SLOVENSKI STANDARD
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Notranji zrak v cestnih vozilih - 6. del: Metoda za določevanje emisij polhlapnih organskih spojin iz notranjih delov in materialov pri visoki temperaturi - Metoda z majhno komoro

Interior air of road vehicles - Part 6: Method for the determination of the emissions of semi-volatile organic compounds from vehicle interior parts and materials at higher temperature - Small chamber method

Air intérieur des véhicules routiers - Partie 6: Méthode pour la détermination des émissions de composés organiques semi-volatils des parties et matériaux intérieurs des véhicules à des températures élevées - Méthode de la petit chambre

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INTERNATIONAL STANDARD

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Interior air of road vehicles —

Part 6: Method for the determination of the emissions of semi-volatile organic compounds from vehicle interior parts and materials at higher temperature — Small chamber method

Air intérieur des véhicules routiers —

Partie 6: Méthode pour la détermination des émissions de composés organiques semi-volatils des parties et matériaux intérieurs des véhicules à des températures élevées — Méthode de la petit chambre

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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

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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).

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 World Trade Organization (WTO) principles in the Technical Barriers to Trade (TBT) see the following URL: www.iso.org/iso/foreword.html .

The committee responsible for this document is Technical Committee ISO/TC 146, *Air quality*, Subcommittee SC 6, *Indoor air*.

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

Introduction

Volatile and semi-volatile organic compounds (VOCs and SVOCs) are widely used in industry and can 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 emission chambers or bags that have sufficient volume to house the complete assembly (typically ≥ 1 m^3). The performance of such tests may take several hours or even days, depending on specified equilibration times and the requirements of the relevant test protocol.

This document outlines a screening method for measuring the types and levels of VOCs and SVOCs in vehicle trim components under controlled conditions using a small emission test chamber (small chamber). The described screening method can be used to investigate the emissions of car interior trim under conditions of real use where elevated temperatures are prevailing in the cabin of road vehicles. For this purpose, tests are performed at 65 °C and 100 °C. ISO 12219-6 describes requirements for a small chamber and a test protocol. Measurements are carried out according to ISO 16000-6 (VOCs).

The capacity of a small chamber is not limited to small assemblies or representative test specimens of homogeneous car trim materials. Small chambers allow qualitative and quantitative VOC and SVOC emission data to be measured and recorded. The subsequent emission data can be used to develop a correlation between material level methods and the vehicle level method.

This document is based on VDA 276[2] and correlates to ISO 16000-9.

Besides the ISO 12219-series, there are parts of ISO 16000 which deal with the measurements of vapour-phase organic chemicals and vapour-phase chemical emissions:

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

— *Part 5: Sampling strategy for volatile organic compounds (VOCs)*

— *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*

— *Part 9: Determination of the emission of volatile organic compounds from building products and furnishing — Emission test chamber method*

— *Part 10: Determination of the emission of volatile organic compounds from building products and furnishing — Emission test cell metho*d

— *Part 11: Determination of the emission of volatile organic compounds from building products and furnishing — Sampling, storage of samples and preparation of test specimens*

— *Part 24: Performance test for evaluating the reduction of volatile organic compound (except formaldehyde) concentrations by sorptive building materials*

— *Part 25: Determination of the emission of semi-volatile organic compounds for building products — Micro chamber method*

Interior air of road vehicles —

Part 6:
Method for the determination of the emissions of semi-volatile organic compounds from vehicle interior parts and materials at higher temperature — Small chamber method

WARNING — This method is unsuitable for materials that are not stable at 100 °C in air. Application of this document for thermally unstable materials could lead to irreversible contamination of the test equipment.

1 Scope

This document describes a qualitative and quantitative analytical method for vapour-phase organic compounds released from car trim materials under simulated real use conditions, i.e. a vehicle is parked for several hours in direct sunlight. Under these conditions, some interior parts and materials reach higher temperatures than 65 °C (ISO 12219-4), e.g. a dashboard can reach temperatures up to 120 °C. This document can be implemented as an optional addition to ISO 12219-4 so that VOC, volatile carbonyl and SVOC testing can all be completed within one day. This part has been added to gain insight into the emission behaviour and emission potential of selected vehicle interior parts and materials exposed to higher temperatures. (By convention, 100 °C is set as the higher temperature.)

The test is performed in small emission test chambers (small chambers). These small chambers are intended to provide a transfer function for vehicle level emissions. This method is intended for evaluating new car interior trim components but can, in principle, be applied to used car components.

The specified analytical procedure for SVOCs and semi-volatile carbonyls is ISO 16000-6.

This document is complementary to existing standards[1],[2] and provides third party test laboratories and manufacturing industry with an approach for

— identifying the effect of real use conditions on specific VOC and SVOC emissions data,

— comparing emissions from various assemblies with regards to specific VOC and SVOC emissions,

— evaluating and sorting specific assemblies regarding specific VOC and SVOC emissions data,

— providing specific VOC and SVOC emissions data to develop and verify a correlation between component level methods and in vehicle air quality and

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

The method described can be exclusively performed as a high temperature test or it can be performed in combination with the determination of VOCs at 65 °C in one run, which is described in ISO 12219-4.

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 12219-4, *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*

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 12219-4 and the following apply.

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

— ISO Online browsing platform: available at http://www.iso.org/obp

— IEC Electropedia: available at http://www.electropedia.org/

3.1
semi-volatile organic compound
SVOC
organic compound whose boiling point is in the range from (240 °C to 260 °C) to (380 °C to 400 °C)

Note 1 to entry: This classification has been defined by the World Health Organization[3].

Note 2 to entry: Boiling points of some compounds are difficult or impossible to determine because they decompose before they boil at atmospheric pressure. Vapour pressure is another criterion for classification of compound volatility that can be used for classification of organic chemicals. SVOCs have vapour pressures between 10^{-2} mPa and 10 Pa.

[SOURCE: ISO 16000-25:2011, 3.16]

3.2
target semi-volatile organic compound
product-specific semi-volatile organic compound

4 Symbols

Symbol	Meaning	Unit
t	time	[h]
q	area specific air flow rate $q = n/L_A$	[$m^3 \cdot m^{-2} \cdot h^{-1}$]
q_A	emission rate per unit area	[$\mu g \cdot m^{-2} \cdot h^{-1}$]
q_m	emission rate per unit mass	[$\mu g \cdot kg^{-1} \cdot h^{-1}$]
n	air change rate	[h^{-1}]
n_L	specific leak rate	[h^{-1}]
L_A	surface loading of chamber	[$m^2 \cdot m^{-3}$]
V	air flow rate entering the small chamber	[$m^3 \cdot h^{-1}$]

5 Principle

A vehicle interior trim component or material sample, referred to as a test specimen, is inserted into a small chamber (0,5 m^3 to 4,0 m^3) and kept under controlled conditions of temperature, humidity and air change rate (air flow rate). The air inside the chamber is thoroughly mixed at all times so that the concentration of any organic substances emitted by the test specimen is uniform – both within the chamber and in the flow of air exhausting from the chamber.

The air exhausting from the chamber is sampled for semi-volatile organic compounds at selected times. Chemical analysis of these samples allows the chamber air concentration and specific emission rates from the test specimen to be determined.

6 Emission test bed preparation

6.1 General

A test bed to determine gaseous emissions consists of the following functional components/operational elements:

— small chamber;

— air circulation;

— clean air supply;

— temperature, humidity, and flow control and regulation;

— sample line.

General guidelines regarding suitable construction materials and configurations of test apparatus are given below. Recommendations for continuous monitoring of the chamber air for quality assurance purposes are also given in Clause 7.

6.2 Small chamber

6.2.1 General

The small chamber is an airtight container with the volume of 0,5 m^3 to 4,0 m^3. A typical standard small chamber has a volume of 1 m^3 ± 0,05 m^3. The chamber volume shall be specified in the test report. Inside the chamber, there is a device for mixing the air and a stand to guarantee positioning of the component (see 6.2.2) without touching the walls. An inflow pipe and an outlet air pipe shall be provided to adjust the air change (air renewal) or to test the air.

An example of a small chamber in the form of a flow chart is shown in Figure 1.

6.2.2 Materials

General specifications and requirements, which apply to all types of small chambers, are provided below.

The small chamber method requires the following key components.

6.2.2.1 Airtight small chamber apparatus.

6.2.2.2 Appropriate wall surfaces and rack. The wall surfaces of the small chamber and the rack for supporting the test specimen should be made of electropolished high-quality steel. When testing materials or components that are not compatible with hot stainless steel (e.g. test specimens which emit odorous reactive substances such as some sulfur-containing compounds), the chamber shall be constructed of inert materials that don't emit or absorb organic vapours.

6.2.2.3 Heating mechanism and temperature control system.

6.2.2.4 Sampling line, constructed of an inert, non-emitting and non-adsorbing material which is heated, if necessary, to prevent condensation/deposition on the inner walls. The length of the sampling line shall be as short as possible and is restricted to about 3 m. It is strongly recommended to heat up the sampling line to 120 °C to prevent condensation.

6.2.2.5 Clean air supply and humidification system.