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S.R. CEN/TR 16013-1:2010

Workplace exposure - Guide for the use of direct-reading instruments for aerosol monitoring - Part 1: Choice of monitor for specific applications

S.R. CEN/TR 16013-1:2010

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English Version

Workplace exposure - Guide for the use of direct-reading instruments for aerosol monitoring - Part 1: Choice of monitor for specific applications

Exposition au poste de travail - Guide d'utilisation des instruments à lecture directe pour la surveillance des aérosols - Partie 1: Choix du moniteur pour des applications spécifiques

Exposition am Arbeitsplatz - Leitfaden für die Anwendung direkt anzeigender Geräte zur Überwachung von Aerosolen - Teil 1: Auswahl des Monitors für besondere Anwendungsfälle

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Foreword

This document (CEN/TR 16013-1:2010) 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.

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.

CEN/TR 16013, *Workplace exposure — Guide for the use of direct-reading instruments for aerosol monitoring*, consists of the following parts:

— *Part 1: Choice of monitor for specific applications*

— *Part 2: Evaluation of airborne particle concentrations using Optical Particle Counters*

— *Part 3: Evaluation of airborne particle concentrations using photometers* (in preparation)

Introduction

The assessment of aerosols in the workplace can have several aims, including:

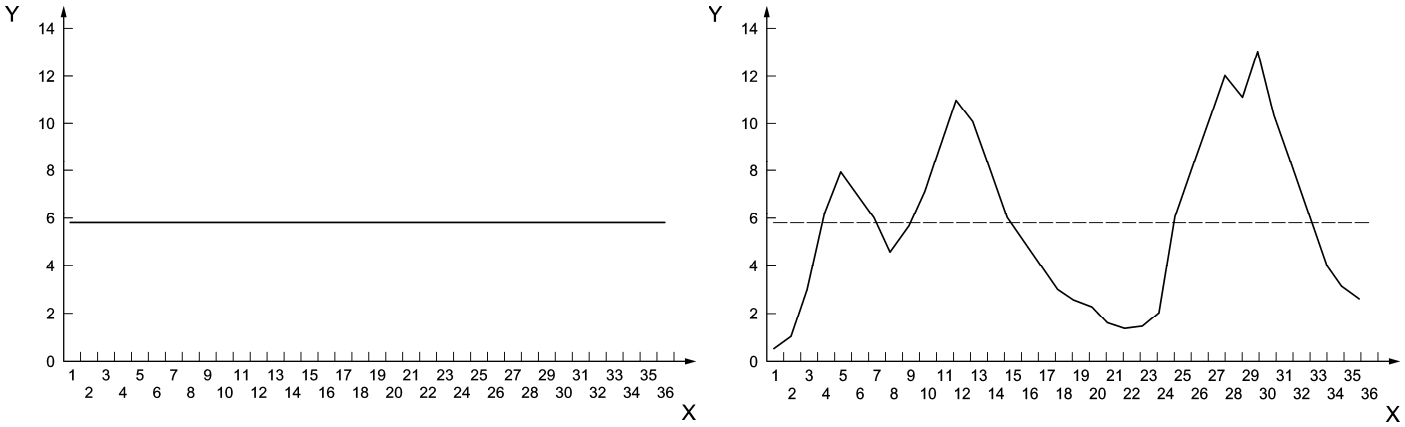
a) estimation of the mean concentration of health-related aerosol particles (see EN 481) during a working shift period (workplace characteristics or personal exposure by static or personal sampling);

b) sampling to provide a sample of airborne particles for later analysis (gravimetric, morphological, chemical, physical, mineralogical, etc., see EN 482);

c) evaluation of almost instantaneous concentrations produced by various work activities using automatic instruments (photometers, β-attenuation instruments, vibrational mass balance instruments);

d) evaluation of almost instantaneous concentrations and particle size distributions (optical particle counters – OPC).

This Technical Report concerns items c) and d), gives the principles, and details the general conditions to be satisfied. In occupational hygiene, no measurement procedure recommends exposure monitoring using direct-reading aerosol monitors. These instruments should instead be considered as permitting a complementary approach to the conventional filter-based gravimetric method. The different types of information obtained are explained in Figure 1.



a) **b)**

Key

X sample number (time) Y concentration (arb units)

Figure 1 — Information from integrated filter sampling vs. continuous monitoring

There is a wide range of portable and personal direct-reading aerosol monitors available.

Recent advances in modern electronics and battery technology means direct-reading dust monitors are becoming smaller and lighter and of relatively low price. In addition to reliance on compliance with Occupational Exposure Limits, emphasis is now also being placed on control banding and advice on suitable control systems. This has led to new roles being identified for direct-reading aerosol monitors in ensuring that systems deployed to control exposure to airborne dusts actually work. Some types of direct-reading aerosol monitors appear to be well suited to evaluate prevention action efficiency and to space- and time-related monitoring of concentration.

All instruments mentioned in this document (see, in particular, Tables 2, 4, 6, 8 and 10) are examples of suitable products available commercially. This information is given for the convenience of users of this Technical Report only and does not constitute an endorsement by CEN of these products.

1 Scope

This Technical Report describes the principles underlying the evaluation of one or more aerosol fractions using direct-reading aerosol monitors. The currently available methods for monitoring levels of aerosols in workplaces for a range of different purposes are described and details are given of their limits and possibilities in the field of occupational hygiene.

The document does not cover the sampling of aerosols for compliance with occupational exposure limits or the collection of aerosol particles for subsequent analysis.

2 Abbreviations

For the purposes of this document, the following abbreviations apply.

DRAM direct-reading aerosol monitor

LOD limit of detection

OEL occupational exposure limit

OPC optical particle counter

PM particulate matter

TEOM tapered element oscillating microbalance

TSP total suspended particulate

3 Principles of direct-reading aerosol monitoring methods

3.1 General

There are many methods, based on different physical principles, for the instantaneous measurement of aerosols. Instruments used are generally called direct-reading or continuous monitoring instruments. Depending on their design, they can give the instantaneous or sequential concentration and can sometimes even measure particle size distribution.

Instantaneous measurement has several advantages:

a) immediate knowledge of the result without going through the laboratory, whence the possibility of rapid intervention (e.g. implementation of a ventilation system);

b) continuous measurement, long-distance surveillance, concentration record over time, mean concentration integration and calculation in selected periods, maxima and minima determination, source location, etc.;

c) measurement of concentration for particles of unstable composition (e.g. volatile substances);

d) monitoring and control of aerosol concentration.

Depending on the principles used, automatic methods can be classed into the following three main groups:

— vibrational mass method (see 3.2);

— beta attenuation method (see 3.3);

— optical methods (see 3.4).