

Road vehicles interior parts Measurement methods of diffused volatile organic compounds (VOCs)

1. Scope

This standard specifies the methods of measuring volatile organic compounds (VOCs), formaldehyde and other carbonyl compounds diffused in the air from road vehicles interior parts using various sizes of sampling bags.

2. Normative reference

The following standards, when referred to in this standard, constitute a part of the specifications of this standard. As required, the most recently updated version of the applicable standard (including addenda) shall be applied. The symbol "MOD" indicating the degree of compliance of a normative reference to the corresponding international standard means that it is "modified" based on **ISO/IEC Guide 21-1**.

JIS A1962 Determination of formaldehyde and other carbonyl compounds in indoor air and test chamber air -- Active sampling method

Note:

Corresponding international standard: **ISO 16000-3**, Indoor air -- Part 3: Determination of formaldehyde and other carbonyl compounds in indoor air and test chamber air -- Active sampling Method (MOD)

JIS A1965 Determination of volatile organic compounds in indoor and test chamber air by active sampling on Tenax TA(R) sorbent, thermal desorption and gas chromatography using MS/FID

Note:

Corresponding international standard : **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 (MOD)

JIS A 1966 Indoor air -- Sampling and analysis of volatile organic compounds by sorbent tube/thermal desorption/capillary gas chromatography -- Pumped sampling

Note:

Corresponding international standard : **ISO 16017-1**, Indoor, ambient and workplace air -- Sampling and analysis of volatile organic compounds by sorbent tube/thermal desorption/capillary gas chromatography - Part1: Pumped sampling (MOD)

3. Definitions

Definitions of main terms used in this standard shall be as follows.

3.1 Vehicle interior parts

Parts used in the passenger compartment of a vehicle.

3.2 Test onset

At the moment when the sampling bag is put in a thermostatic oven

3.3 Sampling bag

A plastic bag with a capacity of 20 to 2000 L used to measure VOCs, formaldehyde and other carbonyl compounds diffused from vehicle interior parts.

3.4 Test concentration

Concentrations of specified VOCs, formaldehyde and other carbonyl compounds that are measured by sampling the gas from inside a sampling bag heated for a certain time with a vehicle interior part put in.

3.5 Blank concentration

Concentration of specified VOCs, formaldehyde or other carbonyl compounds that is measured by sampling the gas from inside a sampling bag heated for a certain time with no vehicle interior part put in.

3.6 Recovery rate

Value determined by dividing the total amount of VOCs, formaldehyde or other carbonyl compounds sampled from a sampling bag by the total amount of the known target VOCs, formaldehyde and other carbonyl compounds that have been supplied in the sampling bag.

3.7 Sampling bag value

Value determined by multiplying the concentration of target substance in a sampling bag that has increased due to VOCs, formaldehyde and other carbonyl compounds diffused from a vehicle interior part by the amount of gas filled in the sampling bag.

3.8 Volatile organic compound (VOC)

Organic compounds except formaldehyde and other carbonyl compounds that are diffused from a vehicle interior part and detected from the sampling bag.

3.9 Total volatile organic compound (TVOC)

VOCs detected in a range from n-hexane to n-hexadecane analysed by gas chromatograph. In this standard, it indicates the sum of peak areas expressed in terms of toluene.

3.10 Formaldehyde and other carbonyl compound

Formaldehyde and other carbonyl compounds that are diffused from a vehicle interior part and detected from a sampling bag.

4. Principle

This test is a method to calculate the sampling bag value of VOCs, formaldehyde and other carbonyl compounds diffused from a vehicle interior part to be tested.

A vehicle interior part is put in a sampling bag and heated at a certain temperature and the test concentration and blank concentration are measured by sampling the gases inside the sampling bag. Then, with the known concentrations, the sampling bag values of VOCs, formaldehyde and other carbonyl compounds diffused from the vehicle interior part are calculated (refer to **10**).

The VOCs components applicable to this standard are decided by the delivery/acceptance parties before the test. The components defined in such a manner are collectively called applicable volatile organic compounds (or applicable VOCs).

Note:

Examples of applicable VOCs are indicated below.

Example: Benzene, toluene, xylene, ethylbenzene, styrene and p-dichlorobenzene, formaldehyde and acetaldehyde

5. Instruments and gases

5.1 General

The instruments and gases required to calculate the sampling bag values of VOCs, formaldehyde and other carbonyl compounds diffused from a vehicle interior part are mainly as follows.

- Sampling bag
- Nitrogen gas or air - thermostatic oven
- Pumps
- Integrating flowmeter
- Analyser
- Sampling tube (sorbent tube and DNPH cartridge)

5.2 Sampling bag

5.2.1 General

The general specifications and requirements applied to the sampling bags referred to herein are specified in **5.2.2, 5.2.3, 5.2.4** and **7.2**.

5.2.2 Material/capacity

Though no specification is set for the material of a sampling bag, the recommended materials are fluorinated resin [vinyl fluoride (PVF), polyvinylidene fluoride (PVDF), 4 ethylene fluoride - 6 propylene fluoride copolymer (FEP)], polyethylene terephthalate (PET), ethylene-vinyl alcohol copolymer (EVOH), etc. The capacity shall be 20 L to 2000 L.

5.2.3 Airtightness

The sampling bag must be sealed airtight using a sealing material such as a tape that will not affect the diffusion test or by the heat seal method so that the gases inside are not mixed with any outside air not controlled.

5.2.4 Blank concentration

The blank concentration generated by heating the sampling bag shall be at such a low level as to not affect the diffusion test. For example, VOCs shall be 20 ng or less for each sampling tube and formaldehyde and other carbonyl compounds shall be 200 ng or less for each sampling tube.

5.3 Nitrogen gas or air

For the nitrogen gas or air filled in a sampling bag, use a high purity gas (99.999 % or more) containing as less impurities as possible (total hydrocarbon (THC) is less than 0.5 ppm) so that the concentration of any contained VOCs, formaldehyde and other carbonyl compounds will not affect the diffusion test.

5.4 Thermostatic oven

To control the temperature, use a thermostatic oven capable of uniform temperature control.

The thermostatic oven into which a sampling bag is set shall be capable of controlling the temperature to a specified level with an error of $\pm 2^{\circ}\text{C}$ at maximum.

5.5 Pump

Use a vacuum pump or equipment that can discharge the gas sufficiently from a sampling bag.

5.6 Integrating flowmeter

Use an integrating flowmeter to measure the amount of sampled gas.

Note:

A device with performance equivalent to or greater than an integrating flowmeter may be used.

5.7 Analyser

Use a gas chromatograph with flame ionization detector (GC/FID) or gas chromatograph with mass spectrometer (GC/MS) to analyse VOCs. Use a high performance liquid chromatograph (HPLC) to analyse formaldehyde and other carbonyl compounds.

Note:

Recommendable analysers are specified in **JIS A1962**, **JIS A1965** and **JIS A1966**. Another device may be used if the performance is equivalent or greater.

5.8 Sampling tube

Use a sampling tube such as Tenax TA[®], Tenax-GR[®] to sample/analyse VOCs. Use a DNPH cartridge to sample/analyse formaldehyde and other carbonyl compounds.

Note:

Recommendable sampling tubes are specified in **JIS A1962**, **JIS A1965** and **JIS A1966**.

6. Test conditions

6.1 General

The test conditions are specified in 6.2 to 6.6. Any change to the conditions shall be reported in any event. Besides, the test room shall be ventilated sufficiently so that no background influence appears.

6.2 Size of vehicle interior part

The vehicle interior part to be tested shall be a part actually installed in a vehicle. If the part is cut or processed before the test, it shall be indicated as a report item.

6.3 Storage period and condition of vehicle interior part

The vehicle interior parts must be stored one by one in an appropriate package so that they are not contaminated with chemicals and affected by heat, humidity, or other condition. The storage period of a vehicle interior part shall not exceed 2 weeks after it is manufactured.

The storage period and condition of each vehicle interior part is a report item, which is also applied when the period and condition are agreed between the delivery/acceptance parties. The details on the sampling and storage of a vehicle interior part are described in **Annex A**.

6.4 Heating temperature

The temperature of sampling bag heating shall be $65\pm 2^{\circ}\text{C}$.

Note:

A different heating temperature may be agreed between the delivery/acceptance parties.

6.5 Heating time

The time of sampling bag heating shall be 2 ± 0.5 h.

Note:

A different heating time may be agreed between the delivery/acceptance parties.

6.6 Gas charge amount

The amount of nitrogen gas or air to be filled in a sampling bag shall be 50 % of the bag size.

Note:

A different gas charge amount may be agreed between the delivery/acceptance parties.

7. Verification of test conditions

7.1 Monitoring of test conditions

Monitor and record the heating temperature. The temperature accuracy of the measurement instrument shall be within $\pm 2^{\circ}\text{C}$ of the specified temperature.

7.2 Recovery rate

Use a standard gas and others containing the applicable component to measure the recovery rate of applicable VOCs, formaldehyde or other carbonyl compounds. The sampling bag shall be able to achieve an average recovery rate of 70 % or more for the applicable VOCs or 60 % or more for formaldehyde or other carbonyl compounds.