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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 vissés à durée de vie finie — Méthode de vérification de la résistance à la fatigue et de la pression d'éclatement du corps de filtre

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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.

International Standards are drafted in accordance with the rules given in the ISO/IEC Directives, Part 3.

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.

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.

International Standard ISO 12829 was prepared by Technical Committee ISO/TC 131, *Fluid power systems*, Subcommittee SC 6, *Contamination control and fluids*.

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 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 ANSI/(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. ANSI/(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 standard 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).

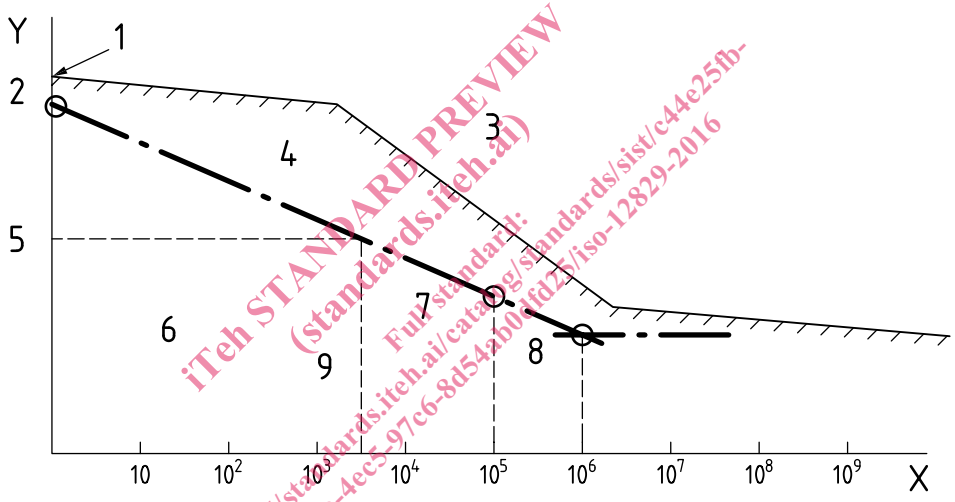


Figure 1 — Possible S-N curve method for estimating finite life rating

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 International Standard 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 ANSI/(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 should be noted that this International Standard 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.

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

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

1 Scope

This International Standard 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 referenced documents are indispensable for the application 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 5598, *Fluid power systems and components — Vocabulary*

ISO 10771-1, *Hydraulic fluid power — Fatigue pressure testing of metal pressure-containing envelopes — Part 1: Test method*

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 International Standard, the terms and definitions given in ISO 5598 and the following apply.

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

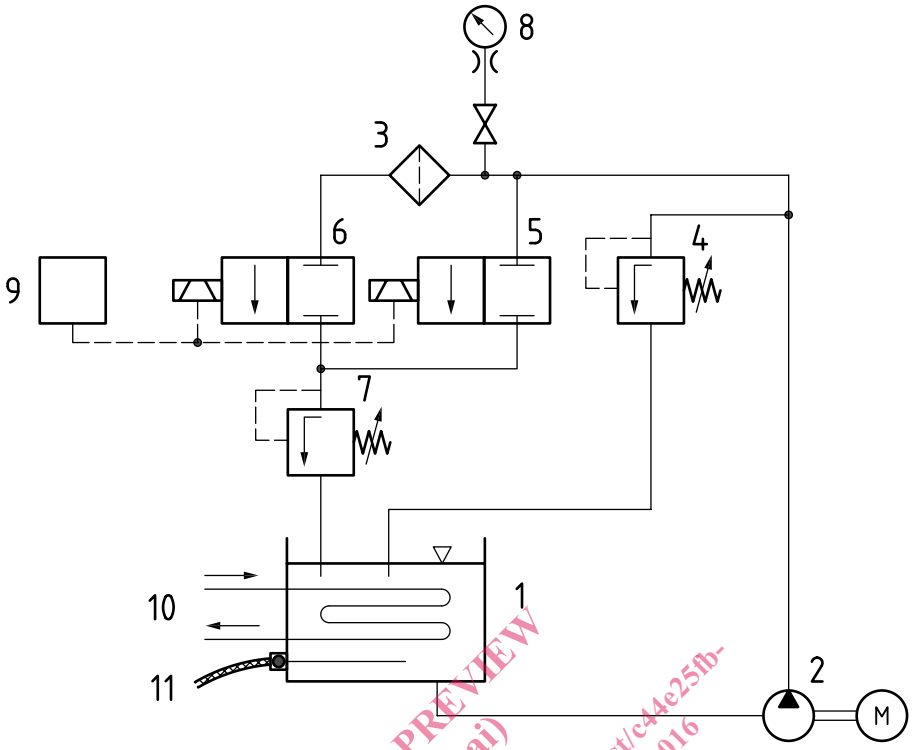
Two samples, each consisting of a minimum of six filters under test that are representative of normal production, shall be prepared. One of these samples shall be subjected to the cyclic endurance test and the other to the burst test.

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, MIL-H-5606 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 International Standard is a minimum of 100 000 cycles.