

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

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

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The UK participation in its preparation was entrusted by Technical Committee MCE/21, Filters for gases and liquids, to Subcommittee MCE/21/5, Filters for lubricating oil, which has the responsibility to:

- aid enquirers to understand the text;
- present to the responsible international/European committee any enquiries on the interpretation, or proposals for change, and keep the UK interests informed;
- monitor related international and European developments and promulgate them in the UK.

A list of organizations represented on this subcommittee can be obtained on request to its secretary.

Cross-references

The British Standards which implement international publications referred to in this document may be found in the BSI Standards Catalogue under the section entitled “International Standards Correspondence Index”, or by using the “Find” facility of the BSI Standards Electronic Catalogue.

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Summary of pages

This document comprises a front cover, an inside front cover, the ISO title page, pages ii to v, a blank page, pages 1 to 26, an inside back cover and a back cover.

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

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

*Méthodes d'essai des filtres à huile de lubrification à plein débit pour les
moteurs à combustion interne —*

*Partie 12: Efficacité de filtration par comptage des particules et capacité de
rétention des contaminants*



Reference number
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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 part of ISO 4548 may be the subject of patent rights. ISO shall not be held responsible for identifying any or all such patent rights.

International Standard ISO 4548-12 was prepared by Technical Committee ISO/TC 70, *Internal combustion engines*, Subcommittee SC 7, *Tests for lubricating oil filters*.

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

- *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 9: Inlet and outlet anti-drain valve tests*
- *Part 10: Life and cumulative efficiency in the presence of water in oil*
- *Part 11: Self-cleaning filters*
- *Part 12: Filtration efficiency using particle counting, and contaminant retention capacity*

Annexes A and C form a normative part of this part of ISO 4548. Annex B is for information only.

Introduction

ISO 4548 establishes standard test procedures for measuring the performance of full-flow lubricating oil filters for internal combustion engines. It 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 may be conducted separately.

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

Part 12:

Filtration efficiency using particle counting, and contaminant retention capacity

1 Scope

This part of ISO 4548 specifies a multi-pass filtration test with continuous contaminant injection and using the on-line particle counting method for evaluating the performance of full-flow lubricating oil filters for internal combustion engines.

The test procedure determines the contaminant capacity of a filter, its particulate removal characteristics and differential pressure.

This test is intended for application to filter elements having a rated flow between 4 l/min and 600 l/min and with an efficiency of less than 99 % at a particle size greater than 10 μm .

NOTE Several test flow loops built into one test rig, or several test rigs, would be required to cover the complete flow range of 4 l/min to 600 l/min.

2 Normative references

The following normative documents contain provisions which, through reference in this text, constitute provisions of this part of ISO 4548. For dated references, subsequent amendments to, or revisions of, any of these publications do not apply. However, parties to agreements based on this part of ISO 4548 are encouraged to investigate the possibility of applying the most recent editions of the normative documents indicated below. For undated references, the latest edition of the normative document referred to applies. Members of ISO and IEC 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 2942:1994, *Hydraulic fluid power — Filter elements — Verification of fabrication integrity and determination of the first bubble point*.

ISO 3968:1981, *Hydraulic fluid power — Filters — Evaluation of pressure drop versus flow characteristics*.

ISO 4021:1992, *Hydraulic fluid power — Particulate contamination analysis — Extraction of fluid samples from lines of an operating system*.

ISO 4405:1991, *Hydraulic fluid power — Fluid contamination — Determination of particulate contamination by the gravimetric method*.

ISO 11171:1999, *Hydraulic fluid power — Calibration of automatic particle counters for liquids*.

ISO 11841-1:—¹⁾, *Road vehicles and internal combustion engines — Filter vocabulary — Part 1: Definitions of filters and filter components*.

ISO 11841-2:—¹⁾, *Road vehicles and internal combustion engines — Filter vocabulary — Part 2: Definitions of characteristics of filters and their components*.

ISO 11943:1999, *Hydraulic fluid power — On-line automatic particle-counting systems for liquids — Methods of calibration and validation*.

ISO 12103-1:1997, *Road vehicles — Test dust for filter evaluation — Part 1: Arizona test dust*.

3 Terms and definitions

For the purposes of this part of ISO 4548, the terms and definitions given in ISO 11841-1 and ISO 11841-2, together with the following, apply.

3.1 multi-pass test

test which requires the recirculation of unfiltered fluid through the filter element

3.2 base upstream gravimetric level

upstream contaminant concentration if no contaminant is recirculated

3.3 filtration efficiency

ability of the filter to retain particles expressed as the percentage of particles of a given size retained by the filter under test

3.4 overall efficiency

efficiency calculated from the average upstream and downstream particle counts

3.5 X % micron²⁾ (μm) rating

particle size, in micrometres, corresponding to an overall efficiency of a given percentage X

4 Symbols

The graphical symbols used in this part of ISO 4548 are in accordance with ISO 1219-1.

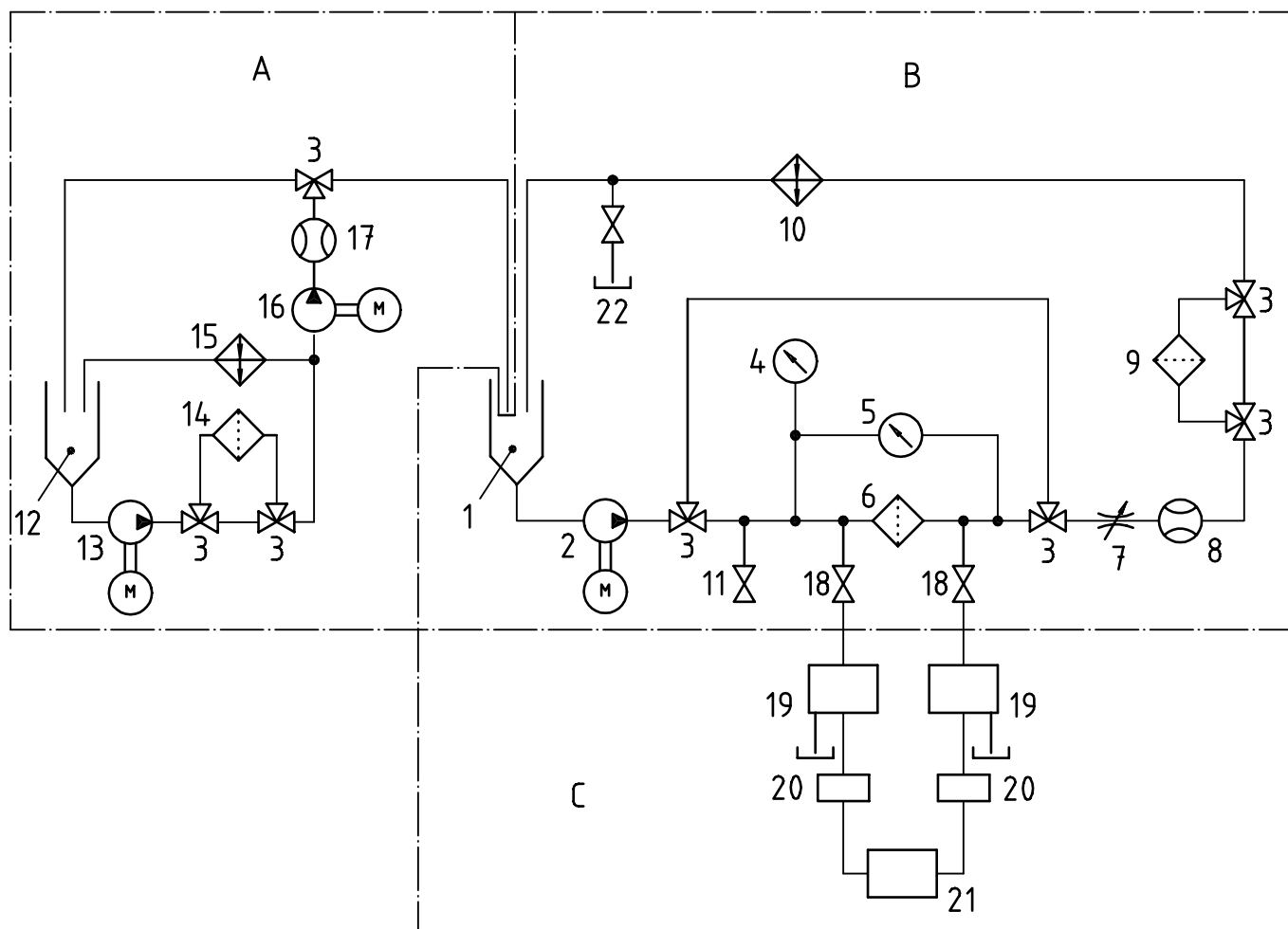
5 Equipment

5.1 Test rig

The test rig shall comprise a filter test circuit and a contaminant injection circuit, as described in 5.1.1 and 5.1.2. See Figure 1.

1) To be published.

2) 1 micron $\equiv$ 1 micrometre.



Key

- | | |
|--|---|
| 1 Reservoir incorporating a thermostatically controlled heater | 12 Reservoir incorporating a thermostatically controlled heater |
| 2 Pump | 13 Pump |
| 3 Three-way valve | 14 Clean-up filter |
| 4 Pressure gauge | 15 Heat exchanger |
| 5 Differential pressure gauge | 16 Injection pump |
| 6 Test filter | 17 Flow meter |
| 7 Throttle valve (for pressure regulation) | 18 Sampling valve |
| 8 Flow meter | 19 Dilution system |
| 9 Clean-up filter | 20 Particle sensor |
| 10 Heat exchanger | 21 Particle counter |
| 11 Sampling valve | 22 Volume control valve |

- A Contaminant injection circuit
 B Filter test circuit
 C Dilution and counting system

Figure 1 — Diagrammatic arrangement of test rig