

**VÄLISÕHK. STANDARDNE KAALUMISMEETOD
SUSPENDEERUNUD OSAKESTE PM10 VÕI PM2,5
MASSIKONTSENTRATSIOONI MÄÄRAMISEKS**

**Ambient air - Standard gravimetric measurement
method for the determination of the PM10 or PM2,5
mass concentration of suspended particulate matter**

EESTI STANDARDI EESSÕNA**NATIONAL FOREWORD**

See Eesti standard EVS-EN 12341:2014 sisaldab Euroopa standardi EN 12341:2014 ingliskeelset teksti.	This Estonian standard EVS-EN 12341:2014 consists of the English text of the European standard EN 12341:2014.
Standard on jõustunud sellekohase teate avaldamisega EVS Teatajas.	This standard has been endorsed with a notification published in the official bulletin of the Estonian Centre for Standardisation.
Euroopa standardimisorganisatsioonid on teinud Euroopa standardi rahvuslikele liikmetele kättesaadavaks 21.05.2014.	Date of Availability of the European standard is 21.05.2014.
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English Version

Ambient air - Standard gravimetric measurement method for the determination of the PM₁₀ or PM_{2,5} mass concentration of suspended particulate matter

Air ambient - Méthode normalisée de mesurage gravimétrique pour la détermination de la concentration massique MP₁₀ ou MP_{2,5} de matière particulaire en suspension

Außenluft - Gravimetrisches Standardmessverfahren für die Bestimmung der PM₁₀- oder PM_{2,5}-Massenkonzentration des Schwebstaubes

This European Standard was approved by CEN on 10 April 2014.

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COMITÉ EUROPÉEN DE NORMALISATION
EUROPÄISCHES KOMITEE FÜR NORMUNG

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Foreword

This document (EN 12341:2014) has been prepared by Technical Committee CEN/TC 264 "Air quality", 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of an identical text or by endorsement, at the latest by November 2014 and conflicting national standards shall be withdrawn at the latest by November 2014.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 supersedes EN 12341:1998 and EN 14907:2005.

This document has been prepared under a mandate given to CEN by the European Commission and the European Free Trade Association and supports Essential Requirements of the Council Directive 2008/50/EC [1].

EN 12341:2014 includes the following significant technical changes with respect to EN 12341:1998 and EN 14907:2005:

- this document is adapted from EN 14907:2005 due to consideration of best available technology;
- the three different standard reference methods for PM_{10} described in EN 12341:1998 and the two different standard reference methods for $PM_{2,5}$ described in EN 14907:2005 are replaced in this document by only one possible standard reference method for each of PM_{10} or $PM_{2,5}$.

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

Introduction

For air quality across the European Union to be assessed on a consistent basis, Member States need to employ standard measurement techniques and procedures. The aim of this European Standard is to present a harmonized methodology for monitoring the mass concentrations of suspended particulate matter (PM₁₀ and PM_{2,5} respectively) in ambient air, following Directive 2008/50/EC on ambient air quality and cleaner air for Europe [1] which sets the parameters specific to the assessment of ambient concentration levels of particulate matter.

NOTE In principle, the methodology described in this European Standard may also be used for measurement of mass concentrations of other PM fractions such as PM₁. However, this European Standard does not describe standardized sampling inlets for such fractions.

This European Standard merges the earlier European Standards EN 12341:1998 [2] and EN 14907:2005 [3] with the aim of harmonizing the very similar procedures that are used to measure mass concentrations of both fractions of particulate matter in ambient air.

The European Standard method described in this European Standard is focussed primarily on harmonization and improvement of the data quality of measurement methods used in monitoring networks, with regard to avoiding unnecessary discontinuities with historical data. It is a method that is suited for practical use in routine monitoring, but not necessarily the method with the highest metrological quality.

There are no traceable reference standards for PM₁₀ or PM_{2,5} measurements. Therefore, the standard method defines the measured quantity by convention, specifically by the sample inlet design and associated operational parameters covering the whole measurement process. This European Standard contains:

- a description of a manual gravimetric standard measurement method for PM₁₀ or PM_{2,5} using sequential samplers or single-filter samplers;
- a summary of performance requirements of the method;
- requirements for suitability testing of facilities and equipment on initial application of the method;
- requirements for ongoing quality assurance / quality control when applying the method in the field;
- the assessment of measurement uncertainty of the results of this European Standard method;
- (tentative) criteria and test methods for the evaluation of the suitability of filters for application using this method.

The performance characteristics and requirements described in this European Standard were partly determined in different comparative and validation trials. The trials were sponsored by the European Commission and the European Free Trade Association.

However, for lack of appropriate criteria and protocols to test filters for fitness for purpose, considerable differences may exist between results obtained when using different filter types, and even filters of the same type. For example, differences of up to 15 % have been found when applying different brands of quartz-fibre filters in parallel measurements of PM₁₀ for concentrations around 50 % of the daily limit value [4]. This may have implications for results produced by automated measurement systems as these are calibrated by comparison of results with those obtained using reference samplers (CEN/TS 16450:2013 [5]).

In principle, the filters collected for the purpose of determining the mass concentrations of PM₁₀ or PM_{2,5} can be used for further speciation, e.g. for the determination of concentrations of:

- heavy metals and polycyclic aromatic hydrocarbons (see EN 14902 [6] and EN 15549 [7]) in conformity with Directive 2004/107/EC [8],

- constituents of $PM_{2.5}$ (see CEN/TR 16243 [9] and CEN/TR 16269 [10]) to be used for source apportionment as required by Directive 2008/50/EC.

Additional requirements might have to be considered for those purposes (e.g. blank values of chemical constituents).

However, the requirements of this European Standard are targeted firstly towards obtaining optimum results for the measurement of mass concentrations of PM_{10} or $PM_{2.5}$.

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1 Scope

This European Standard describes a standard method for determining the PM₁₀ or PM_{2,5} mass concentrations of suspended particulate matter in ambient air by sampling the particulate matter on filters and weighing them by means of a balance.

Measurements are performed with samplers with inlet designs as specified in Annex A, operating at a nominal flow rate of 2,3 m³/h, over a nominal sampling period of 24 h. Measurement results are expressed in µg/m³, where the volume of air is the volume at ambient conditions near the inlet at the time of sampling.

The range of application of this European Standard is from approximately 1 µg/m³ (i.e. the limit of detection of the standard measurement method expressed as its uncertainty) up to 150 µg/m³ for PM₁₀ and 120 µg/m³ for PM_{2,5}.

NOTE 1 Although the European Standard is not validated for higher concentrations, its range of application could well be extended to ambient air concentrations up to circa 200 µg/m³ when using suitable filter materials (see 5.1.4).

This European Standard describes procedures and gives requirements for the use of so-called sequential samplers, equipped with a filter changer, suitable for extended stand-alone operation. Sequential samplers are commonly used throughout the European Union for the measurement of concentrations in ambient air of PM₁₀ or PM_{2,5}. However, this European Standard does not exclude the use of single-filter samplers.

This European Standard does not give procedures for the demonstration of equivalence of other sampler types, e.g. equipped with a different aerosol classifier and/or operating at different flow rates. Such procedures and requirements are given in detail in the *Guide to the Demonstration of Equivalence of Ambient Air Monitoring Methods* [11] and for automated continuous PM monitors (see CEN/TS 16450:2013).

The present European Standard represents an evolution of earlier European Standards (EN 12341:1998 and EN 14907:2005) through the development of the 2,3 m³/h sampler to include constraints on the filter temperature during and after sampling and the ability to monitor temperatures at critical points in the sampling system. It is recommended that when equipment is procured it complies fully with the present European Standard. However, older versions of these 2,3 m³/h samplers that do not employ sheath air cooling, the ability to cool filters after sampling, or the ability to monitor temperatures at critical points in the sampling system have a special status in terms of their use as reference samplers. Historical results obtained using these samplers will remain valid. These samplers can still be used for monitoring purposes and for equivalence trials, provided that a well justified additional allowance is made to their uncertainties (see Annex B).

In addition, three specific sampling systems – the “long nozzle” 2,3 m³/h sampler and the 68 m³/h sampler for PM₁₀ in EN 12341:1998, and the 30 m³/h PM_{2,5} inlet in EN 14907:2005 – also have a special status in terms of their use as reference samplers. Historical results obtained using these samplers will remain valid. These samplers can still be used for monitoring purposes and for equivalence trials, provided that a well-justified additional allowance is made to their uncertainties (see Annex B).

Other sampling systems, as described in Annex B of this European Standard, can be used provided that a well justified additional allowance is made to their uncertainties as derived from equivalence tests.

NOTE 2 By evaluating existing data it has been shown that these samplers give results for PM₁₀ and PM_{2,5} that are equivalent to those obtained by application of this European Standard. Results are shown in Annex B.

This European Standard also provides guidance for the selection and testing of filters with the aim of reducing the measurement uncertainty of the results obtained when applying this European Standard.

2 Normative references

The following document, in whole or in part, is normatively referenced in this document and is 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.

JCGM 100, *Evaluation of measurement data — Guide to the expression of uncertainty in measurement*

3 Terms, definitions, symbols and abbreviations

3.1 Terms and definitions

For the purposes of this document, the following terms and definitions apply.

3.1.1

ambient air

outdoor air in the troposphere, excluding workplaces as defined by Directive 89/654/EEC [12] where provisions concerning health and safety at work apply and to which members of the public do not have regular access

[SOURCE: Directive 2008/50/EC]

3.1.2

calibration

operation that, under specified conditions, in a first step, establishes a relation between the quantity values with measurement uncertainties provided by measurement standards and corresponding indications with associated measurement uncertainties and, in a second step, uses this information to establish a relation for obtaining a measurement result from an indication

[SOURCE: JCGM 200 [13]]

3.1.3

combined standard uncertainty

standard uncertainty of the result of a measurement when that result is obtained from the values of a number of other quantities, equal to the positive square root of a sum of terms, the terms being the variances or covariances of these other quantities weighted according to how the measurement result varies with changes in these quantities

[SOURCE: JCGM 100]

3.1.4

coverage factor

numerical factor used as a multiplier of the combined standard uncertainty in order to obtain an expanded uncertainty

[SOURCE: JCGM 100]

3.1.5

expanded uncertainty

quantity defining an interval about the result of a measurement that may be expected to encompass a large fraction of the distribution of values that could reasonably be attributed to the measurand

Note 1 to entry: The fraction may be viewed as the coverage probability or level of confidence of the interval.

Note 2 to entry: To associate a specific level of confidence with the interval defined by the expanded uncertainty requires explicit or implicit assumptions regarding the probability distribution characterized by the measurement result and its combined standard uncertainty. The level of confidence that may be attributed to this interval can be known only to the extent to which such assumptions may be justified.