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Ambient air – Sampling and analysis of airborne pollen grains and fungal spores for networks related to allergy – Volumetric Hirst method

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National foreword

This British Standard is the UK implementation of EN 16868:2019. It supersedes PD CEN/TS 16868:2015, which is withdrawn.

The UK participation in its preparation was entrusted to Technical Committee EH/2/3, Ambient atmospheres.

A list of organizations represented on this committee can be obtained on request to its secretary.

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EUROPEAN STANDARD

NORME EUROPÉENNE

EUROPÄISCHE NORM

EN 16868

May 2019

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English Version

Ambient air - Sampling and analysis of airborne pollen grains and fungal spores for networks related to allergy - Volumetric Hirst method

Air ambiant - Échantillonnage et analyse des grains de pollen en suspension dans l'air et des spores fongiques pour les réseaux relatifs à l'allergie - Méthode volumétrique de Hirst

Außenluft - Probenahme und Analyse luftgetragener Pollen und Pilzsporen für Allergienetzwerke - Volumetrische Hirst-Methode

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European foreword

This document (EN 16868:2019) 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of an identical text or by endorsement, at the latest by November 2019, and conflicting national standards shall be withdrawn at the latest by November 2019.

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.

This document supersedes CEN/TS 16868:2015.

The main changes with respect to the previous edition are listed below:

a) the title has been changed;

b) modifications have been made to the Introduction, the Scope and Clauses 3, 4, 5 and 6;

c) new paragraphs have been added to Clauses 7 and 8;

d) modifications have been made to all Annexes;

e) Figures D.2 and D.3 have been modified;

f) the Bibliography has been readjusted;

g) editorial changes have been made.

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Introduction

Biological particles (pollen and fungal spores) are present in the air, causing health impacts at various levels. In Europe, a lot of people suffer from pollinosis due to pollen and/or fungal spores (EFA, European Federation of Allergy and Airways Diseases Patients Association, 2017). Pollen grains and fungal spores are considered in some Member States as an air pollutant as well as particles suspended in the air ($PM_{10,2,5}$). In Europe, European Aerobiology Society (EAS) in coordination with International Association for Aerobiology (IAA) manage the methodology of sampling, analysis, quality control, development and information.

Persons and institutions involved in pollen forecasting have a scientific and public health responsibility. A pollen forecast is a guideline for allergen avoidance with a direct influence on pollen allergy sufferers and their behaviour. Pollen allergy sufferers are in need of such information since pollen allergy affects their quality of life and pollen and spores are an abundant, environmental allergen. The health state of pollen allergy sufferers should never be risked due to inadequate forecasts, financial interests or deficient working routines applied in the fundamental work such as pollen data evaluation and all involved processes (maintenance of the device, preparation, evaluation, handling and processing of data).

Further pollen data should be included in therapy (immunotherapy at least for one year) to objectify the benefit of the personal therapy.

For the sampling and analysis of biological particles different methodology and operating procedures are used.

Information on airborne pollen and spore concentration (counts and analyses) plays an important role in aerobiology, as well as in other disciplines and fields of application, such as biodiversity, agriculture, forestry, phytopathology, meteorology, climatology, paleo-ecology/-climatology, forensic science, bioterrorism and health (sensitization and allergy). The method described in this European Standard is aimed for the purposes of networks related to allergy. Besides, it may also be useful for other applications mentioned above.

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1 Scope

This document specifies the procedure to sample continuously and to analyse the concentration of airborne pollen grains and fungal spores in ambient air using the volumetric Hirst type sampler [1] [2] [3] (see Annex A) or an even equivalent method assuring comparable data.

This document describes both the sampling and the analysis procedures for the purpose of networks related to allergy. For the other tasks mentioned in the introduction, other specifications may be required.

2 Normative references

There are no normative references in this document.

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 http://www.iso.org/obp

NOTE For general terms, see [4] [5].

3.1
measurement accuracy
accuracy of measurement
accuracy
closeness of agreement between a measured quantity value and a true quantity value of a measurand

Note 1 to entry: The concept 'measurement accuracy' is not a quantity and is not given a numerical quantity value. A measurement is said to be more accurate when it offers a smaller measurement error.

Note 2 to entry: The term "measurement accuracy" should not be used for measurement trueness and the term "measurement precision" should not be used for 'measurement accuracy', which, however, is related to both these concepts.

Note 3 to entry: Measurement accuracy is sometimes understood as closeness of agreement between measured quantity values that are being attributed to the measurand.

[SOURCE: JCGM 200:2012]

3.2
clockwork
mechanism with a spring and toothed gearwheels, used to drive a mechanical clock, toy or other device

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3.3
combined standard measurement uncertainty
combined standard uncertainty
standard measurement uncertainty that is obtained using the individual standard measurement uncertainties associated with the input quantities in a measurement model

Note 1 to entry: In case of correlations of input quantities in a measurement model, covariances must also be taken into account when calculating the combined standard measurement uncertainty; see also ISO/IEC Guide 98-3:2014 [22].

3.4
defatted
surface conditions after clearing with a fat removing substance

3.5
drum
cylindrical device for the mounting of a sticky tape

3.6
exine
outer wall of pollen grain, also called an exosporium

3.7
eyepiece
lens or combination of lenses in an optical instrument through which the eye views the image formed by the objective lens or lenses; ocular

3.8
flow meter
instrument for measuring the flow rate of a fluid in a pipe

3.9
flow rate
amount of fluid (air volume) that flows in a given time

3.10
fungal spore
sexual or asexual reproductive unit of fungi, capable of developing a new individual

3.11
hood
metal cover or canopy for a stove, ventilator, etc

3.12
impaction
sampling of airborne particles by inertial separation on any surface (e.g. of an adhesive)

3.13
magnetic stirrer
object or mechanical device used for stirring something

3.14
magnification
magnifying power of an instrument

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3.15
microscope
optical instrument having a magnifying lens or a combination of lenses for inspecting objects too small to be seen or too small to be seen distinctly and in detail by the unaided eye

3.16
objective
optics (in a telescope, microscope, camera, or other optical system), the lens or combination of lenses, that first receive the rays from the object and form the image in the focal plane of the eyepiece, as in a microscope, or on a plate or screen as in a camera

Note 1 to entry: Also called object glass, object lens, objective lens.

3.17
orifice
opening or aperture, as of a tube or pipe; a mouthpiece with a slot-like opening on the side of the trap

3.18
particle
pollen and spores

3.19
pollen
male gametophyte of seed plants (either angiosperms or gymnosperms)

3.20
measurement precision
precision
closeness of agreement between indications or measured quantity values obtained by replicate measurements on the same or similar objects under specified conditions

Note 1 to entry: Measurement precision is usually expressed numerically by measures of imprecision, such as standard deviation, variance, or coefficient of variation under the specified conditions of measurement.

Note 2 to entry: The 'specified conditions' can be, for example, repeatability conditions of measurement, intermediate precision conditions of measurement, or reproducibility conditions of measurement (see ISO 5725-1:1994, [6]).

Note 3 to entry: Measurement precision is used to define measurement repeatability, intermediate measurement precision, and measurement reproducibility.

Note 4 to entry: Sometimes "measurement precision" is erroneously used to mean measurement accuracy.

[SOURCE: JCGM 200:2012]

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3.21
repeatability condition of measurement
repeatability condition
condition of measurement, out of a set of conditions that includes the same measurement procedure, same operators, same measuring system, same operating conditions and same location, and replicate measurements on the same or similar objects over a short period of time

Note 1 to entry: A condition of measurement is a repeatability condition only with respect to a specified set of repeatability conditions.

Note 2 to entry: In chemistry, the term "intra-serial precision condition of measurement" is sometimes used to designate this concept.

[SOURCE: JCGM 200:2012]

3.22
reproducibility condition of measurement
reproducibility condition
condition of measurement, out of a set of conditions that includes different locations, operators, measuring systems, and replicate measurements on the same or similar objects

Note 1 to entry: The different measuring systems may use different measurement procedures.

Note 2 to entry: A specification should give the conditions changed and unchanged, to the extent practical.

[SOURCE: JCGM 200:2012]

3.23
sensitivity
measurement of the proportion of search particle which is correctly identified

3.24
slide
rectangular piece of glass on which an object is mounted or placed for examination under a microscope

3.25
specificity
measurement of the proportion of non-searched particles which are correctly identified as different from the searched particles

3.26
standard measurement uncertainty
standard uncertainty of measurement
standard uncertainty
measurement uncertainty expressed as a standard deviation

3.27
taxa
taxonomic groups of any rank, such as a species, genus, family or other rank

3.28
trap
sampling device

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3.29
vacuum pump
pump or device by which a partial vacuum can be produced

3.30
wind vane
mechanical device attached to an elevated structure; rotates freely depending on the direction of the wind

4 Principle

Ambient air is sampled by a volumetric suction system and directed towards a suitably coated sampling surface through a specific orifice oriented towards the wind; the particles contained in the sampled air are deposited by impaction on a continuously moving adhesive acceptor surface. The deposit on the sampling surface is examined with an optical microscope in order to identify and count the pollen and fungal spores per area (deposition rates). Using this method allows to calculate concentrations as a daily mean or an hourly mean. The sampling is usually done at low-volume rate (10 l/min). It allows a continuous sampling for up to seven days [7] [8] [9].

5 Sampling

5.1 Equipment

5.1.1 Apparatus

The sampling device and its functional principles are shown schematically in Figures 1, 2 and 3.

The complete sampling system (so called “trap”) containing the motor, the vacuum pump, the orifice, the rotating drum, the wind vane, the clockwork system, the impaction support shall be:

— resistant to corrosion;

— well attached (i.e. resistant to wind-blow, etc.);

— always horizontal (at the head level).

The commercial devices that meet the requirements are presented in Annex A. For the different purposes, refer to the specific publications.

The wind vane allows permanent rotation of the trap head so that the orifice faces the wind. The rain shield ensures a weather protection for the orifice (i.e. rainfall).

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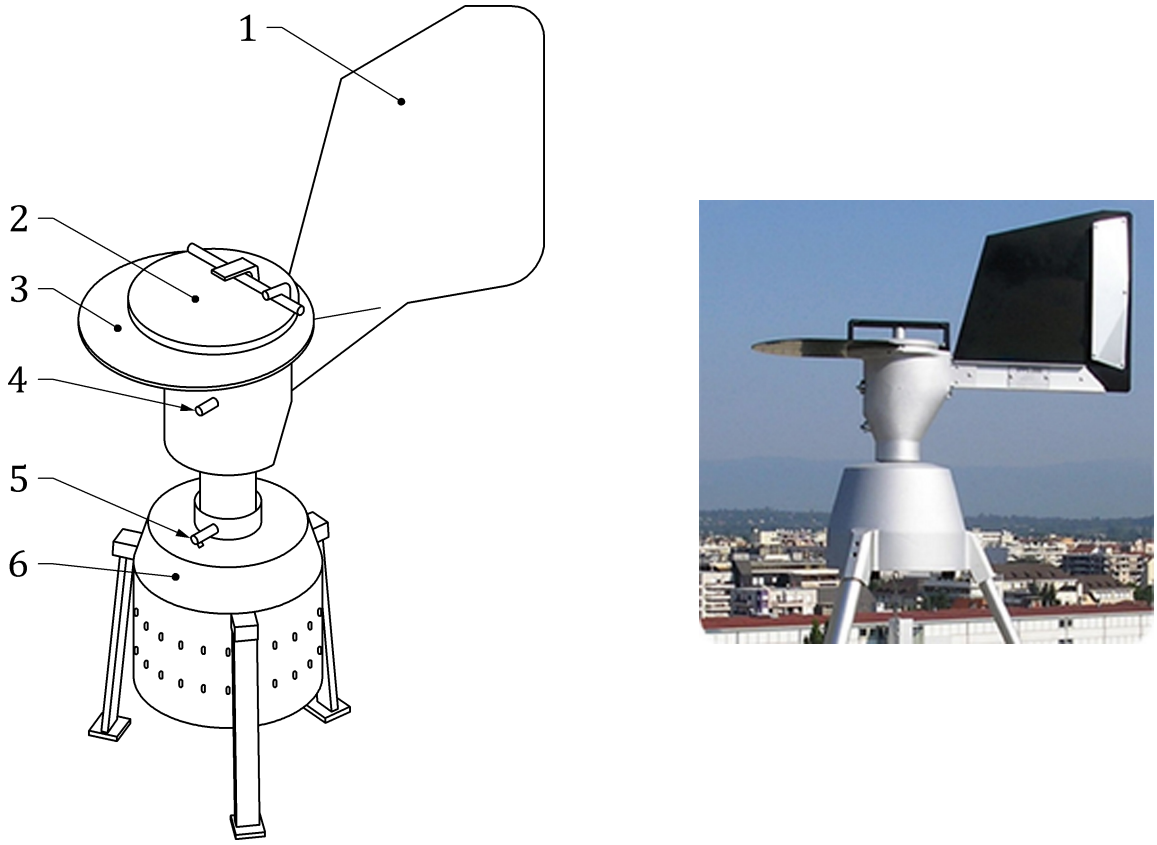

Key

1 wind vane
2 impact unit
3 rain shield
4 orifice (inlet)
5 screw for flow rate adjustment
6 vacuum pump

(Source: RNSA)

Figure 1 — Schematic figure and picture of a sampling device operating on the Hirst type impactor – General view

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