



SLOVENSKI STANDARD

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Nadomešča:
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Zrak na delovnem mestu - Splošne zahteve za izvajanje meritev kemičnih agensov

Workplace atmospheres - General requirements for the performance of procedures for the measurement of chemical agents

Arbeitsplatzatmosphäre - Allgemeine Anforderungen an die Leistungsfähigkeit von Verfahren zur Messung chemischer Arbeitsstoffe

Atmospheres des lieux de travail - Exigences générales concernant les performances des procédures de mesurage des agents chimiques

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ICS:

13.040.30 Kakovost zraka na delovnem mestu Workplace atmospheres

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EUROPEAN STANDARD
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Workplace atmospheres - General requirements for the
performance of procedures for the measurement of chemical
agents

Atmosphères des lieux de travail - Exigences générales
concernant les performances des modes opératoires de
mesurage des agents chimiques

Arbeitsplatzatmosphäre - Allgemeine Anforderungen an die
Leistungsfähigkeit von Verfahren zur Messung chemischer
Arbeitsstoffe

This European Standard was approved by CEN on 7 July 2006.

CEN members are bound to comply with the CEN/CENELEC Internal Regulations which stipulate the conditions for giving this European Standard the status of a national standard without any alteration. Up-to-date lists and bibliographical references concerning such national standards may be obtained on application to the Central Secretariat or to any CEN member.

This European Standard exists in three official versions (English, French, German). A version in any other language made by translation under the responsibility of a CEN member into its own language and notified to the Central Secretariat has the same status as the official versions.

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EUROPEAN COMMITTEE FOR STANDARDIZATION
COMITÉ EUROPÉEN DE NORMALISATION
EUROPÄISCHES KOMITEE FÜR NORMUNG

Management Centre: rue de Stassart, 36 B-1050 Brussels

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EN 482:2006 (E)**Foreword**

This document (EN 482:2006) 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 February 2007, and conflicting national standards shall be withdrawn at the latest by February 2007.

This document supersedes EN 482:1994.

The major technical change between this European Standard and the previous edition is the revision of the method of calculating the uncertainty of a measurement procedure to comply with ENV 13005.

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

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Introduction

National laws and regulations based on European Directives require the assessment of the potential worker exposure 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 give reliable and valid results so that when compared with set occupational exposure limit values a correct decision can be made, for instance, as to whether the exposure level is acceptable or control measures need to be applied.

Because of their importance in the process of exposure assessment, it is required that the measurement procedures should fulfil some general requirements, which are given in this document. Specific European Standards have been prepared for different types of measuring procedures and measuring devices. These include European Standards for dust samplers (EN 13205), diffusive samplers (EN 838), sorption tubes for active sampling (EN 1076), detector tubes (EN 1231), sampling pumps (EN 1232, EN 12919), metals and metalloids (EN 13890), mixtures of airborne particles and vapours (ENV 13936) and direct reading instruments (EN 45544 all parts). In these specific European Standards 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 exists, only the general requirements apply.

Performance requirements are given in this document for unambiguity, selectivity, expanded uncertainty for minimum specified measuring ranges, averaging time, etc. These requirements are intended to apply under environmental conditions present at the workplace. However, because a wide range of environmental conditions is 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 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, test house or research and development laboratory, as is most appropriate. A number of existing procedures for workplace measurements have been tested over part of the required minimum specified measuring range but not over the entire range (see Table 1) or have not been tested for all environmental influences and potential interference's. If these partially validated procedures meet the performance requirements of this European Standard they can nevertheless be used at present. These procedures should be tested over the full ranges as soon as is reasonably practicable. If there is no measuring procedure for a chemical agent, which meet the requirements of this document, a procedure should be used, whose performance is nearest the specified requirements.

EN 482:2006 (E)**1 Scope**

This document specifies general performance requirements for procedures for determination of the concentration of chemical agents in workplace atmospheres as required by the Chemical Agents Directive 98/24/EC (see [1]). These requirements apply to all measuring procedures, irrespective of the physical form of the chemical agent (gas, vapour, suspended matter) and of the sampling method and analytical method used.

This document is applicable to all steps of a measuring procedure.

This document is applicable to measuring procedures with separate sampling and analysis steps, and also to direct-reading devices.

2 Normative references

The following referenced documents are indispensable for the application of this document. For dated references, only the edition cited applies. For undated references the latest edition of the referenced document applies.

EN 838:1995, *Workplace atmospheres – Diffusive samplers for the determination of gases and vapours – Requirements and test methods*

EN 1076:1997, *Workplace atmospheres – Pumped sorbent tubes for the determination of gases and vapours – Requirements and test methods*

EN 1231, *Workplace atmospheres – Short term detector tube measurement systems – Requirements and test methods*

EN 1232, *Workplace atmospheres – Pumps for personal sampling of chemical agents – Requirements and test methods*

EN 1540, *Workplace atmospheres – Terminology*

EN 12919, *Workplace atmospheres – Pumps for the sampling of chemical agents with a volume flow rate of over 5 l/min – Requirements and test methods*

EN 13205:2001, *Workplace atmospheres – Assessment of performance of instruments for measurement of airborne particle concentrations*

EN 13890, *Workplace atmospheres – Procedures for measuring metals and metalloids in airborne particles – 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*

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

3 Terms and definitions

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

3.1

analytical uncertainty

u_a

combined uncertainty of the analytical procedure including, where relevant, contributions from analytical recovery, analytical variability, interferences, calibration, instrument response drift and blank correction

3.2

averaging time

period of time for which the measuring procedure yields a single value

[EN 1540:1998]

NOTE For direct reading instruments the averaging time is related to the internal electrical time constant. For other procedures it is normally equal to the sampling time.

3.3

bias

consistent deviation of the measured value from the value of the air quality characteristic itself or the accepted reference value

[ISO 6879:1995]

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NOTE 1 In this European Standard the "air quality characteristic" means the concentration of a chemical agent in air.

NOTE 2 In this European Standard the "accepted reference value" can be, for example, the certified value of a reference material, the concentration of a standard test atmosphere or the target value of an interlaboratory comparison.

3.4

chemical agent

any chemical element or compound on its own or admixed as it occurs in the natural state or as produced, used, or released, including release as waste, by any work activity, whether or not produced intentionally and whether or not placed on the market

[Council Directive 98/24/EC Art. 2(a) [1]]

3.5

coverage factor

k

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

NOTE A coverage factor, k , is typically in the range from 2 to 3.

[ENV 13005:1999]

3.6

combined standard uncertainty

u_c

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

EN 482:2006 (E)

[ENV 13005:1999]

**3.7
expanded uncertainty** U

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

[ENV 13005:1999]

**3.8
(occupational exposure) limit value**

limit of the time-weighted average of a chemical agent in the air within the breathing zone of a worker in relation to a specified reference period

[Council Directive 98/24/EC Art. 2(d) [1]]

NOTE Limit values are mostly set for reference periods of 8 h, but can also be set for shorter periods or concentration excursions. Limit values for gases and vapours are stated in terms independent of temperature and air pressure variables in ml/m³ and in terms dependent on those variables in mg/m³ for a temperature of 20 °C and a pressure of 101,3 kPa. Limit values for suspended matter and mixtures of particles and vapours are given in mg/m³ or multiples of that for actual environmental conditions (temperature, pressure) at the workplace. Limit values of fibres are given in number of fibres/m³ or number of fibres/cm³ for actual environmental conditions (temperature, pressure) at the workplace.

**3.9
measurand**

particular quantity subject to measurement

[ENV 13005:1999]

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**3.10
non-random uncertainty**

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uncertainty associated with systematic errors

**3.11
random uncertainty**

uncertainty associated with random errors

**3.12
repeatability conditions**

conditions where independent test results are obtained by the same method on identical test items in the same laboratory by the same operator using the same equipment within short intervals of time

[ISO 3534-1:1993]

**3.13
reproducibility conditions**

conditions where test results are obtained by the same method on identical test items in different laboratories with different operators using different equipment

[ISO 3534-1:1993]

**3.14
sampling uncertainty** u_s

combined uncertainty of the sampling procedure including, where relevant, contributions from sampled air volume, sampling efficiency, sample storage and, if applicable, transport

3.15**standard uncertainty**

uncertainty of the result of a measurement expressed as a standard deviation

[ENV 13005:1999]

3.16**uncertainty (of measurement)**

parameter, associated with the result of a measurement, that characterizes the dispersion of the values that could reasonably be attributed to the measurand

[ENV 13005:1999]

4 Classification**4.1 General**

In this document measuring procedures are classified according to measurement task. This classification is based upon the measurement strategy laid down in EN 689.

NOTE EN 689 describes a number of measurement categories that involve a combination of these measurement tasks (see Annex A).

4.2 Screening measurements of time weighted average concentration

Screening measurements of time weighted average concentration are performed to obtain relatively crude quantitative information on exposure levels in order to decide if an exposure problem exists, and if so, to appraise its possible seriousness. These measurements can also determine if the exposure is well below or well above the (occupational exposure) limit value.

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 air;
- identify locations and periods of elevated exposure;
- provide information on the location and intensity of emission sources;
- estimate the effectiveness of ventilation or other technical measures.

4.4 Measurements for comparison with (occupational exposure) limit values and periodic measurements

Measurements for comparison with (occupational exposure) limit values are used to obtain results of known precision and accuracy for the average concentration of a chemical agent in the air in a worker's breathing zone.

Periodic measurements are used to determine whether exposure conditions have changed since the measurements for comparison with limit values were performed, or whether control measures remain effective (see EN 689).

NOTE Since the composition of the workplace atmosphere will have been investigated during the initial occupational exposure assessment, it might be appropriate for periodic measurements to use procedures with lower selectivity.