INTERNATIONAL STANDARD

ISO 17536-1

First edition
2015-12-01

Road vehicles — Aerosol separator performance test for internal combustion engines —

Part 1: General

Véhicules routiers — Essai de performance du séparateur d'aérosols pour les moteurs à combustion interne —

Partie 1: Généralités

Reference number
ISO 17536-1:2015(E)

© ISO 2015



COPYRIGHT PROTECTED DOCUMENT

© ISO 2015, Published in Switzerland

All rights reserved. Unless otherwise specified, no part of this publication may be reproduced or utilized otherwise in any form or by any means, electronic or mechanical, including photocopying, or posting on the internet or an intranet, without prior written permission. Permission can be requested from either ISO at the address below or ISO's member body in the country of the requester.

ISO copyright office
Ch. de Blandonnet 8 • CP 401
CH-1214 Vernier, Geneva, Switzerland
Tel. +41 22 749 01 11
Fax +41 22 749 09 47
copyright@iso.org
www.iso.org

Contents

Page

Foreword ... **iv**

Introduction ... **v**

1 Scope ... **1**

2 Terms, definitions, symbols and units ... **1**
2.1 Terms and definitions ... 1
2.2 Symbols and units ... 4

3 Measurement equipment accuracy ... **4**

4 Absolute filter, wall flow trap and leakage ... **5**
4.1 Absolute filter ... 5
4.1.1 Absolute filter material ... 5
4.1.2 Absolute filter mass measurement method ... 5
4.1.3 Absolute media measurement process validation ... 5
4.2 Wall flow trap ... 5
4.2.1 Weight measurement ... 5
4.2.2 Validation of wall flow trap liquid oil efficiency ... 5
4.2.3 Validation of wall flow trap aerosol efficiency ... 6
4.3 Leakage ... 6

5 Principles for aerosol separator performance tests ... **6**
5.1 General ... 6
5.2 Test equipment ... 6
5.2.1 Grounding ... 6
5.2.2 Upstream sample probe ... 7
5.2.3 Upstream particle counter ... 7
5.2.4 Particle counter calibration ... 7
5.2.5 Maximum particle concentration ... 7
5.2.6 Particle counter flow ... 8
5.3 Determination of gravimetric separation efficiency ... 8
5.3.1 General ... 8
5.3.2 Calculations ... 8

Annex A (normative) **Explanation of differential pressure and pressure loss of an aerosol separator** ... **10**

Annex B (normative) **Test equipment** ... **11**

Annex C (informative) **Aerodynamic diameter** ... **13**

Annex D (informative) **Isokinetic sampling probes and information** ... **15**

Annex E (informative) **Life reference** ... **18**

Annex F (normative) **Validation of the absolute filter media** ... **19**

Annex G (normative) **Leakage** ... **20**

Annex H (informative) **Determination of maximum efficiency aerosol concentration** ... **21**

Annex I (informative) **Test equipment — Wall flow trap design** ... **22**

Bibliography ... **23**

© ISO 2015 – All rights reserved

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.

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 (see www.iso.org/directives).

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. Details of any patent rights identified during the development of the document will be in the Introduction and/or on the ISO list of patent declarations received (see www.iso.org/patents).

Any trade name used in this document is information given for the convenience of users and does not constitute an endorsement.

For an explanation on the meaning of ISO specific terms and expressions related to conformity assessment, as well as information about ISO's adherence to the WTO principles in the Technical Barriers to Trade (TBT) see the following URL: Foreword - Supplementary information

The committee responsible for this document is Technical Committee ISO/TC 22, *Road vehicles*, Subcommittee SC 34, *Propulsion, powertrain and powertrain fluids*.

ISO 17536 consists of the following parts, under the general title *Road vehicles — Aerosol separator performance test for internal combustion engines*:

— *Part 1: General*

— *Part 3: Method to perform engine gravimetric test* [Technical Specification]

The following parts are under preparation:

— *Part 2: Laboratory gravimetric test method* [Technical Specification]

— *Part 4: Laboratory fractional test method*

— *Part 5: Method to perform engine fractional test* [Technical Specification]

 © ISO 2015 – All rights reserved

Introduction

Engine crankcase blowby is composed of combustion exhaust gases which have escaped to the crankcase via piston ring seals and lube oil aerosols generated by thermal and mechanical action within the engine. These gases need to be vented from the crankcase to prevent a build-up of high pressure. The constituents of vented engine blowby gases are recognized as an undesirable contaminant and technology for their containment is therefore evolving.

The device used to separate oil aerosols from the blowby typically releases cleaned gases to atmosphere or alternatively returns the cleaned product to the combustion process by feeding into the engine air intake prior to the turbo compressor (if present). The latter has led to the requirement for a pressure control device to isolate the engine crankcase from air intake pressure.

The engine test methods presented in ISO 17536 are general guidelines for performing an engine test.

Annexes A to I specify general and common provisions for aerosol separator performance test.

© ISO 2015 – All rights reserved

Road vehicles — Aerosol separator performance test for internal combustion engines —

Part 1: General

1 Scope

This part of ISO 17536 specifies general conditions, defines terms and establishes the basic principles for blowby oil aerosol separator performance tests by laboratory or engine and gravimetric or fractional test method.

2 Terms, definitions, symbols and units

2.1 Terms and definitions

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

2.1.1
blowby
aerosol produced from engines and released through a crankcase vent

2.1.2
oil carryover
total amount of liquid oil captured in the downstream wall flow trap

2.1.3
filter element
replaceable part of the crankcase system, consisting of the filter material and carrying frame

2.1.4
crankcase ventilation system
device which separates oil and particles from the engine blowby before venting to either the engine (closed crankcase ventilation, CCV) or the environment (open crankcase ventilation, OCV)

2.1.5
differential pressure
difference in static pressure measured immediately upstream and downstream of the unit under test

2.1.6
pressure loss
measure of the loss of aerodynamic energy caused by an aerosol separator at the observed air flow rate due to different flow velocities at the measuring point:

Note 1 to entry: It is expressed as the differential pressure corrected for any difference in the dynamic head at the measuring points

Note 2 to entry: For further information, see Annex A.

2.1.7
wall flow trap
device to capture oil that is flowing along the walls

Note 1 to entry: The wall flow trap design is drawn in Figure I.2.

© ISO 2015 – All rights reserved