SLOVENSKI STANDARD
SIST EN 14583:2022

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Nadomešča:
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Izpostavljenost na delovnem mestu - Vzorčevalniki za volumetrijsko vzorčenje bioaerosolov - Splošne zahteve in vrednotenje lastnosti

Workplace exposure - Volumetric bioaerosol samplers - General requirements and evaluation of performance

Exposition am Arbeitsplatz - Volumetrische Sammler für Bioaerosole - Allgemeine Anforderungen und Bewertung der Leistungsfähigkeit

Exposition sur les lieux de travail - Dispositifs de prélèvement volumétrique des bioaérosols - Exigences générales et évaluation des performances

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Workplace exposure - Volumetric bioaerosol samplers - General requirements and evaluation of performance

Exposition sur les lieux de travail - Dispositifs de prélèvement volumétrique des bioaérosols - Exigences générales et évaluation des performances

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European foreword

This document (EN 14583:2021) 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.

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of an identical text or by endorsement, at the latest by June 2022, and conflicting national standards shall be withdrawn at the latest by June 2022.

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 EN 14583:2004.

The major technical changes between this document and the previous edition are as follows:

a) document title changed;

b) Scope rewritten and given more detailed;

c) Terms and definitions already referred to in EN 1540 or EN 13098 deleted;

d) Annex B revised by replacing the former content by general requirements on test facilities and an overview on different types and examples of test facilities;

e) new Annex C on microbial model organisms used for bioaerosol studies added;

f) new Annex D giving application guidance added;

g) Bibliography updated;

h) whole document restructured, editorially and technically revised.

Any feedback and questions on this document should be directed to the users’ national standards body. A complete listing of these bodies can be found on the CEN website.

According to the CEN-CENELEC Internal Regulations, the national standards organisations of the following countries are bound to implement this European Standard: Austria, Belgium, Bulgaria, Croatia, Cyprus, Czech Republic, Denmark, Estonia, Finland, France, Germany, Greece, Hungary, Iceland, Ireland, Italy, Latvia, Lithuania, Luxembourg, Malta, Netherlands, Norway, Poland, Portugal, Republic of North Macedonia, Romania, Serbia, Slovakia, Slovenia, Spain, Sweden, Switzerland, Turkey and the United Kingdom.

Introduction

This document is needed to promote the development of new equipment for measurement of microorganisms in the work environment. This document can also apply to existing equipment. It is intended to specify requirements and methods to determine performance characteristics of volumetric bioaerosol samplers used to collect bioaerosols from the workplace atmosphere. Examples of test facilities and microbial model organisms usually used for laboratory measurements of the biological preservation efficiency of volumetric bioaerosol samplers are provided.

WARNING — The use of this document can involve hazardous materials, operations and equipment. This document does not purport to address all of the safety problems associated with its use. It is the responsibility of the user of this document to take appropriate health and safety precautions and to check which restrictive rules and regulations need to be taken into account prior to use.

1 Scope

This document specifies general requirements for the evaluation of volumetric bioaerosol samplers in order to assess workplace exposure and their physical and biological performance.

This document describes the procedures for the development of volumetric bioaerosol samplers as well as their properties and validation.

This document provides a description of a test facility and selection criteria for microbial strains that can be used to assess their biological performance.

This document addresses requirements to manufacturers and developers of volumetric bioaerosol samplers as well as to test facilities with the equipment and skills to carry out the performance measurements of these samplers (see Annex D for application guidance).

This document is not intended for operators who use volumetric bioaerosol samplers to carry out exposure measurements for workers at occupational settings.

This document is not applicable for clean room measurements other than for occupational safety.

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.

EN 1540, *Workplace exposure - Terminology*

EN 13098:2019, *Workplace exposure - Measurement of airborne microorganisms and microbial compounds - General requirements*

EN 60079-1, *Explosive atmospheres - Part 1: Equipment protection by flameproof enclosures "d"*

EN 60079-2, *Explosive atmospheres - Part 2: Equipment protection by pressurized enclosure "p"*

EN 60079-5, *Explosive atmospheres - Part 5: Equipment protection by powder filling "q"*

EN 60079-6, *Explosive atmospheres - Part 6: Equipment protection by liquid immersion "o"*

EN 60079-7, *Explosive atmospheres - Part 7: Equipment protection by increased safety "e"*

EN 60079-11, *Explosive atmospheres - Part 11: Equipment protection by intrinsic safety “i”*

EN 60079-18, *Explosive atmospheres - Part 18: Equipment protection by encapsulation "m"*

EN 60079-25, *Explosive atmospheres - Part 25: Intrinsically safe electrical systems*

EN IEC 60079-0, *Explosive atmospheres - Part 0: Equipment - General requirements (IEC 60079-0)*

EN ISO 13137, *Workplace atmospheres - Pumps for personal sampling of chemical and biological agents - Requirements and test methods (ISO 13137)*

3 Terms and definitions

For the purposes of this document, the terms and definitions given in EN 1540, EN 13098 and the following apply.

ISO and IEC maintain terminological databases for use in standardization at the following addresses:

— ISO Online browsing platform: available at https://www.iso.org/obp

— IEC Electropedia: available at https://www.electropedia.org/

3.1
personal sampler
sampler, attached to a person, that collects gases, vapours or airborne particles in the breathing zone for the purpose of measuring exposure to chemical agents and/or biological agents

Note 1 to entry: Some samplers have integral pumps, and some do not. Where the personal sampler requires the use of an external pump, the pump is not subject to the requirements of this document.

[SOURCE: ISO 18158:2016, 2.2.2.2, modified – Note 1 to entry has been added.]

3.2
particle aerodynamic diameter
diameter of a sphere of 1 g/cm³ density with the same terminal settling velocity in calm air as the particle, under the prevailing conditions of temperature, pressure and relative humidity

[SOURCE: ISO 18158:2016, 2.1.4.8, [21]]

4 Abbreviated terms

ATCC	American Type Culture Collection
CBS	Centraalbureau voor Schimmelcultures
CCUG	Culture Collection University of Göteborg
DSMZ	Deutsche Stammsammlung für Mikroorganismen und Zellkulturen
HEPA	High Efficiency Particulate Air-(filter)
NCTC	National Collection of Type Cultures
OPC	Optical Particle Counter

5 Requirements for volumetric bioaerosol samplers

5.1 General

The pumps used for personal sampling shall fulfil the requirements specified in EN ISO 13137.

NOTE EN 13205 can be used to assess the sampler performance for measurement of airborne particle concentrations. However, at present no practical experience is reported on the application of EN 13205 for volumetric bioaerosol samplers.

5.2 Use in potentially explosive atmospheres

When the sampler covered by this document is to be used in potentially explosive atmospheres, it shall comply with EN IEC 60079-0, EN 60079-1, EN 60079-2, EN 60079-5, EN 60079-6, EN 60079-7, EN 60079-11, EN 60079-18 and EN 60079-25.

5.3 Mechanical construction

Every sampler shall be constructed in such a manner that it is easily accessible for regular function checks and that airflow can easily be measured and calibrated. The sampling pump shall maintain the required airflow rate throughout the sampling period.

Material used in the sampling head should be chosen to avoid moisture uptake and electrostatic charges.

5.4 Indicator devices

An indicator device shall be provided to show that the sampler is switched on. If the sampler has more than one measuring range, the selected range shall be clearly identified.

NOTE It is an advantage if elapsed time indicators, low flow rate indicators, flow interrupted indicators are given.

5.5 Adjustments

Any equipment (switch, knob, etc.) used for modifying the operating parameters (sampling time, flow rate, etc.) of the sampler shall be protected against inadvertent or purposeful adjustment during sampling. The operational settings should be displayed.

5.6 Battery powered samplers

Samplers powered with integrated batteries shall be provided with an early indication of low battery condition.

5.7 Airflow calibration and control

During sampling the deviation from the required airflow should not exceed ± 5 %.

The manufacturer shall state the following:

a) the way in which the calibration of the air flow rate of the sampler can be checked and re-calibration can be done, if necessary;

b) the parameters that should be calibrated, the frequency required and whether the calibration can be carried out by the operator.

5.8 Airflow meter

A device to measure the airflow through the sampler before and after sampling in the field should be supplied if required.

NOTE This device can be different from that used for calibration.

Samplers with integral airflow meters shall be calibrated against a traceable external airflow meter before use.

5.9 Labelling and marking

The manufacturer of the sampler shall be clearly identified to ensure traceability to specified performance characteristics.

5.10 Instruction handbook

The instruction handbook shall be written in a language, which is understandable in the country of the operator. It shall be easily understood and every function explained.

The instruction handbook shall illustrate all components and their handling by figures.

The instruction handbook shall give the environmental conditions and other conditions under which the sampler shall be operated including limitations to its use. It shall give exact calibration instructions and recommended equipment (e.g. flow meters) to be used. The instruction handbook shall also give instructions for troubleshooting and maintenance of the sampler.

5.11 Sampling efficiency

5.11.1 General

The sampling efficiency of samplers collecting biological agents comprises of a physical part, the physical sampling efficiency (see 5.11.2) and the biological preservation efficiency (see 5.11.3).

The sampler should be able to collect a representative sample of the required health-related fraction of the bioaerosol according to EN 481.

The health-related fraction to be used shall be specified by the manufacturer.

5.11.2 Physical sampling efficiency

The physical sampling efficiency can be measured as a function of particle aerodynamic diameter and other influent parameters. For bioaerosol samplers the physical sampling efficiency which corresponds to the (size-selective) sampling efficiency should comply with EN 13205, where applicable.

When assessing the performance of any bioaerosol sampler, the overall sampling efficiency (see A.2, item c)) shall be determined.

The performance of a personal sampler is affected by the proximity of the operator's body when worn within the breathing zone. This needs to be taken into account when assessing that performance. See A.2.

NOTE Annex A gives some information about the physical behaviour of a sampler and the experimental assessment of its physical sampling efficiency in the laboratory.

5.11.3 Biological preservation efficiency

To determine the culturable number of microorganisms, the sampler shall be tested with relevant microorganisms to establish the biological preservation efficiency. The ability of the sampling medium to maintain the integrity of the sampled microorganisms shall be known.

5.12 Functional range of concentration

The manufacturer shall give the upper and lower functional range for the concentration of collected culturable microorganisms and/or the total number of microorganisms.

The manufacturer shall specify the maximum sampling time or the sampling volume that can be sampled without recharging battery-operated samplers or replacing the collection substrate.

NOTE The sampling time can vary from a few minutes up to an 8 h workshift.

5.13 Loading of the sampler

The sampler shall be loaded, emptied and reloaded easily with aseptic collection substrates at the workplace with a minimum loss of collected bioaerosol.