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

**Part 1:
Vocabulary**

Véhicules routiers — Propreté des composants des circuits de fluide —

Partie 1: Vocabulaire

iTeh STANDARD PREVIEW
(standards.iteh.ai)

ISO 16232-1:2007

<https://standards.iteh.ai/catalog/standards/sist/372fbc02-9c32-4b50-84b8-942deeb48714/iso-16232-1-2007>



Reference number
ISO 16232-1:2007(E)

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.

iTeh STANDARD PREVIEW
(standards.iteh.ai)

ISO 16232-1:2007

<https://standards.iteh.ai/catalog/standards/sist/372fbc02-9c32-4b50-84b8-942deeb48714/iso-16232-1-2007>



COPYRIGHT PROTECTED DOCUMENT

© ISO 2007

The reproduction of the terms and definitions contained in this International Standard is permitted in teaching manuals, instruction booklets, technical publications and journals for strictly educational or implementation purposes. The conditions for such reproduction are: that no modifications are made to the terms and definitions; that such reproduction is not permitted for dictionaries or similar publications offered for sale; and that this International Standard is referenced as the source document.

With the sole exceptions noted above, no other 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 Symbols and abbreviations	11

iTeh STANDARD PREVIEW (standards.iteh.ai)

ISO 16232-1:2007

<https://standards.iteh.ai/catalog/standards/sist/372fbc02-9c32-4b50-84b8-942deeb48714/iso-16232-1-2007>

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 16232-1 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 in 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 contaminants 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/TC131/SC6. 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.

iTeh STANDARD PREVIEW
(standards.iteh.ai)

ISO 16232-1:2007

<https://standards.iteh.ai/catalog/standards/sist/372fbc02-9c32-4b50-84b8-942deeb48714/iso-16232-1-2007>

iTeh STANDARD PREVIEW **(standards.iteh.ai)**

ISO 16232-1:2007

<https://standards.iteh.ai/catalog/standards/sist/372fbc02-9c32-4b50-84b8-942deeb48714/iso-16232-1-2007>

Road vehicles — Cleanliness of components of fluid circuits —

Part 1: Vocabulary

1 Scope

This part of ISO 16232 defines the vocabulary used in the characterization and measurement of particulate contamination of parts, components, sub-assemblies and assemblies constituting the fluid circuits of internal combustion engines of road vehicles.

This applies to all components that may come into contact with a liquid (e.g. oil, fuel, air conditioning refrigerant, coolant), a solid lubricant or a gas (intake air).

Unless otherwise specified, this International Standard deals with particulate cleanliness only. It does not therefore cover appearance defects or contamination by liquid or gas materials.

It covers the amount and the nature of residual particulate contaminants resulting from the whole manufacturing processes and from the environment.

NOTE This part of ISO 16232 also covers vocabulary that will not be applied in parts 2 to 10 of ISO 16232. This is in order to complement unified usage of wording in the field of cleanliness of road vehicle components.

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 14644-1:1999, *Cleanrooms and associated controlled environments — Part 1: Classification of air cleanliness*

ISO/TS 16949:2002, *Quality management systems — Particular requirements for the application of ISO 9001:2000 for automotive production and relevant service part organizations*

3 Terms and definitions

For the purposes of this document, the following terms and definitions apply.

3.1

abrasive particle

particle liable to change the surface finish

3.2

active component

component which may set the fluid in motion or be activated by the fluid during operation, for example pump, cylinder, distributor, injector, valve regulator

3.3

agitation

continuous and/or irregular movement of a component

3.4

agglomerate

two or more particles which are in intimate contact and cannot be separated by gentle stirring and the small shear forces thus generated

3.5

ambient contamination

contaminants that are found in the atmosphere surrounding the component

NOTE In an industrial setting, they originate from the atmosphere itself (e.g. atmospheric dust, ventilation), from operators (textile fibres, etc.) from transformation operations (grinding, welding, etc.) or from objects in contact with the component (working surfaces, containers, etc.).

3.6

Automatic Particle Counter

automatic light extinction particle counter

APC

counter that works on the light extinction principle

3.7

back scattered electron detector

BSE detector

supply Scanning Electron Microscope (SEM) images with a high material contrast, used for the detection of particles on a membrane filter

3.8

blank test

analysis carried out with the same operating conditions as on the test component but without the component

NOTE The blank test enables quantification of the contamination brought in from the environment, processes and materials used.

3.9

clean

state of cleanliness of a component or a fluid that meets the specified cleanliness level that is to say with a measured cleanliness level (CLm) lower than or equal to the specified cleanliness level (CLs)

3.10

cleaning

industrial process for the reduction of the quantity of contaminants present in a fluid, in or on a component until the specified cleanliness level (CLs) has been reached

3.11

cleaning curve

progress curve of the cleanliness level of a fluid or component subject to cleaning

NOTE This definition relates to industrial process which can use gas or liquid.

3.12

cleanliness

condition of a product, surface, device, gas, liquid, etc., characterized by the absence of particulate contamination

3.13**cleanliness audit**

methodical and independent examination with the view of determining whether the manufacturing process of a product and all the relevant activities provide the assurance that the cleanliness level shall be effectively obtained and/or maintained

3.14**Component Cleanliness Code****CCC**

alpha-numeric expression of the cleanliness level (CL) of a component measured or specified by the particle size distribution of the contaminants

3.15**cleanliness inspection**

range of operations aimed at bringing as many contaminants as possible from a component to a measuring equipment for their analysis or quantification

NOTE It usually includes three steps: collection/conditioning of the component, extraction and analysis of the contaminants.

3.16**cleanliness inspection equipment**

all equipment and products used to extract, collect and analyse the contaminants in order to determine the cleanliness level

3.17**cleanliness level****CL**

amount and/or nature of contaminant present on the controlled surfaces and/or in controlled volumes of a component

iTeh STANDARD PREVIEW
(standards.iteh.ai)

[ISO 16232-1:2007](https://standards.iteh.ai/catalog/standards/sist/372fbc02-9c32-4b50-84b8-942deeb48714/iso-16232-1-2007)

See Clause 4.

<https://standards.iteh.ai/catalog/standards/sist/372fbc02-9c32-4b50-84b8-942deeb48714/iso-16232-1-2007>

NOTE The term may apply to the presumed, specified or measured extent of contamination.

3.18**cleanliness specification**

document that specifies the cleanliness level required (CLs) for a given component along with the agreed inspection method

3.19**clean room**

room whose ambient particulate contamination level does not have negative effect on the cleanliness measurements

3.20**cleanroom**

room in which the concentration of airborne particles is controlled, and which is constructed and used in a manner to minimize the introduction, generation, and retention of particles inside the room, and in which other relevant parameters e.g. temperature, humidity, and pressure, are controlled as necessary

[ISO 14644-1:1999]

NOTE Used only to show the difference between clean room as defined in 3.19.

3.21**clean sampling container**

sampling device cleaned and conditioned according to an appropriate and validated method

3.22

coincidence

presence of more than one particle in the sensing volume of an APC at the same time

3.23

collection equipment

any device (e.g. conical flask, beaker, tray, funnel, collection area of the spraying chamber) with a size and a shape suited to the collection of all the extraction liquid draining from the test component

3.24

component

general term used to cover a part, a sub-assembly, a part assembly or a system fitted to a road vehicle

3.25

cleaning liquid

liquid compatible with the extraction sample used for conditioning of the analysis equipment and/or monitoring of the blank value of the analysis set-up

3.26

container

any device, the characteristics of which allow the test component to be handled and transported from a location (e.g. the production line) to the test location and/or to handle liquids during the test

3.27

contaminant

undesirable substance which is in suspension in a fluid or in or on a component

NOTE

In ISO 16232, contaminant are particles as defined in 3.56

3.28

contamination

all contaminants in a fluid, system or on a component

[ISO 16232-1:2007](https://standards.iteh.ai/catalog/standards/sist/372fbc02-9c32-4b50-84b8-942deeb48714/iso-16232-1-2007)

<https://standards.iteh.ai/catalog/standards/sist/372fbc02-9c32-4b50-84b8-942deeb48714/iso-16232-1-2007>

3.29

controlled surface area

surface of a component subjected to cleanliness requirement and/or the subject of a cleanliness inspection

NOTE

The controlled surface area may differ from the wetted surface area defined in 3.79.

3.30

controlled volume

volume of a component subjected to a cleanliness requirement and/or the subject of a cleanliness inspection or measurement

NOTE

The controlled volume may differ from the wetted volume defined in 3.80.

3.31

delay time

period of time between two data acquisition intervals during which the APC will not record the particles passing through the sensor

3.32

detachable burr

burr which may become detached in specified conditions

3.33

determination of cleanliness

measurement of the particulate contamination (preferred term: cleanliness inspection)

3.34**dynamic size range**

size range between the smallest detectable particle and the largest detectable particle

3.35**end-point sample**

last sample in a series of repetitive samples producing a result that in less than 10 % of all the samples

3.36**energy dispersive system****EDX system**

X-ray detection system with which energy dispersive X-ray spectra are recorded for element analysis

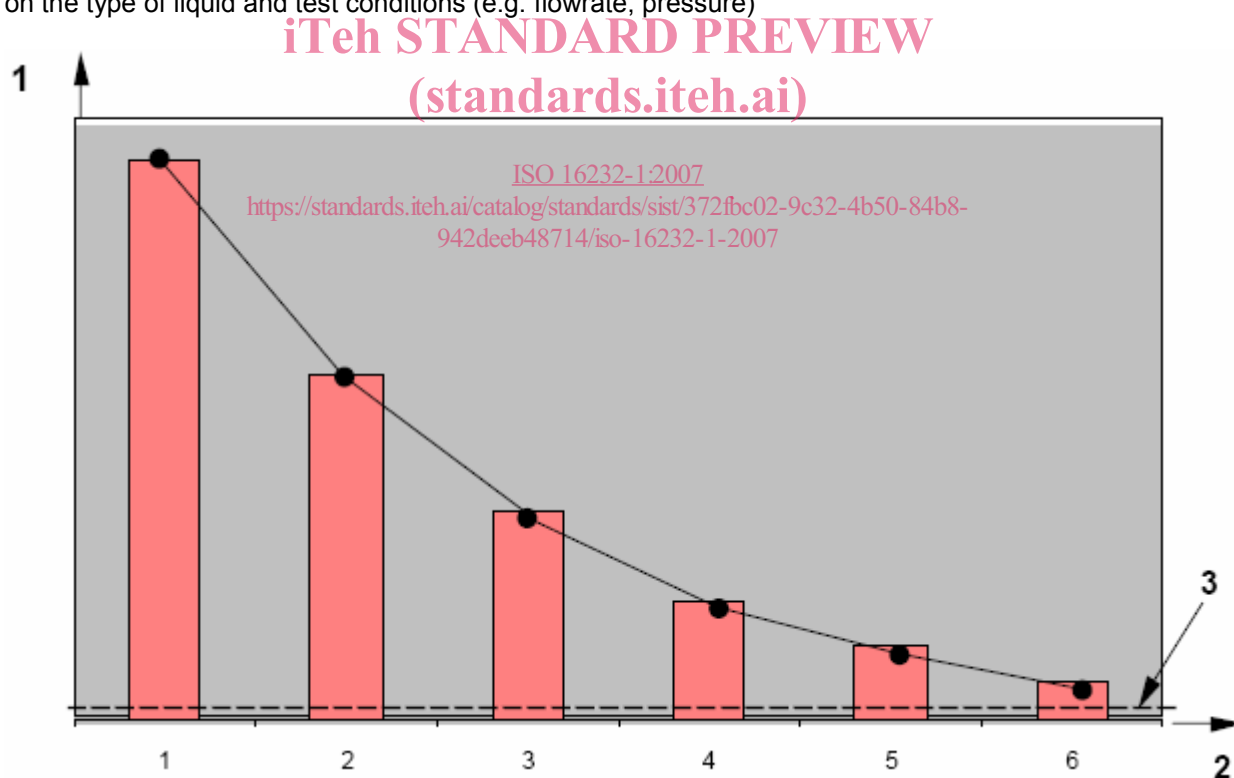
3.37**extraction**

operation required to transfer as many as possible of the contaminants present in a controlled volume or on the controlled surface of a component into a known volume of test liquid for a subsequent analysis

See **extraction liquid** (3.39).

3.38**extraction curve**

progress curve of the cleanliness level of an extraction liquid applied to the test component in relation to extraction time or volume of test liquid passed through or over the test component (see Figure 1), depending on the type of liquid and test conditions (e.g. flowrate, pressure)

**Key**

- 1 measured cleanliness level (CLm)
- 2 extraction samples
- 3 blank level

Figure 1 — Extraction curve