
**Road vehicles — Cleanliness of
components of fluid circuits —**

**Part 7:
Particle sizing and counting by
microscopic analysis**

Véhicules routiers — Propreté des composants des circuits de fluide —

*Partie 7: Détermination et comptage des particules par analyse
microscopique*



PDF disclaimer

This PDF file may contain embedded typefaces. In accordance with Adobe's licensing policy, this file may be printed or viewed but shall not be edited unless the typefaces which are embedded are licensed to and installed on the computer performing the editing. In downloading this file, parties accept therein the responsibility of not infringing Adobe's licensing policy. The ISO Central Secretariat accepts no liability in this area.

Adobe is a trademark of Adobe Systems Incorporated.

Details of the software products used to create this PDF file can be found in the General Info relative to the file; the PDF-creation parameters were optimized for printing. Every care has been taken to ensure that the file is suitable for use by ISO member bodies. In the unlikely event that a problem relating to it is found, please inform the Central Secretariat at the address given below.

This document is a preview generated by EVS



COPYRIGHT PROTECTED DOCUMENT

© ISO 2007

All rights reserved. Unless otherwise specified, no part of this publication may be reproduced or utilized in any form or by any means, electronic or mechanical, including photocopying and microfilm, without permission in writing from either ISO at the address below or ISO's member body in the country of the requester.

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
Web www.iso.org

Published in Switzerland

Contents

Page

Foreword.....	iv
Introduction	v
1 Scope	1
2 Normative references	1
3 Terms and definitions.....	1
4 Principles.....	2
5 Equipment	2
5.1 Equipment for the preparation of membrane filters.....	2
5.2 Analysis equipment.....	3
5.3 Image analysis	7
5.4 Motorized sample stage.....	8
5.5 Multiple image analysis.....	8
5.6 Environmental conditions.....	9
5.7 Health and Safety.....	9
6 Calibration	9
7 Procedure	10
7.1 Cleaning and preparing of equipment.....	10
7.2 Preparation of the membrane filter.....	10
7.3 Particle sizing and counting procedure.....	11
8 Results	12
8.1 Test report	12
8.2 Report the results	12
Annex A (informative) Filtration.....	13
Annex B (informative) Field scanning	14
Annex C (informative) Particle counting on the margin	15
Annex D (informative) Multiple image analysis	18
Annex E (informative) Resolution and calibration of an image analysis system	19
Annex F (informative) Example of a test report	20
Bibliography	22

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 2.

The main task of technical committees is to prepare International Standards. 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.

ISO 16232-7 was prepared by Technical Committee ISO/TC 22, *Road vehicles*, Subcommittee SC 5, *Engine tests*.

ISO 16232 consists of the following parts, under the general title *Road vehicles — Cleanliness of components of fluid circuits*:

- *Part 1: Vocabulary*
- *Part 2: Method of extraction of contaminants by agitation*
- *Part 3: Method of extraction of contaminants by pressure rinsing*
- *Part 4: Method of extraction of contaminants by ultrasonic techniques*
- *Part 5: Method of extraction of contaminants on functional test bench*
- *Part 6: Particle mass determination by gravimetric analysis*
- *Part 7: Particle sizing and counting by microscopic analysis*
- *Part 8: Particle nature determination by microscopic analysis*
- *Part 9: Particle sizing and counting by automatic light extinction particle counter*
- *Part 10: Expression of results*

Introduction

The presence of particulate contamination in a fluid system is acknowledged to be a major factor governing the life and reliability of that system. The presence of particles residual from the manufacturing and assembly processes will cause a substantial increase of the wear rates of the system during the initial run-up and early life, and may even cause catastrophic failures.

In order to achieve reliable performance of components and systems, control over the amount of particles introduced during the build phase is necessary, and measurement of particulate contamination is the basis of control.

The ISO 16232 series has been drafted to fulfil the requirements of the automotive industry, since the function and performance of modern automotive fluid components and systems are sensitive to the presence of a single or a few critically sized particles. Consequently, ISO 16232 requires the analysis of the total volume of extraction liquid and of all contaminants collected using an approved extraction method.

The ISO 16232 series has been based on existing ISO International Standards such as those developed by ISO/TC 131/SC 6. These International Standards have been extended, modified and new ones have been developed to produce a comprehensive suite of International Standards to measure and report the cleanliness levels of parts and components fitted to automotive fluid circuits.

This part of ISO 16232 defines methods of microscopic examination to determine the particle size distribution of contaminants which have been removed from the component under analysis and collected using an approved extraction method.

This document is a preview generated by EVS

Road vehicles — Cleanliness of components of fluid circuits —

Part 7:

Particle sizing and counting by microscopic analysis

1 Scope

This part of ISO 16232 defines methods for determining the size and number of contaminant particles, which have been extracted from components and deposited on the surface of a membrane filter, as determined by using either a light optical microscope (LM) or a scanning electron microscope (SEM). The result of this measurement is the particle size distribution on the membrane filter.

As the function of parts and components can be impaired by the presence of a single or a few critical particles, a complete analysis of the total membrane filter surface is essential.

These analyses can be performed either manually or automatically using Image Analysis (IA) techniques if the appropriate equipment is available.

NOTE 1 Manual full-surface counting is a difficult and tiring task associated with errors. For this reason, an automatic counting system is recommended if the membrane filter is prepared in a suitable way as described herein.

NOTE 2 The results of counting and sizing depend on many parameters, such as type and model of microscope, magnification, illumination, and other settings used.

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 16232-1, *Road vehicles — Cleanliness of components of fluid circuits — Part 1: Vocabulary*

ISO 16232-2, *Road vehicles — Cleanliness of components of fluid circuits — Part 2: Method of extraction of contaminants by agitation*

ISO 16232-3, *Road vehicles — Cleanliness of components of fluid circuits — Part 3: Method of extraction of contaminants by pressure rinsing*

ISO 16232-4, *Road vehicles — Cleanliness of components of fluid circuits — Part 4: Method of extraction of contaminants by ultrasonic techniques*

ISO 16232-5, *Road vehicles — Cleanliness of components of fluid circuits — Part 5: Method of extraction of contaminants on functional test bench*

ISO 16232-10, *Road vehicles — Cleanliness of components of fluid circuits — Part 10: Expression of results*

3 Terms and definitions

For the purposes of this document, the terms and definitions given in ISO 16232-1 apply.