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Izpostavljenost na delovnem mestu - Postopki za določevanje koncentracije kemičnih agensov - Splošne zahteve

Workplace exposure - Procedures for the determination of the concentration of chemical agents - General performance requirements

Exposition am Arbeitsplatz - Allgemeine Anforderungen an die Leistungsfähigkeit von Verfahren zur Messung chemischer Arbeitsstoffe

Exposition sur les lieux de travail - Exigences générales concernant les performances des procédures de mesure des agents chimiques

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Workplace exposure - Procedures for the determination of the concentration of chemical agents - General performance requirements

Exposition sur les lieux de travail - Exigences générales
concernant les performances des procédures de
mesure des agents chimiques

Exposition am Arbeitsplatz - Allgemeine
Anforderungen an die Leistungsfähigkeit von
Verfahren zur Messung chemischer Arbeitsstoffe

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EUROPEAN COMMITTEE FOR STANDARDIZATION
COMITÉ EUROPÉEN DE NORMALISATION
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prEN 482:2020 (E)**European foreword**

This document (prEN 482:2020) 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 document is currently submitted to the CEN Enquiry.

This document will supersede EN 482:2012+A1:2015.

This document corresponds to ISO 20581:2016, published by the International Organization for Standardization (ISO) which contains a modified version of EN 482:2012+A1:2015.

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

- a) standard title adapted to the wording used in the scope
- b) 4.4 revised and divided in two subclauses;
- c) recommendation regarding exposure peaks inserted in 5.4.3;
- d) 5.4.6 reformulated to improve comprehensibility;
- e) new Table 2 with additional requirements for the testing parameters added to 5.10;
- f) Annex A specified more in detail;
- g) new subclause B.9 for blank subtraction added.

[SIST EN 482:2021](https://standards.iteh.ai/catalog/standards/sist/a33aa81f-c31b-4f29-8ba3-78d907a2f111/sist-en-482-2021)

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Introduction

National laws and regulations require the assessment of the potential exposure of a worker to chemical agents in workplace atmospheres. One way of assessing such exposure is to measure the concentration of a chemical agent in the air in the worker's breathing zone. The procedures used for such measurements should provide reliable and valid results for the comparison purpose of exposure measurements with occupational exposure limit values and for the provision of acceptable control strategies.

This document introduces general requirements to fulfil the measurement procedures in the process of quantitative exposure assessment. Specific European Standards and International Standards have been prepared for different types of measuring procedures and measuring devices. These include Standards for airborne particle samplers (EN 13205, all parts), diffusive samplers (EN 838 and ISO 16107), pumped samplers (EN ISO 22065), short-term detector tubes (EN ISO 17621), personal sampling pumps (EN ISO 13137), metals and metalloids in airborne particles (EN ISO 21832), mixtures of airborne particles and vapour (EN 13936) and direct reading instruments for toxic gases and vapours (EN 45544, all parts). In these specific documents, additional requirements have been included for the procedure or device in question, so that the general requirements of this document are not compromised. Where no specific European Standard and/or International Standard exist, only the general requirements apply.

Performance requirements given in this document are intended to apply under environmental conditions present at the workplace. However, because a wide range of environmental conditions are encountered in practice, this document specifies requirements that have to be fulfilled by measuring procedures when tested under prescribed laboratory conditions.

It is the user's responsibility to choose the appropriate procedures or devices that meet the requirements of this document. One way of doing this is to obtain information or confirmation from the provider of a procedure or the manufacturer of a device. Type-testing or, more generally, assessment of the performance of procedures or devices, can be undertaken by the manufacturer, user, testing house or research and development laboratory, as is most appropriate. A number of existing procedures for workplace measurements have either been tested over a part of the required minimum measuring range, but not over the entire range, or have not been tested for all environmental influences and potential interferences. If these partially validated procedures meet the performance requirements of this document, they can be used at present. Nevertheless these procedures should be tested over the full ranges as soon as is reasonably practicable.

prEN 482:2020 (E)**1 Scope**

This document specifies general performance requirements for procedures for the determination of the concentration of chemical agents in workplace atmospheres as required by the Chemical Agents Directive 98/24/EC [5]. These requirements apply to all steps of measuring procedures regardless of the physical form of the chemical agent (gas, vapour, airborne particles), measuring procedures with separate sampling and analytical methods, and direct-reading devices.

This document specifies requirements that are fulfilled by measuring procedures when tested under prescribed laboratory conditions due to a wide range of environmental conditions encountered in practice.

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 481, *Workplace atmospheres - Size fraction definitions for measurement of airborne particles*

EN 838, *Workplace exposure - Procedures for measuring gases and vapours using diffusive samplers - Requirements and test methods*

EN 1540, *Workplace exposure - Terminology*

EN 13205 (all parts), *Workplace exposure — Assessment of sampler performance for measurement of airborne particle concentrations*

EN 13936, *Workplace exposure - Procedures for measuring a chemical agent present as a mixture of airborne particles and vapour - Requirements and test methods*

EN 45544 (all parts), *Workplace atmospheres — Electrical apparatus used for the direct detection and direct concentration measurement of toxic gases and vapours*

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

EN ISO 17621, *Workplace atmospheres - Short term detector tube measurement systems - Requirements and test methods (ISO 17621)*

EN ISO 21832,¹ *Workplace air —Metalls and metalloids in airborne particles — Requirements for evaluation of measuring procedures*

EN ISO 22065, *Workplace air - Gases and vapours - Requirements for evaluation of measuring procedures using pumped samplers (ISO 22065)*

ISO 78-2, *Chemistry — Layouts for standards — Part 2: Methods of chemical analysis*

ISO 16107, *Workplace atmospheres — Protocol for evaluating the performance of diffusive samplers*

¹ Under preparation.

3 Terms and definitions

For the purposes of this document, the terms and definitions given in EN 1540 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>

4 Classification

4.1 General

In this document, measurements are classified according to their purposes. These classifications are based upon the measurement strategy in EN 689.

4.2 Screening measurements of time-weighted average concentration

Screening measurements of time-weighted average concentration are performed to obtain semiquantitative information on exposure levels. Such information is used to identify potential health hazards, and to estimate the risk to health based on the likely severity of harm and the probability of its occurrence. These measurements can also determine if the exposure is significantly below or above the occupational exposure limit value (OELV). Apparatus intended for detection and concentration measurements of chemical agents, that meet the requirements of this document and is capable of reporting the time weighted average, can be used.

4.3 Screening measurements of variation of concentration in time and/or space

Screening measurements of variation of concentration in time and/or space are used to provide information on the likely pattern of the concentration of chemical agents in the air and to identify locations and periods of elevated exposure. The screening measurements also provide information on the location and intensity of emission sources and to estimate the effectiveness of ventilation or other technical measures. Apparatus intended for detection and concentration measurements of chemical agents, that meet the requirements of this document, can be used.

4.4 Measurements for comparison with occupational exposure limit values (OELVs)

Provided the method meets established acceptable uncertainty criteria, measurements can be made for comparison with OELVs. Measurements can be taken to determine whether a worker's exposure exceeds the OELV initially and repeated after any significant change in working conditions, industrial process, products or chemicals or OELV.

4.5 Periodic measurements

Periodic measurements are used to determine whether exposure conditions have changed since the measurements for comparison with OELVs were performed, or whether control measures remain effective. The interval between measurements should be established based on the initial occupational exposure assessment or subsequent amendments to it.

NOTE Since the composition of the workplace atmosphere will have been investigated during the initial occupational exposure assessment and the composition is known not to vary over time, it can be appropriate for periodic measurements to use procedures with lower selectivity.

5 Performance requirements

5.1 General

Performance requirements for measuring procedures depend on the purpose for which they are used. The performance requirements for screening measurements are less stringent than for measurements for the comparison with limit values and periodic measurements. Therefore, the performance requirements for screening measurements in 5.2 and 5.3 are only given in general terms.

5.2 Screening measurements of time-weighted average concentration

The purpose of these measurements is described in 4.2. The measurement procedures shall include the following:

- a) adequate selectivity for the chemical agent
- b) averaging time less than or equal to the limit value reference period,
- c) measuring range that includes the limit value, and
- d) expanded uncertainty that is fit for purpose.

5.3 Screening measurements of variation of concentration in time and/or space

The purpose of these measurements is described in 4.3. The measurement procedures shall include the following:

- a) adequate selectivity for the chemical agent
- b) short averaging time (for variation of concentration in time ≤ 5 min; for variation of concentration in space ≤ 15 min),
- c) measuring range that is fit for purpose, and
- d) expanded uncertainty that is fit for purpose.

5.4 Measurements for comparison with limit values and periodic measurements

5.4.1 Unambiguity

NOTE A measuring procedure for a given limit value which meets the requirements given in 5.4.1 to 5.4.5 is called compliant method.

A measuring procedure shall produce an unambiguous result for the concentration of the chemical agent being measured in the specified measuring range, i.e. an analytically determined value shall correspond to one concentration only within a known uncertainty.

5.4.2 Selectivity

The measuring procedure shall contain appropriate information about the nature and magnitude of any interference.

NOTE 1 Requirements on selectivity vary from case to case, depending on what is known in advance about the workplace air. If the identity of all contaminants present is not known in advance then the measuring procedure will need to have a high selectivity. If the identity of all contaminants is known prior to measurement and there are no interferences present, then it might be possible to use a measurement procedure with a low or adequate selectivity.

Where a particle size fraction, as defined in EN 481, is specified for an OELV, procedures for measuring chemical agents present as airborne particles shall prescribe a method for sampling the specified particle size fraction.

NOTE 2 In addition to samplers meeting the requirements of EN 481, there are samplers which themselves define the sample (see EN 13205 series).

If different limit values are set for different species of a chemical agent, then the measuring procedure shall determine the individual species concerned.

5.4.3 Averaging time

The averaging time is equal to the sampling time, which shall be less than or equal to the limit value reference period. Depending on the sampling techniques, the sampling time can vary.

NOTE A full shift average concentration, typically the 8 h time-weighted concentration, gives a representative description of the occupational exposure situation.

Exposure peaks which may occur systematically or randomly during the shift should fulfil the short-term exposure limit conditions, if any.

5.4.4 Measuring range

The measuring range of the procedure listed in Table 1 shall cover at least the concentrations from 0,1 times to 2 times the limit value for long-term measurements, and from 0,5 times to 2 times the limit value for short-term measurements.

NOTE Reference [1] provides a list of nationally applicable limit values for workplace air.

5.4.5 Expanded uncertainty

The requirements for expanded uncertainty are given in Table 1.

Table 1 — Expanded uncertainty requirements for measurements for comparison with limit values and periodic measurements

Reference period	Measuring range	Relative expanded uncertainty	Relative expanded uncertainty (mixtures of airborne particles and vapour)
short-term (e.g. 15 min)	0,5 times to 2 times limit value	≤ 50 %	≤ 50 %
long-term	0,1 times to < 0,5 times limit value	≤ 50 %	≤ 50 %
long-term	0,5 times to 2 times limit value	≤ 30 %	≤ 50 %

NOTE Variation of exposure to chemical agents in the workplace can be significantly greater than indicated by the uncertainty of a single measurement calculated according to this document. This is due to the temporal and spatial variability of workplace exposure.

5.4.6 Chemical agents where compliant methods are not available

Limit values are determined by authorities independently from those developing measuring procedures. If a measuring procedure is not available for a given limit value which meets the requirements given in 5.4.4 and 5.4.5 a measuring procedure should be used whose performance is