
**Inlet air cleaning equipment for
internal combustion engines and
compressors — Performance testing**

*Séparateurs aérauliques placés à l'entrée des moteurs à combustion
interne et des compresseurs — Détermination des performances*



This document is a preview generated by EKO



COPYRIGHT PROTECTED DOCUMENT

© ISO 2020

All rights reserved. Unless otherwise specified, or required in the context of its implementation, 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
CP 401 • Ch. de Blandonnet 8
CH-1214 Vernier, Geneva
Phone: +41 22 749 01 11
Email: copyright@iso.org
Website: www.iso.org

Published in Switzerland

Contents

Page

Foreword	v
1 Scope	1
2 Normative references	1
3 Terms, definitions and symbols	1
3.1 Terms and definitions	1
3.2 Symbols	3
4 Measurement accuracy and standard conditions	4
4.1 Measurement accuracy and precision	4
4.2 Standard conditions	4
5 Test materials and test conditions	4
5.1 Test dust	4
5.1.1 Grade	4
5.1.2 Preparation	4
5.2 Test oil for oil bath air cleaners	5
5.3 Absolute filter materials	5
5.3.1 Filter media	5
5.3.2 Validation of absolute filter media efficiency, E_a	5
5.4 Absolute filter mass	5
5.5 Temperature and humidity	6
6 Test procedure for dry-type air cleaners for automotive applications	6
6.1 General	6
6.2 Test equipment	6
6.3 Restriction and differential pressure test	8
6.4 Efficiency test	8
6.4.1 Purpose	8
6.4.2 Types	8
6.4.3 Test procedure — Absolute filter method	9
6.4.4 Test procedure — Direct weighing method	10
6.5 Capacity test	10
6.6 Filter element pressure collapse test	11
6.7 Variable air flow test	11
6.8 Presentation of data	12
7 Test procedure for dry-type air cleaners for industrial applications	12
7.1 General	12
7.2 Test equipment	12
7.3 Restriction and differential pressure test	13
7.4 Initial efficiency test procedure — Absolute filter method	13
7.5 Full-life efficiency and capacity test	14
7.5.1 Air cleaner dust capacity	14
7.5.2 Test procedure — Absolute filter method	14
7.5.3 Test procedure — Direct weighing method	16
7.6 Presentation of data	16
7.7 Scavenged air cleaner performance test	16
7.7.1 General	16
7.7.2 Additional equipment	17
7.7.3 Restriction and differential pressure test	17
7.7.4 Full-life efficiency and capacity test	17
7.7.5 Presentation of data	18
7.8 Precleaner performance test	18
7.8.1 Precleaner dust removal	18
7.8.2 Precleaner efficiency	19
7.8.3 Presentation of data	19

7.9	Secondary element test procedure.....	19
7.9.1	General.....	19
7.9.2	Specific efficiency test.....	19
7.9.3	Expression of results.....	20
8	Test procedure for industrial applications of oil bath air cleaners.....	20
8.1	General.....	20
8.2	Test equipment and conditions.....	20
8.3	Restriction and differential pressure test.....	21
8.4	Oil carry-over test.....	21
8.5	Full life efficiency and capacity test.....	21
8.6	Recovery test.....	22
8.7	Presentation of data.....	22
Annex A	(normative) Explanation of restriction, differential pressure and pressure loss of an air cleaner.....	23
Annex B	(normative) Test equipment.....	25
Annex C	(informative) Report sheet on performance testing of air cleaner equipment according to ISO 5011 — Automotive application.....	35
Annex D	(informative) Report sheet on performance testing of air cleaner equipment according to ISO 5011 — Industrial application.....	36
Annex E	(informative) Presentation of results — Air cleaner restriction/differential pressure versus flow.....	38
Annex F	(informative) Presentation of results — Air cleaner capacity.....	39
Annex G	(normative) Airflow and resistance corrections to standard conditions.....	40
Annex H	(normative) Penetration sensitivity.....	42
Bibliography	50

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 of the voluntary nature of standards, the meaning of ISO specific terms and expressions related to conformity assessment, as well as information about ISO's adherence to the World Trade Organization (WTO) principles in the Technical Barriers to Trade (TBT) see www.iso.org/iso/foreword.html.

This document was prepared by Technical Committee ISO/TC 22, *Road vehicles*, Subcommittee SC 34, *Propulsion, powertrain and powertrain fluids*.

This fourth edition cancels and replaces the third edition (ISO 5011:2014), which has been technically revised. It also incorporates the Amendment ISO 5011:2014/Amd.1:2018. The main changes compared to the previous edition are as follows:

- added a validation procedure for verifying efficiency measurements;
- revised recommended ISO dust injector table;
- added formula for precleaner efficiency method;
- removed requirement for secondary element collapse test;
- added [Annex H](#) (Penetration sensitivity);
- added a new dust injector.

Any feedback or questions on this document should be directed to the user's national standards body. A complete listing of these bodies can be found at www.iso.org/members.html.

Inlet air cleaning equipment for internal combustion engines and compressors — Performance testing

1 Scope

This document establishes and specifies uniform test procedures, conditions, equipment and a performance report to permit the direct laboratory performance comparison of air cleaners.

The basic performance characteristics of greatest interest are air flow restriction or differential pressure, dust collection efficiency, dust capacity and oil carry-over on oil bath air cleaners. This test code therefore deals with the measurement of these parameters.

This document is applicable to air cleaners used on internal combustion engines and compressors generally used in automotive and industrial applications.

2 Normative references

The following documents are referred to in the text in such a way that some or all of their content constitutes requirements 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 5167-1, *Measurement of fluid flow by means of pressure differential devices inserted in circular cross-section conduits running full — Part 1: General principles and requirements*

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

3 Terms, definitions and symbols

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

ISO and IEC maintain terminological databases for use in standardization at the following addresses:

- ISO Online browsing platform: available at <https://www.iso.org/obp>
- IEC Electropedia: available at <http://www.electropedia.org/>

3.1 Terms and definitions

3.1.1

air filter

air cleaner

device which removes particles suspended in the intake air as it is drawn into the engine

3.1.2

filter element

replaceable part of the *air filter* (3.1.1), consisting of the filter material and carrying frame

3.1.3

secondary element

air cleaner (3.1.1) element fitted downstream of the primary element for the purpose of providing the engine with protection against dust in the event of

- a) certain types of primary element failure, or
- b) dust being present during the removal of the primary element for servicing