

Workplace exposure - Assessment of sampler performance for measurement of airborne particle concentrations - Part 5: Aerosol sampler performance test and sampler comparison carried out at workplaces

EESTI STANDARDI EESSÕNA

NATIONAL FOREWORD

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English Version

Workplace exposure - Assessment of sampler performance for
measurement of airborne particle concentrations - Part 5:
Aerosol sampler performance test and sampler comparison
carried out at workplaces

Exposition sur les lieux de travail - Évaluation des
performances des dispositifs de prélèvement pour le
mesurage des concentrations de particules en suspension
dans l'air - Partie 5: Essais de performances des
échantillonneurs d'aérosols, réalisés sur les lieux de travail

Exposition am Arbeitsplatz - Beurteilung der
Leistungsfähigkeit von Sammlern für die Messung der
Konzentration luftgetragener Partikel - Teil 5: An
Arbeitsplätzen durchgeführte Prüfung der Leistungsfähigkeit
des Aerosolsammlers und Sammlervergleich

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COMITÉ EUROPÉEN DE NORMALISATION
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Foreword

This document (EN 13205-5:2014) has been prepared by Technical Committee CEN/TC 137 "Assessment of workplace exposure to chemical and biological agents", the secretariat of which is held by DIN.

This European Standard shall be given the status of a national standard, either by publication of an identical text or by endorsement, at the latest by December 2014 and conflicting national standards shall be withdrawn at the latest by December 2014.

Attention is drawn to the possibility that some of the elements of this document may be the subject of patent rights. CEN [and/or CENELEC] shall not be held responsible for identifying any or all such patent rights.

This document together with EN 13205-1, EN 13205-2, CEN/TR 13205-3, EN 13205-4 and EN 13205-6 supersedes EN 13205:2001.

EN 13205, *Workplace exposure — Assessment of sampler performance for measurement of airborne particle concentrations*, consists of the following parts:

- *Part 1: General requirements;*
- *Part 2: Laboratory performance test based on determination of sampling efficiency;*
- *Part 3: Analysis of sampling efficiency data [Technical Report];*
- *Part 4: Laboratory performance test based on comparison of concentrations;*
- *Part 5: Aerosol sampler performance test and sampler comparison carried out at workplaces (the present document);*
- *Part 6: Transport and handling tests.*

Significant technical changes from the previous edition, EN 13205:2001:

- This part of EN 13205 is partly based on Annex C of the previous edition, EN 13205:2001.
- The scope has been limited to aerosol samplers, and the current version of the standard is not (directly) applicable to other types of aerosol instruments.
- As this is now a standard in its own right, a clause on used symbols has been added. Almost all definitions are now given either in EN 1540, *Workplace exposure — Terminology* or in Part 1 of this standard.
- The method of calculating the uncertainty of a sampler or a measuring procedure has been revised in order to comply with ENV 13005. The concept of "accuracy" is no longer used, instead the concept of "expanded uncertainty" is used.
- The main part of the standard states how to determine the performance of an aerosol sampler at a specific workplace. This is an adaption of the laboratory method given in Part 2.
- The standard gives a method on how to determine the dependence of the sampling efficiency on the collected mass or internally separated mass.

The five major sources of uncertainty due to aspects of the sampling performance of an aerosol sampler (calibration of sampler test system, estimation of sampled concentration, bias relative to the sampling

convention, individual sampler variability and excursion from nominal flow rate) are described with formulae on how to incorporate these uncertainties into the expanded uncertainty of a sampler.

According to the CEN-CENELEC Internal Regulations, the national standards organizations of the following countries are bound to implement this European Standard: Austria, Belgium, Bulgaria, Croatia, Cyprus, Czech Republic, Denmark, Estonia, Finland, Former Yugoslav Republic of Macedonia, France, Germany, Greece, Hungary, Iceland, Ireland, Italy, Latvia, Lithuania, Luxembourg, Malta, Netherlands, Norway, Poland, Portugal, Romania, Slovakia, Slovenia, Spain, Sweden, Switzerland, Turkey and the United Kingdom.

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Introduction

EN 481 defines sampling conventions for the particle size fractions to be collected from workplace atmospheres in order to assess their impact on human health. Conventions are defined for the inhalable, thoracic and respirable aerosol fractions. These conventions represent target specifications for aerosol samplers, giving the ideal sampling efficiency as a function of particle aerodynamic diameter.

In general, the sampling efficiency of real aerosol samplers will deviate from the target specification, and the aerosol mass collected will therefore differ from that which an ideal sampler would collect. In addition, the behaviour of real samplers is influenced by many factors such as external wind speed. In many cases there is an interaction between the influence factors and fraction of the airborne particle size distribution of the environment in which the sampler is used.

The workplace performance test for samplers for the inhalable, thoracic or respirable aerosol fractions described in this document is based on a comparison of concentrations sampled from a specific workplace (under otherwise identical conditions) by a candidate sampler and a (previously) validated sampler. Additionally, a method is described for determining a correction factor for recalculation of the concentration determined with one sampler into that of the other at specific workplaces.

This method is intended for the user, rather than the manufacturer, of aerosol samplers.

EN 13205 (all parts) enables manufacturers and users of aerosol samplers to adopt a consistent approach to sampler validation, and provide a framework for the assessment of sampler performance with respect to EN 481 and EN 482.

It is the responsibility of the manufacturer of aerosol samplers to inform the user of the sampler performance under the laboratory conditions¹⁾ specified in EN 13205-1. It is the responsibility of the user to ensure that the actual conditions of intended use are within what the manufacturer specifies as acceptable conditions according to the performance test.

1) The inhalable convention is undefined for particle sizes in excess of 100 μm or for wind speeds greater than 4 m/s. The tests required to assess performance are therefore limited to these conditions. Should such large particle sizes or wind speeds actually exist at the time of sampling, it is possible that different samplers meeting this part of EN 13205 give different results.

1 Scope

This European Standard specifies a method for determining the performance of an aerosol sampler under prescribed workplace conditions in order to test whether the performance of a candidate sampler fulfils the requirements of EN 13205-1.

This part of EN 13205 specifies also a simple method to determine how, for a specific workplace aerosol, the concentration measured by the candidate sampler can be recalculated into that of a validated sampler.

This part of EN 13205 is applicable to all samplers used for the health-related sampling of particles in workplace air. Different test procedures and types of evaluation are included to enable application of this part of EN 13205 to a wide variety of instruments.

The methods specified in this part of EN 13205 are not applicable to tests where the performance of personal samplers is related to static samplers or vice versa.

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.

EN 1540, *Workplace exposure - Terminology*

EN 13205-1:2014, *Workplace exposure — Assessment of sampler performance for measurement of airborne particle concentrations — Part 1: General requirements*

EN 13205-2:2014, *Workplace exposure — Assessment of sampler performance for measurement of airborne particle concentrations — Part 2: Laboratory performance test based on determination of sampling efficiency*

EN 13205-4:2014, *Workplace exposure — Assessment of sampler performance for measurement of airborne particle concentrations — Part 4: Laboratory performance test based on comparison of concentrations*

3 Terms and definitions

For the purpose of this document, the term and definitions given in EN 1540, EN 13205-1:2014 EN 13205-2:2014 and the following apply.

NOTE With regard to EN 1540, in particular, the following terms are used in this document: total airborne particles, respirable fraction, sampling efficiency, static sampler, thoracic fraction, inhalable fraction, measuring procedure, non-random uncertainty, random uncertainty, expanded uncertainty, standard uncertainty, combined standard uncertainty, uncertainty (of measurement), coverage factor, precision and analysis.

3.1

correction function

mathematical function relating aerosol concentrations measured using a candidate sampler to those measured using a validated sampler, determined by a comparison of the two samplers