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Hydraulic spin-on filters with finite lives — Method for verifying the rated fatigue life and the rated static burst pressure of the pressure-containing envelope

Filtres hydrauliques à visser ayant une durée de vie spécifiée — Méthode de vérification de la durée de vie nominale en fatigue et de la pression statique d'éclatement nominale de l'enveloppe sous pression

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Foreword

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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).

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The committee responsible for this document is ISO/TC 131, *Fluid power systems*, Subcommittee SC 6, *Contamination control.*

Introduction

In hydraulic fluid power systems, power is transmitted and controlled through a liquid under pressure within an enclosed circuit. A basic requirement of hydraulic fluid power components is that they should be capable of adequately containing the pressurized fluid.

The pressure to which an individual component can normally be subjected has a relationship with the rated fatigue pressure and minimum burst pressure. This relationship can be estimated and used as a basis of total life expectancy for the component in an individual application. Such an estimate is applied by the user. Factors such as shock, heat, misuse, etc., are to be judged by the user in each application. Selection of a specific pressure and life expectancy for a component in a particular application can be based upon the rated fatigue pressure and burst pressure as described in Figure 1. This finite life pressure rating test procedure differs from the (NFPA)T2.6.1 R2 infinite life pressure rating document (which is referred to in ISO/TR 10771-2) and can be visualized from the S-N diagram in Figure 1. (NFPA) T2.6.1 R2 is a rating system along the vertical axis, with its fatigue strength distribution and assurance level in the vertical direction at a defined life. The finite life method described in this document is a rating system along the horizontal axis, with its fatigue life distribution and assurance level in the horizontal direction at a defined stress (pressure).

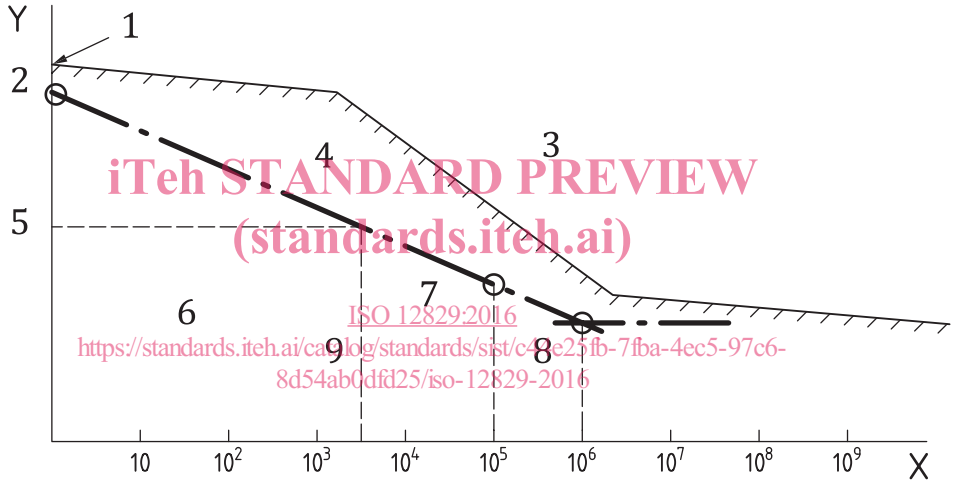

Figure 1 — Possible S-N curve method for estimating finite life rating

Because the service life of the element container for a finite life spin-on hydraulic filter is relatively short, a fatigue life of 100 000 cycles is judged sufficient for common industrial ratings. Ratings at levels other than 100 000 cycles are permitted; this document may be applied for those cases. The method of rating includes both pressure and minimum life. The pressure rating of the filter head or mounting base can be subjected to the full 10^6 fatigue cycles established by (NFPA)T2.6.1 R2.

The spin-on housing, because of its construction, can be tested and evaluated as an elastic body with specific pressure cycle test times and pressure rise rate conditions.

It needs to be noted that this document deals only with verifying the pressure ratings of spin-on filters. Separate from this verification procedure, manufacturers have the continuing responsibility to use managerial controls necessary to test spin-on filters that are representative of production.

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WARNING — The use of this document can involve hazardous materials, operations and equipment. This document does not purport to address all of the safety concerns associated with its use. The user of this document is responsible, prior to its use, to establish appropriate safety and health practices and to determine the applicability of regulatory limitations.

1 Scope

This document specifies methods for verifying the rated fatigue life and the rated static burst pressure of the pressure-containing envelope (i.e. the filter housing) of a spin-on hydraulic filter with a disposable filter element and a finite life.

Because the service life of housings for these types of filters is relatively short, a rated fatigue life of 100 000 cycles is judged sufficient for typical industrial applications.

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 19972-1, *Hydraulic fluid power — Methods to assess the reliability of hydraulic components — Part 1: General procedures and calculation method*

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:

— IEC Electropedia: available at http://www.electropedia.org/

— ISO Online browsing platform: available at http://www.iso.org/obp

3.1
rated fatigue life
N_f
minimum life, expressed in cycles, with a specified assurance level, that a filter housing can sustain at a rated pressure

3.2
rated fatigue pressure
p_{fr}
pressure that a filter housing can sustain for a specific number of cycles without failure

3.3
rated static burst pressure
p_{Br}
pressure that the pressure-containing envelope of a component can sustain without failure

3.4
spin-on filter
filter assembly of which the filter element, housing and means of attaching are unitised into one inseparable part

4 Samples

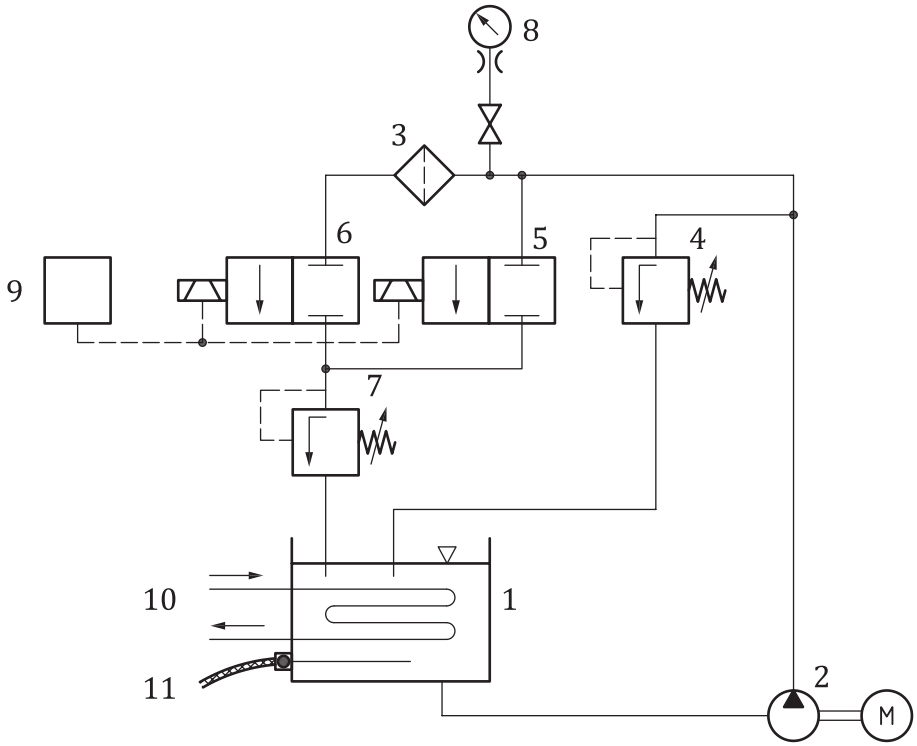
Two samples, each consisting of a minimum of six filters under test that are representative of normal production, shall be prepared. One of these samples shall be subjected to the cyclic endurance test and the other to the burst test.

5 Cyclic endurance test to verify the rated fatigue life at a rated fatigue pressure

5.1 Test equipment

5.1.1 Hydraulic test stand, that is capable of producing repeatable pressure impulses that conform to the requirements of 5.3.4. Figure 2 shows a circuit diagram of a typical test stand that can be used for this procedure.

NOTE The actual cyclic test pressure exceeds the measured test pressure if the frequency response of the measurement system or its components is insufficient to reproduce the actual waveform, thereby penalizing the component under test.



Key

1	reservoir	7	outlet pressure control valve
2	pump	8	pressure gauge
3	filter under test	9	component controls
4	inlet pressure control valve	10	heat exchanger
5	solenoid valve	11	thermostat
6	solenoid valve		

Figure 2 — Circuit diagram of typical test stand

5.1.2 Test liquid, MIF-PRF-5606H or a suitable non-corrosive hydraulic fluid.

5.1.3 Oscilloscope computerized recording system or **light beam recorder with sufficient speed,** to properly record the test waveform.

5.1.4 Pressure-measuring instrument, mounted directly into, or as close as possible to, the filter head or base through a pressurized port that is not being used to supply the test liquid. The pressure-measuring instrument shall not be installed in the line that supplies the test liquid to the test filter and shall be set up and maintained so that pressure measurements are accurate within the limits specified in Table 1. If the test setup allows multiple filters to be tested simultaneously, pressure shall be measured at each filter under test, to ensure that each filter is subjected to the pressure impulsing.

5.1.5 Thermometer, set up and maintained so that the temperature measured is accurate within the limits specified in Table 1.

5.2 Test conditions

5.2.1 Unless otherwise specified, the rated fatigue life for filters tested in accordance with this document is a minimum of 100 000 cycles.