SLOVENSKI STANDARD
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Notranji zrak - 37. del: Določevanje masne koncentracije frakcije delcev PM2,5

Indoor air - Part 37: Measurement of PM2,5 mass concentration

Air intérieur - Partie 37: Mesure de la concentration massique en PM2,5

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Indoor air —

Part 37: Measurement of $PM_{2.5}$ mass concentration

Air intérieur —

Partie 37: Mesure de la concentration massique en PM 2,5

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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 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 the following URL: 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 16000 series can be found on the ISO website.

Introduction

Airborne particulate matter (colloquially known as 'fine dust') plays a role not only outdoors, but is also significant in terms of hygiene, especially indoors. People in industrialized countries spend most of the day indoors. Either particles are transported into indoor air from outdoor environments or the particles directly result from indoor sources like smoking, residential wood burning, cooking etc.

$PM_{2,5}$ concentration and composition in indoor environments strongly depend on parameters such as the room size, relative humidity, air exchange rate, airflow conditions, and sink effects on surfaces (e.g. walls, ceilings, floor coverings, furnishings). In addition, particles already sedimented are temporarily resuspended to the air through various activities, and can be inhaled. All this can result in highly variable levels of indoor $PM_{2,5}$ pollution that are not easily ascertained or assessed in terms of their impacts on health.

This International standard document describes the general strategies for the measurement of indoor $PM_{2,5}$ concentration.

This document was prepared in response to the need for improved comparability of methods for particle measurement.

Indoor air —

Part 37:
Measurement of $PM_{2.5}$ mass concentration

1 Scope

This part of ISO 16000 specifies the measurement methods and strategies for determining the $PM_{2,5}$ mass concentrations of suspended particulate matter in indoor air. This standard can also be used for determining PM_{10} mass concentration.

The reference method principle consists in collecting $PM_{2,5}$ on a filter after separation of the particles by an impaction head and weighing them by means of a balance.

Measurement procedure and main requirements are similar to the conditions specified in EN 12341.

This International Standard also gives procedures for operating appropriate supplementary high time resolution instruments, which can be used to highlight peak emission, room investigation and as part of the quality control of the reference method.

Quality insurance, determination of the measurement uncertainty and minimal reporting information are also part of this standard.

The lower range of application of this International Standard is 2 $\mu g/m^3$ of $PM_{2,5}$ (i.e. the limit of detection of the standard measurement method expressed as its uncertainty).

This International Standard does not cover the determination of bioaerosols or the chemical characterisation of particles. For the measurement and assessment of dust composition, see the relevant technical rules in the International Standards in the ISO 16000 series.

This International Standard does not cover passenger compartments of vehicles and public transport systems.

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 16000-1, *Indoor air — Part 1: General aspects of sampling strategy*

ISO 16000-34, *Indoor air — Part 34: General strategies for the measurement of airborne particles*

EN 12341, *Ambient air — Standard gravimetric measurement method for the determination of the PM_{10} or $PM_{2,5}$ mass concentration of suspensed particulate matter*

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:

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

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

3.1
Aerodynamic diameter
Diameter of a sphere of density 1 g cm^{-3} and the same setting velocity in still air as the particle of interest under prevailing conditions of temperature, pressure and relative humidity

[SOURCE: ISO 7708;1995, 2.2]

Note 1 to entry: The aerodynamic diameter is calculated using the formula:

$$D_a = D_p \sqrt{\frac{1}{\chi}} \sqrt{\frac{\rho_p}{\rho_0}} \quad (1)$$

where

D_a s the aerodynamic diameter;

D_p s the particle diameter;

ρ_p s the density of the particle;

ρ_0 s the standard density;

χ is the form factor.

Note 2 to entry: The form factor describes by how much the resisting force of an irregular shaped particle is greater than that of a sphere with the same volume[8].

Note 3 to entry: The aerodynamic diameter determines the sedimentation and the separation properties of particles in impactors. It is also of particular importance for penetrative behaviour and the retention of particles in the human body.

Note 4 to entry: Various definitions are used for the particle diameter, depending on the measurement method. These different diameters are only indirectly comparable since different particle properties are being measured, e.g. geometric diameter, diameter according to dielectric mobility, diameter according to light scattering properties.

3.2
aerosol
suspension of solid and/or liquid particles in a gas

[SOURCE: ISO 29464:2017, 3.2.1]

3.3
mass concentration *c*
ration of the mass *m* of the measured component and the gas volume *V*

$$c = \frac{m}{V} \quad (2)$$

[SOURCE: EN 15259]

3.4
particle
small discrete mass or solid or liquid matter

[SOURCE: ISO 29464:2017, 3.2.111]

3.5
PM_x
particulate matter suspended in air which is small enough to pass through a size-selective inlet with a 50 % efficiency cut-off at x µm aerodynamic diameter

[SOURCE: EN 12341]

3.6
cut-off-diameter
aerodynamic diameter at which the impactor stage has a separation efficiency of 50 %

[SOURCE: ISO 23210:2009, 3.1.2]

3.7
calibration
operation that, under specified conditions, in a first step, establishes a relation between the quantity values with measurement uncertainties provided by measurement standards and corresponding indications with associated measurement uncertainties and, in a second step, uses this information to establish a relation for obtaining a measurement result from an indication

[SOURCE: JCGM 200]

3.8
uncertainty (of measurement)
parameter associated with the result of a measurement that characterizes the dispersion of the values that could reasonably be attributed to the measurand

[SOURCE: JCGM 100]

3.9
standard uncertainty
uncertainty of the result of a measurement expressed as a standard deviation

[SOURCE: JCGM 100]

3.10
coverage factor
numerical factor used as a multiplier of the combined standard uncertainty in order to obtain an expanded uncertainty

[SOURCE: JCGM 100]

3.11
expanded uncertainty
quantity defining an interval about the result of a measurement that may be expected to encompass a large fraction of the distribution of values that could reasonably be attributed to the measurand

Note 1 to entry: The fraction may be viewed as the coverage probability or level of confidence of the interval.

Note 2 to entry: To associate a specific level of confidence with the interval defined by the expand uncertainty requires explicit or implicit assumptions regarding the probability distribution characterized by the measurement result and its combined standard uncertainty. The level of confidence that may be attributed to this interval can be known only to the extent to which such assumptions may be adjusted.

[SOURCE: JCGM 100]