



SLOVENSKI STANDARD
oSIST prEN ISO 23861:2021

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Zrak na delovnem mestu - Kemični agensi, prisotni kot zmesi lebdečih delcev in par - Zahteve za vrednotenje merilnih postopkov z vzorčevalniki (ISO/DIS 23861:2021)

Workplace air - Chemical agent present as a mixture of airborne particles and vapours - Requirements for evaluation of measuring procedures using samplers (ISO/DIS 23861:2021)

Luft am Arbeitsplatz - Chemischer Arbeitsstoff, der als Gemisch aus luftgetragenen Partikeln und Dampf vorliegt - Anforderungen an die Bewertung von Messverfahren mit gepumpten Proben (ISO/DIS 23861:2021)

Air des lieux de travail - Agent chimique présent sous forme de mélange de particules en suspension dans l'air et de vapeurs - Exigences d'évaluation des procédures de mesure utilisant des dispositifs de prélèvement (ISO/DIS 23861:2021)

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13.040.30 Kakovost zraka na delovnem Workplace atmospheres
mestu

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Workplace air — Chemical agent present as a mixture of airborne particles and vapours — Requirements for evaluation of measuring procedures using samplers

ICS: 13.040.30

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ISO copyright office
CP 401 • Ch. de Blandonnet 8
CH-1214 Vernier, Geneva
Phone: +41 22 749 01 11
Email: copyright@iso.org
Website: www.iso.org

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Foreword

ISO (the International Organization for Standardization) is a worldwide federation of national standards bodies (ISO member bodies). The work of preparing International Standards is normally carried out through ISO technical committees. Each member body interested in a subject for which a technical committee has been established has the right to be represented on that committee. International organizations, governmental and non-governmental, in liaison with ISO, also take part in the work. ISO collaborates closely with the International Electrotechnical Commission (IEC) on all matters of electrotechnical standardization.

The procedures used to develop this document and those intended for its further maintenance are described in the ISO/IEC Directives, Part 1. In particular, the different approval criteria needed for the different types of ISO documents should be noted. This document was drafted in accordance with the editorial rules of the ISO/IEC Directives, Part 2 (see www.iso.org/directives).

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For an explanation of the voluntary nature of standards, the meaning of ISO specific terms and expressions related to conformity assessment, as well as information about ISO's adherence to the World Trade Organization (WTO) principles in the Technical Barriers to Trade (TBT), see www.iso.org/iso/foreword.html.

This document was prepared by Technical Committee ISO/TC 146, *Air quality*, Subcommittee SC 2, *Workplace atmospheres* in collaboration with CEN/TC 137, *Assessment of workplace exposure to chemical and biological agents*.

Any feedback or questions on this document should be directed to the user's national standards body. A complete listing of these bodies can be found at www.iso.org/members.html.

Introduction

This document provides a framework for assessing the performance of procedures for measuring a chemical agent present as a mixture of airborne particles and vapours against the general requirements for the performance of procedures for measuring chemical agents in workplace atmospheres as specified in ISO 20581.

This document enables manufacturers and users of samplers and developers and users of procedures for measuring a chemical agent present as a mixture of airborne particles and vapours to adopt a consistent approach to method validation.

This document is based on EN 13936:2014, published by the European Committee for Standardization (CEN).

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Workplace air — Chemical agent present as a mixture of airborne particles and vapours — Requirements for evaluation of measuring procedures using samplers

1 Scope

This document specifies requirements for the evaluation of measuring procedures using samplers for the determination of a chemical agent present in the workplace atmosphere as a mixture of airborne particles and vapours.

The procedures given in this document provide results only for the sum of airborne particles and vapours. The concentration is calculated in terms of mass per unit volume.

NOTE Examples of substances which can be present in multiple phases are toluene diisocyanate, diethanolamine, ethyleneglycol or tributylphosphate.

This document can also be applied to complex mixtures, such as metal working fluids or bitumen fumes.

This document is applicable to samplers and measuring procedures using these samplers in which sampling and analysis are carried out in separate stages.

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2 Normative references (standards.iteh.ai)

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.

ISO 7708:1996, *Air quality — Particle size fraction definitions for health-related sampling (eq. EN 481)*

ISO 13137:2013, *Workplace atmospheres — Pumps for personal sampling of chemical and biological agents — Requirements and test methods*

ISO 18158, *Workplace air — Terminology*

ISO 20581, *Workplace air — General requirements for the performance of procedures for the measurement of chemical agents*

ISO 21832:2018, *Workplace air — Metals and metalloids in airborne particles — Requirements for evaluation of measuring procedures*

ISO 22065:2020, *Workplace air — Gases and vapours — Requirements for evaluation of measuring procedures using pumped samplers*

EN 13205-1, *Workplace exposure — Assessment of sampler performance for measurement of airborne particle concentrations — Part 1: General requirements*

3 Terms and definitions

For the purposes of this document, the terms and definitions given in ISO 18158 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/>

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3.1 mixed-phase sampler
sampler or sampling train that is used to collect airborne particles and vapours onto one or more collection substrates

[SOURCE: ISO 18158:2016, 2.2.2.1.7, modified – The given cross-references have been removed.]

3.2 joint extraction mode
procedure that simultaneously extracts and analyses all collection substrates contained in the mixed-phase sampler, resulting in a unique quantification of the analyte for each air sample

3.3 separate extraction mode
procedure that separately extracts and analyses the collection substrates contained in the mixed-phase sampler, resulting in multiple quantifications for each air sample that are summed to give the final result

4 Symbols and abbreviated terms

For the purposes of this document, the following symbols and abbreviations apply.

OELV occupational exposure limit value

5 Sampler types

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Samplers are classified based on differences in the collection substrate because of differences in the analytical procedures.

Where the vapour phase is collected on a sorbent bed the mixed-phase sampler is classified as type A sampler.

Where the vapour phase is collected on an impregnated filter the mixed-phase sampler is classified as type B sampler.

NOTE Other systems, for example denuder and filter or impinger and filter, can be used alternatively for specific chemical agents. See [Annex B](#).

6 Requirements

6.1 General

The measuring procedure used shall comply with the requirements of ISO 20581 and those clauses of ISO 13137, ISO 21832, ISO 22065 and EN 13205-1 which apply.

Measuring procedures shall meet the requirements specified in [6.3](#). When use of a sampler for measurement of a particular mixture of airborne particles and vapours is claimed, the sampler shall meet the requirements specified in [6.2](#).

Known or suspected interferences shall be noted as required by [6.3.4](#). The results of any tests performed to evaluate interferences, including suitable and sufficient information to minimize their effects shall be presented in the method description as required by [6.3.4](#).

6.2 Sampler requirements

6.2.1 General

The sampler shall comply with the general requirements given in EN 13205-1 and with the performance requirements for pumped samplers prescribed in ISO 22065:2020, 6.2.2 to 6.2.6.

6.2.2 Flow resistance and stability of the air flow

The back pressure of the mixed-phase sampler shall not exceed the maximum values specified for the pump performance test in ISO 13137, unless the combination of mixed-phase sampler and pump has been tested and shown to be able to sample for the required sampling period.

The air flow through the sampling train associated with the pump shall be measured over the duration of the sampling period and not deviate more than 5 % as specified in ISO 13137.

Pumps used with size-selective mixed-phase samplers shall also meet the pump pulsation test as specified in ISO 13137.

6.2.3 Connecting parts

The volume of any connecting parts between collection substrates within the mixed-phase sampler shall be kept to a minimum and any connection shall be made of an inert material that

- does not retain the chemical agent of interest,
- does not react with the chemical agent of interest,
- does not emit chemical agents that can interfere with the one of interest,
- is resistant to solvents, if applicable.

6.2.4 Pumps

Measuring procedures shall specify the use of pumps complying with ISO 13137.

6.3 Measuring procedure requirements

6.3.1 Sampling procedure requirements

6.3.1.1 General

Measuring procedures shall specify the use of a mixed-phase sampler designed to collect the inhalable fraction of airborne particles, as defined in ISO 7708, and vapours.

The requirements specified in ISO 22065:2020, 6.3.1 shall apply according to the types of collection substrates that are used in the mixed-phase sampler.

NOTE Due to the particularity of mixed-phase samplers, some requirements are adapted from ISO 22065 as given in [6.3.1.2](#) and [6.3.1.3](#).

6.3.1.2 Air flow rate

For type A samplers, the air flow rate constrained by the particle-size selector of the sampler should not exceed the maximal air flow rate of the sorbent tube. If not, the air flow should be split to achieve this requirement.

For type B samplers, the maximum air flow rate to ensure complete sampling according to ISO 22065:2020, 6.3.1.3.1 shall comply with the air flow rate required by the particle-size selector used.

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6.3.1.3 Storage condition after sampling

When tested in accordance with the procedure prescribed in 8.2.2, the mean analytical recovery after storage shall not differ by more than 10 % from the value before storage.

6.3.2 Analytical procedure requirements

6.3.2.1 General

The requirements given in ISO 22065:2020, 6.3.2 shall apply according to the types of collection substrates that are used in the mixed-phase sampler.

NOTE Due to the particularity of mixed-phase samplers, some requirements are adapted from ISO 22065 as stated in 6.3.2.2 to 6.3.2.5.

6.3.2.2 Extraction of the collection substrates

The extraction procedure shall ensure that all phases are extracted and presented for analysis of total mass of the analyte(s) of interest.

When collection substrates are extracted and analysed separately, the masses determined on each collection substrate shall not be interpreted as accurate separation of a particle fraction or vapour fraction as these fraction were not stabilized during the sampling period and thus, transfer can occur between collection substrates.

NOTE However, a preponderance of analyte on the portion of the sampler intended for either particulate or vapour collection can give valuable guidance regarding the environment and the control measures, including respiratory protection measures, which may need to be implemented. Samplers which consist of a filter and adsorbent are not able to give an accurate assessment of partition but samplers have been and are being designed to provide more accurate information.

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6.3.2.3 Analytical quantification limit

The quantification limit shall be lower than or equal to the mass of analyte that would be collected for the minimum air sample volume specified in the measuring procedure at the following concentrations and calculated by the Formula (1):

$$m_{LoQ} = \frac{(x \cdot \rho_{LV})}{N} \cdot Q \cdot t_{min} \quad (1)$$

where

x is the fraction of LV considered as follow:

— $x = 0,1$ for substances with long-term limit value

— $x = 0,5$ for substances with short-term limit value

m_{LoQ} is the minimum of mass of analyte that shall be quantified

ρ_{LV} is the limit value considered

N is the number of extractions realized to analyse all collection substrates, control sections excluded

Q is the recommended air flow rate of the mixed-phase sampler