

English Version

Ambient air - Determination of the particle number size  
distribution of atmospheric aerosol using a Mobility  
Particle Size Spectrometer (MPSS)

Air ambient - Détermination de la distribution  
granulométrique de particules d'un aérosol  
atmosphérique à l'aide d'un spectromètre de  
granulométrie à mobilité électrique (MPSS)

Außenluft - Bestimmung der  
Partikelanzahlgrößenverteilung des atmosphärischen  
Aerosols mit einem Mobilitäts-  
Partikelgrößenspektrometer (MPSS)

This Technical Specification (CEN/TS) was approved by CEN on 22 December 2019 for provisional application.

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EUROPEAN COMMITTEE FOR STANDARDIZATION  
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EUROPÄISCHES KOMITEE FÜR NORMUNG

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## European foreword

This document (CEN/TS 17434:2020) has been prepared by Technical Committee CEN/TC 264 “Air quality”, 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 shall not be held responsible for identifying any or all such patent rights.

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## Introduction

There is a growing awareness of the significance of aerosol particles with diameters of  $D < 1 \mu\text{m}$  for human health as well as for their climatic impact. To assess air quality, it appears necessary to supplement gravimetrically determined mass concentrations such as  $\text{PM}_{10}$  or  $\text{PM}_{2.5}$  with a measurement of the particle number concentration. Since ultrafine particles with diameters of  $D < 0,1 \mu\text{m}$  make an almost insignificant contribution to the mass concentration of atmospheric aerosol particles, they can best be detected with counting measuring methods of sufficient sensitivity.

As particle measurement instrumentation allows determining either the particle number concentration or the particle number size distribution two Technical Specifications have been established:

- one dealing with the determination of the single parameter number concentration (a measure of “total” number concentration (CEN/TS 16976)),
- one dealing with the determination of number concentrations within a limited number of size ranges (this document).

Clauses 5 and 6 contain general information about the method and the expected properties of the aerosol particles to be measured.

Clause 7 sets out the performance criteria for MPSSs. Specifically, these are the relevant performance characteristics of MPSS instruments (without any sampling system), the respective criteria that shall be met, and a description of how the tests shall be carried out. In general these tests are expected to be carried out by test houses or MPSS manufacturers rather than users, and could form the basis for type approval of MPSSs in future.

Clause 8 sets out the performance criteria and test procedures for the sampling and conditioning system. These may be applied by manufacturers of sampling systems, test houses or users (network operators).

Clause 9 sets out requirements for the installation, initial checks and calibrations, and operation of an MPSS and sampling system at a monitoring site, including routine maintenance, data processing (including use of QA/QC data) and reporting. In general these will be the responsibility of users (network operators), though calibrations requiring test aerosols shall only be carried out by suitably qualified laboratories.

Clause 10 sets out Quality Assurance and Quality Control procedures, i.e. the ongoing checks and calibrations that are required on the MPSS and sampling system during operation at a monitoring site. It is expected that these will be the responsibility of users (network operators). The main sources of measurement uncertainty are described, but it is not possible in this document to quantify the overall measurement uncertainty for data reported following the method.

## 1 Scope

This document describes a standard method for determining particle number size distributions in ambient air in the size range from 10 nm to 800 nm at total concentrations up to approximately  $10^5 \text{ cm}^{-3}$  with a time resolution of a few minutes. The standard method is based on a Mobility Particle Size Spectrometer (MPSS) used with a bipolar diffusion charger and a Condensation Particle Counter (CPC) as the detector. The document describes the performance characteristics and minimum requirements of the instruments and equipment to be used, and describes sampling, operation, data processing and QA/QC procedures, including calibration.

## 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.

CEN/TS 16976:2016, *Ambient air — Determination of the particle number concentration of atmospheric aerosol*

ISO 15900, *Determination of particle size distribution — Differential electrical mobility analysis for aerosol particles*

ISO 27891:2015, *Aerosol particle number concentration — Calibration of condensation particle counters*

## 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 <https://www.iso.org/obp/ui>

### 3.1

#### **aerosol**

multi-phase system of solid and/or liquid particles suspended in a gas, ranging in particle size from 0,001  $\mu\text{m}$  to 100  $\mu\text{m}$

[SOURCE: CEN/TS 16976:2016]

### 3.2

#### **detection efficiency**

ratio of the particle number concentration determined by the measuring instrument to the reference particle number concentration of the aerosol at the instrument's inlet

[SOURCE: CEN/TS 16976:2016, modified]

### 3.3

#### **number size distribution**

frequency distribution of the particle number concentration represented as a function of the logarithm of particle size, such that the area under the distribution between two sizes is the number concentration of that size range