INTERNATIONAL STANDARD

ISO 2942

Third edition
1994-09-15

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

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

ISO 2942:1994
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Reference number
ISO 2942:1994(E)

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.

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International Standard ISO 2942 was prepared by Technical Committee ISO/TC 131, *Fluid power systems*, Subcommittee SC 8, *Product testing and contamination control*.

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This third edition cancels and replaces the second edition (ISO 2942:1985), which has been technically revised and expanded to include the determination of the first bubble point.

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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.

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

1 Scope

This International Standard specifies a bubble-point test method applicable to filter elements to be used in hydraulic fluid power systems. It can be used either to verify the fabrication integrity of a filter element (by checking the absence of bubbles) or to permit the localization of the largest pore of the filtering medium by determining the first bubble point. It therefore defines the acceptability of filter elements for further use or testing.

The first bubble point is under no circumstances a functional characteristic of a filter element; in particular, it cannot be used for extrapolation to the concepts of filtration rating, efficiency or retention capacity.

2 Normative references

The following standards contain provisions which, through reference in this text, constitute provisions of this International Standard. At the time of publication, the editions indicated were valid. All standards are subject to revision, and parties to agreements based on this International Standard 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 1219-1:1991, *Fluid power systems and components — Graphic symbols and circuit diagrams — Part 1: Graphic symbols.*

ISO 5598:1985, *Fluid power systems and components — Vocabulary.*

3 Definitions

For the purposes of this International Standard, the definitions given in ISO 5598 and the following definitions apply.

3.1 filter element: The component which ensures the retention of contaminant.

[ISO 5598]

In this International Standard, a filter element is a porous device which performs the actual process of filtration.

3.2 fabrication integrity: The physical acceptability of a filter element relative to that designated by the filter manufacturer.

3.3 first bubble point: The pressure at which the first bubble appears when a filter element is tested using the method specified in this International Standard. In the absence of manufacturing defects, this value is related to the largest pore of the filtering medium.

4 Graphic symbols

Graphic symbols used are in accordance with ISO 1219-1.

5 Apparatus and material

5.1 Bubble-point testing apparatus, as shown in figure 1, and mainly composed of the following.

5.1.1 Compressed-air supply, with filter(s) and pressure regulator(s), adjustable for values from the minimum up to 10 kPa (100 mbar).

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5.1.2 Pressure-measuring device, with a relative accuracy of ± 3 %.

5.1.3 Leakproof container, for submerging the filter element under test, fitted with a thermometer and a built-in manual or automatic mechanism for rotating the filter element.

5.2 Reference liquid, clean isopropanol or an alternative liquid designated by the filter element manufacturer. Its cleanliness shall be consistent with subsequent test requirements. Its surface tension shall be regularly checked if the liquid is used repeatedly. It is advisable to renew the liquid when its surface tension varies by ± 5 % with respect to fresh liquid.

WARNING — Isopropanol or other solvents used as the reference liquid may be hazardous to the individual and to the environment. Take safety precautions appropriate to the liquid being used and consult local environmental regulations before disposal of any reference liquid.

6 Test methods

6.1 General procedure

6.1.1 Check that the filter element to be tested complies with the manufacturer's drawing(s).

6.1.2 Install the clean filter element in the bubble-point testing apparatus (5.1), with the major axis of the filter element parallel to the surface of the reference liquid (5.2).

6.1.3 Submerge the element until it is covered by 12 mm ± 3 mm of the reference liquid at a temperature of 22 °C ± 5 °C.

6.1.4 Allow the filter element to remain submerged in the liquid for 5 min before proceeding.

NOTE 1 This arbitrary 5-min soak is to ensure that the filter element is wetted. Soaking may be performed in the tank, not necessarily whilst the filter is clamped in the rotating apparatus.

6.2 Verification of fabrication integrity (absence of air bubbles)

6.2.1 Apply air pressure to the inside of the filter element at the value designated by the filter manufacturer.

After filling the test element with air, re-adjust the depth of liquid covering the element to 12 mm ± 3 mm.

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Dimensions in millimetres

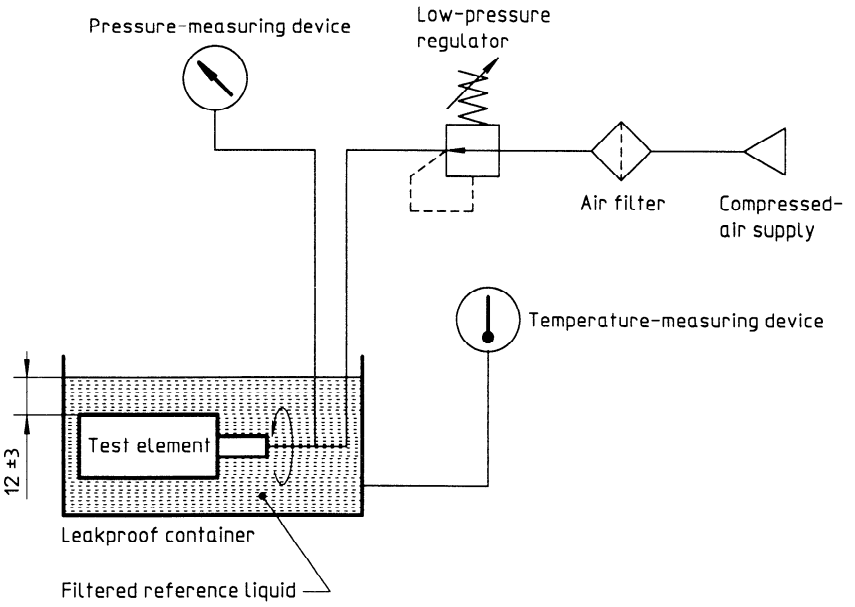

Figure 1 — Typical bubble-point testing apparatus

NOTE 2 Air bubbles may be trapped on or within the outer structure of the filter element, resulting in a few spurious bubbles. These bubbles should be ignored. A steady stream of bubbles at the manufacturer's designated value is the only consideration.

6.2.2 Rotate the filter element through 360° about its major axis while applying the air pressure as indicated in 6.2.1.

6.2.3 The acceptance criterion is that there shall be no evidence of bubbles at the pressure specified by the manufacturer.

6.3 Determination of the first bubble point

6.3.1 Apply air pressure progressively to the inside of the filter element while rotating it about its axis (as indicated in 6.2.2). Increase the pressure by steps of 50 Pa (0,5 mbar) beginning at zero pressure.

Stop the pressure rise as soon as the first bubble point appears as a regular flow. Record the corresponding pressure.

CAUTION — Air bubbles may be trapped on or within the outer structure, resulting in a few spurious bubbles. These bubbles should be ignored. The first bubbles appears in a regular flow as long as internal air pressure is maintained. Adequate lighting is required for reliable observation. Increase air pressure slowly to allow the establishment of equilibrium and to prevent overshooting. Avoid mechanical vibration or jarring of the test element to prevent upsetting bubble equilibrium which causes erroneously low pressure readings.

6.3.2 Completely release the air pressure in the filter element to allow the pores to be flooded with liquid and repeat the procedures given in 6.3.1.

6.3.3 Repeat the operation two more times and record the corresponding pressures.

7 Data presentation

Record the result of the verification of fabrication integrity and the data for the determination of the first bubble point in accordance with the typical test report shown in figure 2.

8 Identification statement (Reference to this International Standard)

Use the following statement in test reports, catalogues and sales literature when electing to comply with this International Standard:

"Filter element fabrication integrity verified and first bubble point determined in accordance with ISO 2942:1994, *Hydraulic fluid power — Filter elements — Verification of fabrication integrity and determination of the first bubble point.*"

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Test report for filter element fabrication integrity and first bubble point

Date: ..... Operator: .....

Reference liquid: ..... Surface tension: .....

Test temperature: ..... °C

Filter element

Manufacturer: .....

Manufacturing No.: .....

Batch No.: .....

Type: .....

Material: .....

Fabrication integrity

Appearance of a regular flow of bubbles: YES ☐ NO ☐

at the pressure of ..... Pa, as specifed by the manufacturer

First bubble point (optional)

Pressure measured when the first bubble appears as a regular flow:

1st reading: ..... Pa

2nd reading: ..... Pa

3rd reading: ..... Pa

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Filter element fabrication integrity verified and first bubble point determined in accordance with ISO 2942:1994, *Hydraulic fluid power — Filter elements — Verification of fabrication integrity and determination of the first bubble point.*

Figure 2 — Typical test report for fabrication integrity and first bubble point

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