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Interior air of road vehicles —

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

Air intérieur des véhicules routiers —

Partie 5: Méthode de criblage pour la détermination des émissions de composés organiques volatils des parties et matériaux intérieurs des véhicules — Méthode de la chambre statique

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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.

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).

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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 ISO/TC 146, *Air quality*, Subcommittee SC 6, *Indoor air*.

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: Method for the determination of the emissions of volatile organic compounds from vehicle interior parts and materials — Small chamber method*

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

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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. Therefore there is a need for comprehensive and reliable information about the types of organic compounds in the interior air of vehicles and also their concentrations. As part of measures to achieve acceptable indoor air quality it is important to determine the material emissions of interior parts and to reduce them, if necessary, to an acceptable level.

Measuring VOCs from vehicle interior trim components can be performed in several ways and the approach selected depends upon the desired outcome and the material type. Complete assembly-based measurements[1,5] provide total emission results only, but cannot provide VOCs emission of each constituent component. Rapid screening methods obtain VOCs emission data for cut components.[2,3,6,7] Therefore, VOCs emission data for constituent unit component of car interior trim is required for reducing VOCs level in vehicles.

This part of ISO 12219 outlines a method of measuring the types and levels of chemicals emitted by unit component-based car interior trim using a static chamber method based on the principles of static headspace. Static chamber methods can provide diffusion data from unit components of vehicle interior trim without emission from cutting planes. It can be used to verify the correlation between a material-based method and an assembly-based method. Adjunctively, the static headspace chamber method is simply modified to the dynamic headspace mode to obtain complementary information by connecting of a supply of air for comparison.

Each measurement method such as bag[2] / micro-scale chamber[3] / small-chamber[1] sampling offers a complementary approach.

ISO 16000-3, ISO 16000-5, ISO 16000-6, ISO 16000-9, ISO 16000-10, ISO 16000-11, ISO 16000-24, and ISO 16000-25 also focus on VOC and formaldehyde measurements. ISO 16017-1 and ISO 16017-2 focus on VOC measurements.

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Interior air of road vehicles —

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

1 Scope

This part of ISO 12219 specifies a chamber based, static headspace type method for measuring volatile organic compounds (VOCs), formaldehyde and other carbonyl compounds which may diffuse from vehicle interior unit components into the cabin air. The chamber emission test is intended to provide characteristic emission of unit component to car interior of assembly level emission. It also specifies the emission test chamber, preparation of the test specimen, connection of the vapour sampling devices and test conditions. This method is valid for new car interior unit components intended for vehicles, and can also be used for car interior unit components disassembled from assembly of car interior trim or used cars. A set of multi-unit components could be applicable according to the test purpose.

A dynamic mode operation of emission chamber could be applied if corroborative information of the unit component emission between this method and small chamber method (ISO 12219-4:2013) is desired.

The specified analytical procedure for VOCs (ISO 16000-6) is valid for the determination of VOCs ranging in concentration from sub-$\mu g/m^3$ to several mg/m^3. The method is applicable to the measurement of non-polar and slightly polar VOCs ranging in volatility from n-C_6 to n-C_{16}. Some very volatile compounds (VVOC) and semi-volatile organic compounds (SVOC) can also be analysed (see informative Annex D of ISO 16000-6:2011).

This part of ISO 12219 is complementary to existing standards and provides third party test laboratories and manufacturing industry with an approach for:

— comparing emissions from various unit components (sub-assemblies) with VOC emissions from related complete assemblies measured in other tests,

— evaluating and categorising specific unit components by their VOC emission data,

— comparing and correlating emission from unit components with VOC emission data obtained in other tests for the various materials used to make the unit component,

— evaluating prototype, “low-emission” unit components during development.

NOTE 1 All volatile carbonyls except formaldehyde can be analysed by ISO 16000-6:2011 incorporating informative Annex D.

NOTE 2 The dynamic mode operation is described in the informative Annex D of this part of ISO 12219.

2 Normative references

The following documents, in whole or in part, are normatively referenced in this document and are indispensable for its application. For dated references, only the edition cited applies. For undated references, the latest edition of the referenced document (including any amendments) applies.

ISO 12219-4:2013, *Interior air of road vehicles — Part 4: Method for the determination of the emissions of volatile organic compounds from vehicle interior parts and materials — Small chamber method*

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ISO 16000-3:2011, *Indoor air — Part 3: Determination of formaldehyde and other carbonyl compounds in indoor air and test chamber air — 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 following terms and definitions apply.

3.1
emission test chamber
enclosure ranging in size from 10 l to 500 l excluding buffer bag volume that permits the testing of vapour-phase organic emissions from various types of vehicle interior trim unit components under atmospheric pressure, and which is equipped with mixing fan for homogeneous mixing in the entire chamber and buffer bag

Note 1 to entry: Adapted from ISO 16000-9:2006, definition 3.6.

Note 2 to entry: See Annex A for a description of the test chamber.

Note 3 to entry: The size of the buffer bag connection port shall be large enough for homogeneous mixing between the bag and test chamber.

3.2
buffer bag
low-emitting, impermeable and low-sorption plastic bag having a large enough mouth for proper connection to the test chamber and a capacity higher than the expansion volume that is due to heating of the emission test chamber

3.3
test concentration
concentration of a specific volatile organic compounds, VOC_X, (or group of volatile organic compounds), formaldehyde and other carbonyl compounds collected from an emission test chamber outlet which has been heated for a specified period of time with unit component test sample in it

Note 1 to entry: Adapted from ISO 16000-9:2006, definition 3.7 emission test chamber concentration.

3.4
background concentration
concentration of a specific volatile organic compounds, VOC_X, (or group of volatile organic compounds), formaldehyde and other carbonyl compounds collected from an emission test chamber outlet which has been heated for a specified period of time without any test sample

Note 1 to entry: Adapted from ISO 12219-4:2013, definition 3.6.

3.5
unit component value
total mass of each target compound, (VOC or carbonyl) or TVOC emitted from unit component under the prescribed test conditions

3.6
recovery rate
ratio of the total amount of VOC, formaldehyde and other carbonyl compounds collected from an emission test chamber to the known total amount of VOC, formaldehyde and other carbonyl compounds supplied to the emission test chamber in the same time period[4]

Note 1 to entry: Adapted from ISO 16000-9:2006, definition 3.9, recovery.

Note 2 to entry: The recovery provides information about the performance of the entire method.

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3.7
unit component
basic manufacturing unit of car trim interior part at the part manufacturing factory, and components before assembling the assembly of car interior trim or disassembled components in the assembly of car interior trim

3.8
volatile organic compound
VOC
organic compounds that are emitted from the unit components and all those detected in the chamber air

Note 1 to entry: For a detailed definition see ISO 16000-6.

3.9
total volatile organic compound
TVOC
sum of organic compounds eluting between and including *n*-hexane and *n*-hexadecane

Note 1 to entry: For a detailed definition see ISO 16000-6.

4 Principle

The principle of the test is to assess the emission rate of VOCs and carbonyls from unit components under conditions of fixed temperature and no external air flow. It is a static headspace type method. The sample is incubated in an emission test chamber containing clean air for a selected period at fixed temperature. During the incubation, the air between the chamber inside and buffer bag is mixed thoroughly with a mixing fan. The gas inside the test chamber is then sampled and analysed, after equilibrium has been reached or at time, *t*, to determine the vapour-phase masses/concentrations of VOCs and carbonyls. These data are used to characterize the car trim unit component in terms of their relative emission rates.

5 Instrument and reagent

5.1 General

A test bed to determine VOCs and carbonyls emissions consists of the following required elements:

— a suitable emission test chamber to contain the test specimen of unit component;

— a regulated, pressurized supply of clean air for cleaning and checking airtightness;

— a non-emitting, temperature-controlled incubation chamber;

— low-emitting, low-sorptive plastic buffer bag with large diameter connection port;

— a non-emitting cover of buffer bag connection port;

— flow controlled pumps, to draw the air from the test chamber through the sampling devices;

— an inert, non-emitting flow meter to control the flow of air supplied to the test chamber;

— vapour sampling trains incorporating the sampling devices specified in ISO 16000-6 and ISO 16000-3 and associated analytical apparatus;

— pressure and humidity control and regulation apparatus.

An example of a static test chamber is shown schematically in Annex A.

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