National Standards Authority of Ireland

STANDARD RECOMMENDATION

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ICS 13.040.30

WORKPLACE ATMOSPHERES - CALCULATION OF THE HEALTH-RELATED AEROSOL FRACTION CONCENTRATION FROM THE CONCENTRATION MEASURED BY A SAMPLER WITH KNOWN PERFORMANCE CHARACTERISTICS

National Standards
Authority of Ireland
Glasnevin, Dublin 9
Ireland
Tel: +353 1 807 3800
Fax: +353 1 807 3838
http://www.nsai.ie

Sales
http://www.standards.ie

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English Version

Workplace atmospheres - Calculation of the health-related aerosol fraction concentration from the concentration measured by a sampler with known performance characteristics

Atmosphères des lieux de travail - Calcul de la concentration en fractions d'aérosols liées à la santé à partir de la concentration mesurée à l'aide d'un dispositif de prélèvement ayant des caractéristiques de performances connues

Arbeitsplatzatmosphäre - Berechnung der gesundheitsbezogenen Fraktion der Aerosolkonzentration anhand der mit einem Probenahmegerät mit bekannten Leistungseigenschaften gemessenen Konzentration

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EUROPEAN COMMITTEE FOR STANDARDIZATION
COMITÉ EUROPÉEN DE NORMALISATION
EUROPÄISCHES KOMITEE FÜR NORMUNG

Management Centre: rue de Stassart, 36 B-1050 Brussels

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Foreword

This document (CEN/TR 15547:2007) 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.

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Introduction

Exposure assessment of workers to particulate matter dispersed into the air at the workplace is generally achieved through aerosol sampling by using instruments designed for measuring health-related aerosol fractions as defined in EN 481. EN 13205 gives a methodology to evaluate sampler performance. The knowledge of the sampling efficiency of a sampler is used to calculate the bias and the accuracy in concentration for log-normally distributed aerosols. Bias and accuracy maps give an overall indication on sampler performance when sampling health-related aerosol fractions. This performance varies with particle size distribution of sampled aerosol.

Many different samplers can be used for the same purpose, depending on local circumstances or the current practice in the country where these measurements have to be performed. Even with samplers whose performances are quite similar, some significant differences in measured concentrations can occur between these samplers, depending on the aerosol measured. Furthermore, the concentration measured by a sampler is not actually the conventional concentration even if the sampler fulfils the performance criteria stated in EN 13205. This is due to the fact that the particle-size selectivity of the sampler does not generally coincide exactly with the conventional sampling curve over the whole particle-size range.

In the revision of EN 482 presently under way, the uncertainty estimate of a measurement procedure should be expanded to meet the requirements of ENV 13005 complying with GUM (ISO Guide to the expression of Uncertainty in Measurements). This requires that all uncertainties encountered by the use of a measurement procedure (except interlaboratory variation) have to be accounted for. For the special case of aerosol sampling this means that the uncertainty in an expected bias of the sample due to non-ideal collection characteristics will only be estimated for a very wide range of size distributions. The calculations presented in this Technical Report can help to significantly reduce this uncertainty by first estimating a restricted range of size distributions in which the sampler was actually used, and then estimate the bias uncertainty only over this narrow range of size distributions. For an aerosol sampler, the variability due to bias is in many cases a major component of the uncertainty.