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Methods of test for full-flow lubricating oil filters for internal combustion engines —

Part 13: Static burst pressure test for composite filter housings

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Méthodes d'essai des filtres à huile de lubrification à passage intégral pour moteurs à combustion interne —

Partie 13: Essai d'éclatement à la pression statique pour les corps de filtre pressurisés à base de matériaux composites

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ISO copyright office
Case postale 56 • CH-1211 Geneva 20
Tel. + 41 22 749 01 11
Fax + 41 22 749 09 47
E-mail copyright@iso.org
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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. www.iso.org/directives

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The committee responsible for this document is ISO/TC 70, *Internal combustion engines*, Subcommittee SC 7, *Tests for lubricating oil filters*.

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ISO 4548 consists of the following parts, under the general title *Methods of test for full-flow lubricating oil filters for internal combustion engines*:

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— *Part 1: Differential pressure/flow characteristics*

— *Part 2: Element by-pass valve characteristics*

— *Part 3: Resistance to high differential pressure and to elevated temperature*

— *Part 4: Initial particle retention efficiency, life and cumulative efficiency (gravimetric method)*

— *Part 5: Cold start simulation and hydraulic pulse durability test*

— *Part 6: Static burst pressure test*

— *Part 7: Vibration fatigue test*

— *Part 8:*[1)] *Inlet anti-drain valve test*

— *Part 9: Inlet and outlet anti-drain valve tests*

— *Part 11:*[2)] *Self-cleaning filters*

— *Part 12: Filtration efficiency using particle counting, and contaminant retention capacity*

— *Part 13: Static burst pressure test for composite filter housings*

The following parts are under preparation:

— *Part 14: Cold start simulation and hydraulic pulse durability for composite filter housings*

— *Part 15: Vibration fatigue test for composite filter housings*

1) Withdrawn.

2) Withdrawn.

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Introduction

ISO 4548 (all parts) establishes standard test procedures for measuring the performance of full-flow lubricating oil filters for internal combustion engines. The series has been prepared in separate parts, each part relating to a particular performance characteristic.

Together the tests provide the information necessary to assess the characteristics of a filter, but if agreed between the purchaser and the manufacturer, the tests can be conducted separately.

This part of ISO 4548 deals with filter modules made of composite materials for internal combustion engines in terms of static burst pressure.

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Methods of test for full-flow lubricating oil filters for internal combustion engines —

Part 13:
Static burst pressure test for composite filter housings

1 Scope

This part of ISO 4548 specifies a method of testing full-flow lubricating oil filters for internal combustion engines to determine their ability to withstand a static pressure objective at high and cold temperatures and to determine their burst pressure and the failure mode.

It applies to all oil filters, for example spin-on ones and filters made of temperature sensitive materials.

It applies to new filters and filters returned from endurance tests.

2 Normative references

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The following documents, in whole or in part, are normatively referenced in this document and are indispensable for its application. For dated references, only the edition cited applies. For undated references, the latest edition of the referenced document (including any amendments) applies.

ISO 4548-1, *Methods of test for full-flow lubricating oil filters for internal combustion engines — Part 1: Differential pressure/flow characteristics*

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3 Terms and definitions

For the purposes of this document, the terms and definitions given in ISO 4548-1 apply.

4 Test rig

The test rig shall include a hydraulic hand pump or other appropriate technology to generate the required pressure, with high pressure tubing and valves, a pressure device located downstream to the filter under test with measuring range of 0 kPa to 3 000 kPa or higher if the specified pressure objective [see 6.1 g)] requires it, and an adaptor to attach the complete filter.

To allow tests at a temperature between −30 °C and +150 °C, an environmental chamber is recommended.

The filter samples will be tested by default at a temperature between −30 °C and +150 °C.

A means of recording pressure or detecting the maximum reached pressure shall be supplied in order to allow the continuous follow up of the pressure and to detect the pressure at which the leak occurs.

The test rig shall be designed such that operators can conduct the test safely.

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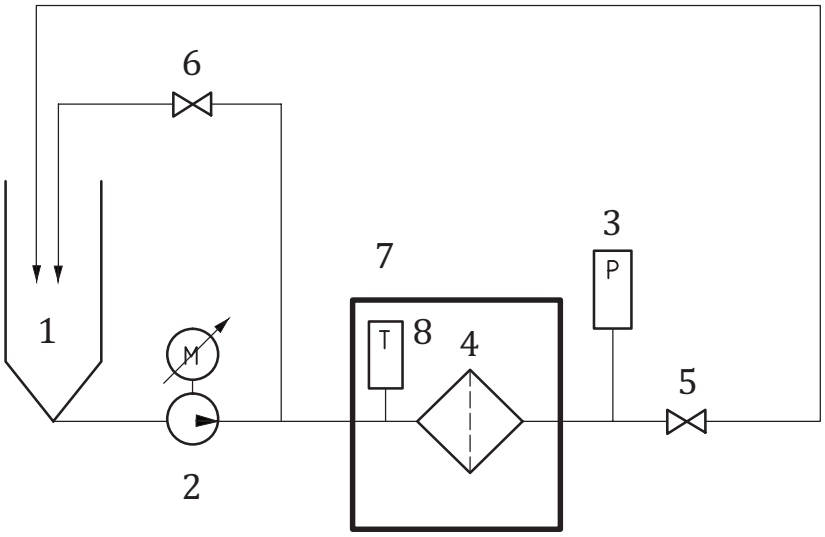

Key

1	oil sump	7	climatic chamber
2	Pump	8	temperature sensor
3	pressure sensor	M	motor
4	filter under test	T	temperature
5	closing valve	P	pressure
6	pressure regulating valve		

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Figure 1 — Hydraulic schematic of the static burst pressure test rig

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Table 1 — Instrument accuracy

Test parameters	Unit	Working range	Measurement accuracy
Temperature	°C	From -30 °C to +150 °C	±3 °C
Pressure	kPa	From 0 kPa to 3 000 kPa[a]	±5 %
[a] To be adapted if higher pressure is required.			

5 Test liquid

The oil shall be functional between −30 °C and +150 °C (or the temperature range agreed by the manufacturer and the purchaser) to avoid its inflammation or its gelling. The viscosity of the oil shall be between 5 mm^2/s and 10 000 mm^2/s in the temperature range.

6 Preparation and test procedure

6.1 Verification that filters meet technical requirements

a) Assemble the complete filter using the recommended tightening torques (relative to the cover, the spin-on samples, etc.). If a tolerance is given, apply the minimum tightening torque. The filter to adaptor connection shall be equivalent to the one on the engine, as agreed between manufacturer and customer.

b) Connect the pump to the inlet of the filter or adaptor, and the outlet of the filter or adaptor to an open valve. The outlet of the valve should be the highest point of the system.

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c) Introduce oil into the system by operating the pump until oil is seen to emerge from the outlet of the valve. This indicates that all the air has been excluded from the system.

d) Close the valve and position the safety shield between observer and filter.

e) Set the fluid temperature in order to have the filter sample temperature at the specified one and then cool or heat the sample (if possible, put the temperature sensor inside the housing or at its surface).

f) As soon as the specified test temperature has been reached and maintained during at least 1 h, raise the pressure gradually to 200 kPa, maintain for more than 1 min, and check the filter and all fittings for leaks.

NOTE If appropriate burst pressure is known, the first pressure increment can be 50 % of the known value. This shortens the test time for high-pressure filters without a loss in data quality.

g) Raise the pressure at a controlled pressure ramp up to approximately 100 kPa per 10 s, maintain for more than 1 min at each increment, and check the filter for leaks. Continue until the specified pressure is reached and maintain for 1 min (unless a failure occurs).

h) Relieve the pressure to 0 kPa. Allow the fluid and environmental chamber temperatures to return to ambient conditions and then measure the remaining tightening torque relative to the cover and the spin-on cartridge. Then unscrew the filter or cap and identify any kind of permanent distortion.

6.2 Determination of the filter failing pressure

a) Apply [6.1 a)] to [6.1 f)] with another filter.

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NOTE If appropriate burst pressure is known, the first pressure increment can be 50 % of the known value. This shortens the test time for high-pressure filters without a loss in data quality.

b) Continue to increase pressure gradually in increments of about 100 kPa for 10 s. Maintain for about 10 s at each increment until failure occurs, i.e. bursting or leaking.

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c) Examine the filter for details of the failure mode.

7 Test report

The test report shall indicate at least the following:

a) a reference to this part of ISO 4548 (i.e. ISO 4548-13);

b) the test establishment;

c) the filter type (manufacturer model no. and batch no.);

d) the date of test;

e) a description of the filter, whether it is new or used (in the latter case, approximate period of service);

f) the torque applied initially [see 6.1 a)];

g) the test temperature;

h) the oil viscosity;

i) the specified pressure objective and whether reached [see 6.1 g)];

j) the remaining tightening torque [see 6.1.h)];

k) any visible permanent distortion [see 6.1 h)];

l) the burst pressure [see 6.2 b)];

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