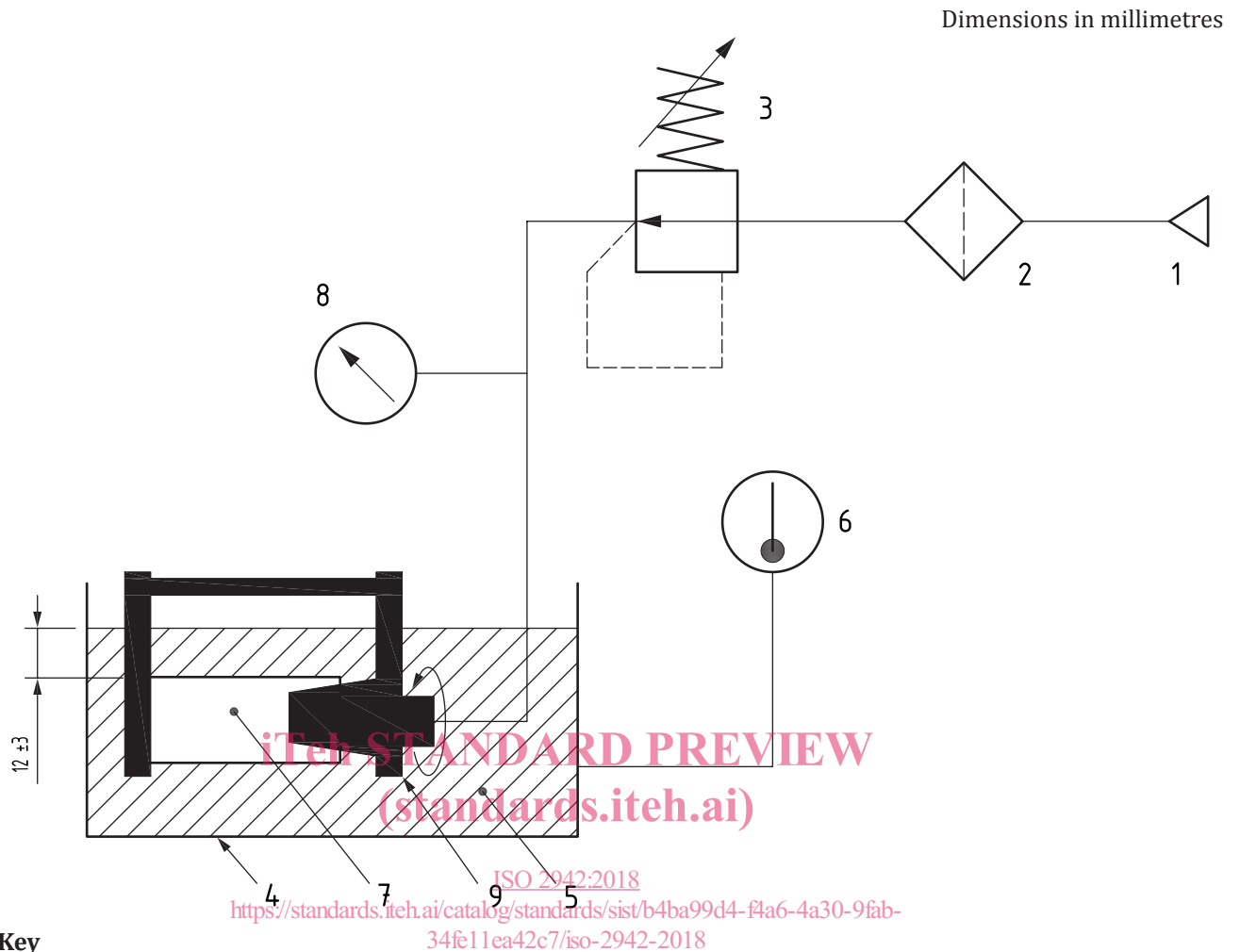


Figure 1 — Typical bubble-point testing apparatus

5 Test methods

WARNING — Exercise care when using solvents with low flash points, as there could be a risk of fire or explosion. Appropriate precautions shall be taken to avoid inhalation of fumes from these solvents. Always use suitable protective equipment.

5.1 General procedure

5.1.1 Check that the manufacturer's identification number or part number of the filter element to be tested complies with the manufacturer's specification. Determine the minimum fabrication integrity of