
Interior air of road vehicles —

Part 3:

**Screening method for the determination
of the emissions of volatile organic
compounds from vehicle interior parts and
materials — Micro-scale chamber method**

Air intérieur des véhicules routiers —

*Partie 3: Méthode de criblage pour la détermination des émissions de
composés organiques volatils des parties et matériaux intérieurs des
véhicules — Méthode de la micro-chambre*



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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 12219-3 was prepared by Technical Committee ISO/TC 146, *Air quality*, Subcommittee SC 6, *Indoor air*, in collaboration with Technical Committee ISO/TC 22, *Road vehicles*.

ISO 12219 consists of the following parts, under the general title *Interior air of road vehicles*:

- *Part 1: Whole vehicle test chamber — Specification and method for the determination of volatile organic compounds in cabin interiors*
- *Part 2: Screening method for the determination of the emissions of volatile organic compounds from vehicle interior parts and materials — Bag method*
- *Part 3: Screening method for the determination of the emissions of volatile organic compounds from vehicle interior parts and materials — Micro-scale chamber method*
- *Part 4: Screening method for the determination of the emissions of volatile organic compounds from vehicle interior parts and materials — Small chamber method*

The following part is under preparation:

- *Part 5: Screening method for the determination of the emissions of volatile organic compounds from vehicle interior parts and materials — Static chamber method*

Introduction

Volatile organic compounds (VOCs) are widely used in industry and may be emitted by many everyday products and materials. They have attracted attention in recent years because of their impact on indoor air quality. After homes and workplaces, people spend a lot of time in their vehicles. It is important to determine the material emissions of interior parts and to reduce them to an acceptable level, if required. Therefore it is necessary to obtain comprehensive and reliable information about the types of organic compounds in the interior air of vehicles and also their concentrations.

Monitoring emissions from vehicle trim components can be performed in several ways and the approach selected depends upon the desired outcome and the material type. For example, to obtain emissions data from complete assemblies (e.g. a dashboard or seat), it is necessary to employ emissions chambers or bags that have sufficient volume to house the complete assembly (typically $>1 \text{ m}^3$). Such tests may take several hours or even days to perform, depending on specified equilibration times and the requirements of the relevant test protocol.

This part of ISO 12219 outlines a method of measuring the types and levels of VOCs emitted using micro-scale chambers (References [2]–[4]). These allow qualitative and semiquantitative screening of product emissions after only minutes, rather than hours or days, of equilibration. Their capacity is limited so they are best suited to small assemblies or representative samples of homogeneous vehicle interior parts and materials. Multiple test specimens can also be readily evaluated from the same sample if required. Micro-scale chambers can provide an ideal quick screening tool for quality control of production and other in-house tests by manufacturers. They offer a complementary approach to large chamber or sampling bag approaches.

ISO 16000-3, ISO 16000-5,^[5] ISO 16000-6, ISO 16000-9,^[6] ISO 16000-10,^[7] ISO 16000-11,^[8] ISO 16000-24,^[9] ISO 16000-25,^[10] as well as ISO 16017-1^[11] and ISO 16017-2,^[12] also focus on VOC measurements.

Interior air of road vehicles —

Part 3:

Screening method for the determination of the emissions of volatile organic compounds from vehicle interior parts and materials — Micro-scale chamber method

WARNING — It is the responsibility of the user of this part of ISO 12219 to establish appropriate safety and health practices and determine the applicability of regulatory limitations prior to use. National regulations for precautions shall be followed.

1 Scope

This part of ISO 12219 specifies a fast, qualitative and semiquantitative screening method for vapour-phase organic compounds (volatile and some semi-volatile) released from vehicle trim materials under simulated real-use conditions using micro-scale test chambers. This method is intended for evaluating new car interior trim components but can, in principle, also be applied to used car components.

Target analytes include VOCs (conventionally defined as organic compounds in the volatility range of *n*-hexane to *n*-hexadecane) and volatile carbonyl compounds such as formaldehyde. The specified analytical procedure for VOCs is ISO 16000-6 and for formaldehyde and some other light carbonyl compounds is ISO 16000-3.

NOTE 1 Some compounds more volatile than *n*-hexane and less volatile than *n*-hexadecane can also be analysed (for more information, see: ISO 16000-6:2011, Annex D; ISO 16017-1;^[1] and Annex E).

NOTE 2 For dry, homogeneous materials, results from tests of volatile organic emissions carried out using micro-scale chambers on newly manufactured products have been found to correlate well with data obtained using standard (reference) methods and conventional emission test chambers (ISO 12219-4, VDA 276^[1] and ISO 16000-9^[6]) or test cells (ISO 16000-10^[7]). Correlation with emission data obtained using bags (ISO 12219-2) has also been reported. The practice specified in this part of ISO 12219 is therefore complementary to existing standards.

This part of ISO 12219 provides third party test laboratories and manufacturing industry with a cost-effective approach for:

- a) monitoring and screening VOC emissions as part of routine quality control;
- b) monitoring product uniformity or conformity between formal certification tests;
- c) comparing emissions from products within a range (e.g. different colours or patterns);
- d) evaluating prototype, “low-emission” materials or products during development.

NOTE 3 All volatile carbonyl compounds except formaldehyde can be analysed according to ISO 16000-6.

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 12219-1, *Interior air of road vehicles — Part 1: Whole vehicle test chamber — Specification and method for the determination of volatile organic compounds in cabin interiors*

ISO 16000-3:2011, *Indoor air — Part 3: Determination of formaldehyde and other carbonyl compounds — Active sampling method*

ISO 16000-6:2011, *Indoor air — Part 6: Determination of volatile organic compounds in indoor and test chamber air by active sampling on Tenax TA® sorbent, thermal desorption and gas-chromatography using MS or MS–FID*

3 Terms and definitions

For the purposes of this document, the terms and definitions given in ISO 16000-6, ISO 12219-1 and the following apply.

3.1

vehicle trim component

vehicle interior part or material

4 Principle

The principle of the test is to determine the area (or mass) specific emission rate of VOCs emitted from automotive products. The test is performed in a micro-scale test chamber at a constant temperature and flow rate. The surface area (or mass) of the sample in the micro-scale test chamber is constant and, by measuring the mass or vapour-phase concentrations of emitted compounds, the area (or mass) specific emission rates of VOCs from the product under test can be determined at a given time, t (see Clause 10).

The results can be used to assess product performance with respect to emission levels — either by comparison with control levels or by comparing the data with results from other products or batches of product.

5 Apparatus

5.1 General. General specifications and requirements, which apply to all types of micro-scale chambers, are given in 5.1 to 5.5. General micro-scale chamber principles are also summarized in Annex A and specific micro-scale chamber examples are given in Annexes B to D.

The following key micro-scale chamber components are required:

- micro-scale chamber apparatus;
- heating mechanism;
- clean gas supply and optional humidification system,

NOTE Most samples contain sufficient inherent humidity to facilitate formaldehyde screening, according to ISO 16000-3, over the short duration of a micro-scale chamber test. Therefore humidification is normally not required for this screening method.

- appropriate monitoring and control systems (to ensure that the test is carried out according to specified conditions);
- appropriate vapour sampling tubes.

5.2 Micro-scale chamber apparatus construction materials. Micro-scale test chambers range in size from 30 cm³ to 1 l (e.g. 44,5 ml, see Annex B). They are designed to operate at ambient or elevated temperatures and to permit the testing of vapour-phase organic emissions from various types of vehicle interior trim components, construction products, and consumer goods.

The micro-scale chamber apparatus can comprise one or multiple sealable, micro-scale chambers constructed of inert, non-emitting and non-absorbing materials, such as surface-treated (polished) or inert coated stainless steel or deactivated glass or quartz. In all cases, the requirements specified in 5.4 and 5.5 shall be fulfilled.

Any sealing materials e.g. gaskets or O-rings used for sealing the doors or lids of micro-scale chambers, shall be low emitting and low absorbing and shall not contribute significantly to the background vapour concentration. The O-rings or gaskets shall be easily removed to facilitate cleaning or replacement. The micro-scale chambers shall be easily dismantled and removed from any housings to facilitate cleaning as specified in Clause 8.