

**Töökeskonna õhu kvaliteet.
Granulomeetrilise fraktsiooni
määramine õhu kaudu levivate tahkete
osakeste mõõtmiseks**

Workplace atmospheres - Size fraction definitions for
measurement of airborne particles

EESTI STANDARDI EESSÕNA

NATIONAL FOREWORD

Käesolev Eesti standard EVS-EN 481:1999 sisaldab Euroopa standardi EN 481:1993 ingliskeelset teksti.	This Estonian standard EVS-EN 481:1999 consists of the English text of the European standard EN 481:1993.
Käesolev dokument on jõustatud 12.12.1999 ja selle kohta on avaldatud teade Eesti standardiorganisatsiooni ametlikus väljaandes.	This document is endorsed on 12.12.1999 with the notification being published in the official publication of the Estonian national standardisation organisation.
Standard on kättesaadav Eesti standardiorganisatsioonist.	The standard is available from Estonian standardisation organisation.

Käsitlusala: Standard esitab proovivõtmise üldpõhimõtted tahkete osakeste granulomeetriliste fraktsioonide korral, mida kasutatakse töökoha õhus levivate tahkete osakeste sissehingamisel tekkida võiva tervisele kahjuliku mõju kindlaksmääramiseks.	Scope:
--	---------------

ICS 13.040.30

Võtmesõnad: aerosoolid, hõljum, kontsentratsioon, kvaliteet, mõõtmine, osakeste tihedus, proovivõtmine, tehnilised andmed, tööruum, õhk, õhu saastumine, õnnetuse vältimine

UDC 628.511 : 331.1 : 620.113

Descriptors: Air, quality, air pollution, workroom, accident prevention, aerosols, sampling, suspended matter, measurements, particle density, specifications.

English version

Workplace atmospheres

**Size fraction definitions for measurement
of airborne particles**

Atmosphères des lieux de travail; définition des fractions de taille pour le mesurage des particules en suspensions dans l'air

Arbeitsplatzatmosphäre; Festlegung der Teilchengrößenverteilung zur Messung luftgetragener Partikel

This European Standard was approved by CEN on 1993-07-27.

CEN members are bound to comply with the CEN/CENELEC Internal Regulations which stipulate the conditions for giving this European Standard the status of a national standard without any alteration.

Up-to-date lists and bibliographical references concerning such national standards may be obtained on application to the Central Secretariat or to any CEN member.

This European Standard exists in three official versions (English, French, German). A version in any other language made by translation under the responsibility of a CEN member into its own language and notified to the Central Secretariat has the same status as the official versions.

CEN members are the national standards bodies of Austria, Belgium, Denmark, Finland, France, Germany, Greece, Iceland, Ireland, Italy, Luxembourg, Netherlands, Norway, Portugal, Spain, Sweden, Switzerland and United Kingdom.

CEN

European Committee for Standardization
Comité Européen de Normalisation
Europäisches Komitee für Normung

Central Secretariat: rue de Stassart 36, B-1050 Brussels

Foreword

This European Standard was prepared by Technical Committee CEN/TC 137 'Assessment of workplace exposure', the Secretariat of which is held by DIN.

This standard was submitted to Formal Vote, and the result was positive.

This European Standard shall be given the status of a national standard, either by publication of an identical text or by endorsement, and conflicting national standards withdrawn, by January 1994 at the latest.

In accordance with the CEN/CENELEC Internal Regulations, the following countries are bound to implement this European Standard:

Austria, Belgium, Denmark, Finland, France, Germany, Greece, Iceland, Ireland, Italy, Luxembourg, Netherlands, Norway, Portugal, Spain, Sweden, Switzerland and United Kingdom.

0 Introduction

The proportion of total particulate matter which is inhaled into a human body depends on properties of the particles, on the speed and direction of air movement near the body, on breathing rate, and whether breathing is through nose or mouth. Inhaled particles can then deposit somewhere in the respiratory tract, or can be exhaled. The site of deposition, or probability of exhalation, depends on properties of the particle, respiratory tract, breathing pattern, and other factors.

Liquid particles or soluble components of solid particles can be absorbed by the tissues wherever they deposit. Particles can cause damage close to the deposition site if they are corrosive, radioactive, or capable of initiating some other type of damage. Insoluble particles can be transported to another part of the respiratory tract or body, where they can be absorbed or cause a biological effect.

There is a wide variation from one person to another in the probability of particle inhalation, deposition, reaction to deposition, and clearance. Nevertheless, it is possible to define conventions for size selective sampling of airborne particles when the purpose of sampling is health-related. These conventions are relationships between aerodynamic diameter and the fractions to be collected or measured, which approximate to the fractions penetrating to regions of the respiratory tract under average conditions. Measurement conducted according to these conventions will probably yield a better relationship between measured concentration and risk of disease.

Note:

For further information on the factors affecting inhalation and deposition, and their application in standards, see [8], [9], [10], [11], [12] and [13].

1 Scope

This standard defines sampling conventions for particle size fractions which are to be used in assessing the possible health effects resulting from inhalation of airborne particles in the workplace. They are derived from experimental data for healthy adults. Conventions are defined for the inhalable, thoracic and respirable fractions; extrathoracic and tracheobronchial conventions may be calculated from the defined conventions. (The inhalable fraction is sometimes called inspirable - the terms are equivalent. The nomenclature of the fractions is discussed in annex A). Assumptions are given in clause 4. The convention chosen will depend on the region of effect of the component of interest in the airborne particles (see clause 3). Conventions are stated in terms of mass fractions, but they may also be used when the intention is to evaluate the total surface area or the number of particles in the collected material.

In practice, the conventions will often be used to specify instruments to sample airborne particles for the purpose of measuring concentrations corresponding to

the defined fractions. It should be noted that experimental error in the testing of instruments, and possible dependence on factors other than aerodynamic diameter, mean that it is only possible to make a statement of probability that an instrument's performance falls within a certain range, and that different instruments will fall within an acceptable range.

Note:

The problem of comparing instruments with the conventions is to be dealt with in another standard.

One application is the comparison of mass concentration of airborne size fractions with limit values. It should be noted with respect to relevant European Directives that the use of other methods is allowed provided that they yield the same or stricter conclusion. One important example is the respirable convention in relation to compliance with the limit value. Equipment matching the Johannesburg convention [2] will in practical circumstances give the same or a higher mass concentration (by up to about 20 %) than equipment matching the respirable convention given in 5.3, so the use of equipment matching the Johannesburg convention will be consistent with the European Directive.

The conventions should not be used in association with limit values defined in completely different terms, for example for fibre limit values defined in terms of the length and diameter of fibres.

2 Definitions

For the purposes of this standard, the following definitions apply.

2.1 Sampling convention

A target specification for sampling instruments which approximates to, for each particle aerodynamic diameter:

- in the case of inhalable convention, the ratio of the mass concentration of particles entering the respiratory tract to the corresponding mass concentration in the air before the particles are affected by the presence of the exposed individual and inhalation;
- in the case of the other conventions, the ratio of the mass concentration of particles entering the specified region of the respiratory tract to the mass concentration of particles entering the respiratory tract. (These other conventions can also be expressed as ratios to the mass concentration of total airborne particles).