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Interior air of road vehicles —

Part 9: Determination of the emissions of volatile organic compounds from vehicle interior parts — Large bag method

Air intérieur des véhicules routiers —

Partie 9: Détermination des émissions de composés organiques volatils des parties et matériaux intérieurs des véhicules — Méthode du grand sac

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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 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 146, *Air quality*, Subcommittee SC 6, *Indoor air.*

A list of all parts in the ISO 12219 series can be found on the ISO website.

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.

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Introduction

Volatile organic compounds (VOCs) are widely used in industry and can be emitted by many every-day products and materials. They have attracted much attention in recent years because of their impact on cabin 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. Therefore, it is important to get comprehensive and reliable information about the types of organic compounds in the interior air of vehicles and also their concentrations.

This document outlines the sampling bag test method of volatile organic compounds (VOC), formaldehyde and other carbonyl compounds which diffuse from vehicle interior parts into the air inside road vehicles.

Measuring VOC from vehicle interior parts can be performed in several ways and the approach selected depends upon the desired outcome and the material type. For example, to obtain diffusion data from complete assemblies (e.g. instrument panel, seat, etc.), chambers/bags that have sufficient volume to house the complete assembly are employed. Meanwhile, to obtain diffusion data from representative samples of homogeneous vehicle interior materials, micro-scale chamber method can be chosen.

Each measurement method such as bag/micro-scale chamber/small-chamber sampling offers a complementary approach.

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Interior air of road vehicles —

Part 9: Determination of the emissions of volatile organic compounds from vehicle interior parts — Large bag method

1 Scope

This document specifies a large bag sampling method for measuring volatile organic compounds (VOCs), formaldehyde and other carbonyl compounds which are emitted from vehicle interior parts into the air inside road vehicles. This method is intended for evaluation of large new vehicle interior parts, and complete assemblies. This is a screening method to compare similar car components under similar test conditions on a routine basis.

Evaluating VOC emissions of vehicle interior parts is an important aspect of the vehicle indoor air quality.

This document is complementary to existing standards and provides test laboratories and the manufacturing industry with a cost-effective evaluation of vehicle interior parts. This method is only applicable to newly manufactured vehicle parts. This method is applicable to all types of vehicles, and vehicle products which are used as parts in the interior of vehicles.

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 16000-3, *Indoor air — Part 3: Determination of formaldehyde and other carbonyl compounds in indoor air and test chamber air — Active sampling method*

ISO 16000-6, *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.

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
vehicle interior part
part which is used in the interior of a vehicle including related materials such as adhesives and coating materials

[SOURCE: ISO 12219-2:2012, 3.1]

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3.2
sampling bag value
concentration increment of a subject gas component due to the diffusion of VOCs, formaldehyde and other carbonyl compounds from a *vehicle interior part* (3.1), multiplied by the total amount of the gas filled in the sampling bag

[SOURCE: ISO 12219-2:2012, 3.2 modified — "vehicle interior part" replaces "test specimen".]

3.3
volatile organic compound
VOC
organic compound eluting between and including n-hexane and n-hexadecane on a gas chromatographic column specified as a 5 % phenyl 95 % methyl polysiloxane capillary column

3.4
total volatile organic compound
TVOC
sum of volatile organic compounds, sampled on Tenax TA®, which elute between and including n-hexane and n-hexadecane on a non-polar capillary column, detected with a flame ionization detector (TVOC-FID) or mass spectrometric detector (TVOC-MS), and quantified by converting the total area of the chromatogram in that analytical window to a nominal mass using the chromatographic response factor for toluene (toluene equivalents)

[SOURCE: ISO 16000-6:2011, 3.4, modified —Note has been deleted.]

4 Principle

The test method specified in this document describes a procedure for calculating sampling bag values of VOC, formaldehyde and other carbonyl compounds which can diffuse from vehicle interior parts.

Vehicle interior parts put in a sampling bag are heated at a specified temperature, and then a fraction of the gas in the sampling bag is collected to measure the test concentrations. By comparing the test concentrations with the corresponding bag blank concentrations, the sampling bag values of VOC, formaldehyde and other carbonyl compounds diffusing from vehicle interior parts can be calculated (see Clause 10).

The analytical part of the overall measurement procedure is based on the use of sorbent tubes with subsequent thermal desorption and gas chromatographic analysis for VOCs (according to ISO 16000-6) and the use of 2,4-dinitrophenylhydrazine (DNPH) sorbent tubes, followed by high performance liquid chromatography (HPLC) analysis with ultraviolet absorption for the determination of formaldehyde and other carbonyl compounds (according to ISO 16000-3).

The specified analytical procedure is valid for the determination of volatile organic compounds (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}.

The specified analytical procedure for formaldehyde and other carbonyl compounds is valid for the determination of carbonyls within the concentration range of approximately 1 $\mu g/m^3$ to 1 mg/m^3.

5 Apparatus and materials

5.1 General

Test apparatus and materials necessary for determining the sampling bag values of VOC, formaldehyde and other carbonyl compounds diffusing from vehicle interior parts are mainly as follows:

— sampling bag;

— nitrogen gas or air (filling gas);

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