

Full-flow lubricating oil filters for internal combustion engines —

**Part 4: Methods of test for initial
particle retention efficiency, life and
cumulative efficiency
(gravimetric method)**

ICS 27.020

NO COPYING WITHOUT BSI PERMISSION EXCEPT AS PERMITTED BY COPYRIGHT LAW

BSI
Documents

AVA

Document Sharing Hub

National foreword

This British Standard reproduces verbatim ISO 4548-4:1997 and implements it as the UK national standard. BS 7403-4, together with BS 7403-1, BS 7403-2 and BS 7403-3, supersedes BS 4836:1972 which is withdrawn.

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 or European 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.

A British Standard does not purport to include all the necessary provisions of a contract. Users of British Standards are responsible for their correct application.

Compliance with a British Standard does not of itself confer immunity from legal obligations.

Summary of pages

This document comprises a front cover, an inside front cover, pages i and ii, the ISO title page, pages ii to iv, pages 1 to 18, an inside back cover and a back cover.

This standard has been updated (see copyright date) and may have had amendments incorporated. This will be indicated in the amendment table on the inside front cover.

Amendments issued since publication

Amd. No.	Date	Comments

This British Standard, having been prepared under the direction of the Engineering Sector Board, was published under the authority of the Standards Board and comes into effect on 15 March 1998

© BSI 05-1999

ISBN 0 580 29613 X

Contents

	Page
National foreword	Inside front cover
Foreword	iii
Text of ISO 4548-4	1

INTERNATIONAL STANDARD

ISO
4548-4

First edition
1997-12-01

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

Part 4:

**Initial particle retention efficiency, life and
cumulative efficiency (gravimetric method)**

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

*Partie 4: Efficacité initiale, capacité de rétention et efficacité cumulée
(méthode gravimétrique)*



Contents

	Page
Foreword	iii
Introduction	1
Section 1. General	
1.1 Scope	1
1.2 Normative references	1
1.3 Definitions	1
1.4 Graphical symbols	1
Section 2. Initial particle retention efficiency	
2.1 Operational characteristics to be assessed	2
2.2 Test rig	2
2.3 Test liquids	2
2.4 Test contaminant	2
2.5 Test procedure	4
2.6 Test results and calculations	6
2.7 Report of test results for initial particle retention efficiency	6
Section 3. Life and cumulative efficiency	
3.1 Operational characteristics to be assessed	8
3.2 Test rig	8
3.3 Periodic checks on equipment	8
3.4 Test liquids	8
3.5 Test contaminant	9
3.6 Test procedure	10
3.7 Test results and calculations	12
3.8 Report of test results for life and cumulative efficiency	13
Annex A (normative) Test parameters for initial particle retention efficiency test	14
Annex B (normative) Method for determining insolubles in test liquid samples for initial particle retention efficiency	14
Annex C (normative) Test parameters for life and cumulative efficiency test	16
Annex D (normative) Method for determining insolubles in test liquid samples for cumulative efficiency	17
Annex E (normative) Details of equipment used in the mixing of test dust and liquid slurry	18
Annex F (informative) Bibliography	Inside back cover
Figure 1 — Filter and mounting block in test position	2
Figure 2 — Diagrammatic arrangement of test rig for initial particle retention efficiency test	3
Figure 3 — Details of slurry additional vessel	4
Figure 4 — Typical initial particle retention efficiency curve	7
Figure 5 — Diagrammatic arrangement of test rig for life and cumulative efficiency test	9
Figure 6 — Typical test rig validation graph	12
Figure 7 — Graph of cumulative efficiency against grams of contaminant added	13
Figure B.1 — Typical fixation apparatus — Membrane filter holder assembled on vacuum flask	15
Figure E.1 — Ultrasonic probe dimensions	18
Figure E.2 — Stirrer paddle dimensions	18
Table 1 — Test dust grades	2

Descriptors: Internal combustion engines, lubrication systems, oil filters, tests, performance tests, determination, efficiency.

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.

International Standard ISO 4548-4 was prepared by Technical Committee ISO/TC 70, *International combustion engines*, subcommittee SC 7, *Tests for lubricating oil filters*.

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

- *Part 1: Differential pressure/flow characteristics;*
- *Part 2: Elements by-pass component 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: Particle retention ability and contaminant holding capacity using particle counting.*

Annex A, Annex B, Annex C, Annex D and Annex E form an integral part of this part of ISO 4548. Annex F is for information only.

Section 1. General

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.

1.1 Scope

This part of ISO 4548 specifies tests for determining the performance of full-flow lubricating oil filters for internal combustion engines as follows.

Section 2: Initial particle retention efficiency. This gives the test procedures and parameters for the determination of the initial particle retention efficiency of lubricating oil filter elements under defined test conditions. By reporting the results in accordance with subclause 2.6, the probable retention efficiency for any particle size may be derived. The retention efficiency is determined by the gravimetric method.

Section 3: Life and cumulative efficiency. This gives the test procedures and parameters for the determination of element life and cumulative efficiency of lubricating oil filters. The cumulative efficiency is determined by the gravimetric method.

NOTE By agreement between filter manufacturer and purchaser, tests on large filters can be conducted on the basis of tests carried out on filters scaled-down in length. The relationship of the filter flow and test dust addition rate to the effective length of the filter medium should be the same in the scaled-down tests as in the full size filter. For the purposes of this part of ISO 4548, a filter having a test flow rate exceeding 100 l/min is considered large.

1.2 Normative references

The following standards contain provisions which, through reference in this text, constitute provisions of this part of ISO 4548. At the time of publication, the editions indicated were valid. All standards are subject to revision, and parties to agreements based on this part of ISO 4548 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 4548-1:—, *Methods of test for full-flow lubricating oil filters for internal combustion engines — Part 1: Differential pressure/flow characteristics*¹⁾.

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

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

ISO 12103-1:—, *Road vehicles — Test dust for filter evaluation — Part 1: Arizona test dust*²⁾.

ISO 12103-2:—, *Road vehicles — Test dust for filter evaluation — Part 2: Aluminium oxide test dust*²⁾.

1.3 Definitions

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

1.4 Graphical symbols

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

¹⁾ To be published. (Revision of ISO 4548-1:1982)

²⁾ To be published.