SLOVENSKI STANDARD
SIST-TP CEN/TR 17055:2017

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Izpostavljenost na delovnem mestu - Meritve kemičnih agensov v skladu z zahtevami standarda EN 482 in enega izmed standardov EN 838, EN 1076, EN 13205, EN 13890 in EN 13936 - Izbira postopkov

Workplace exposure - Measurement of chemical agents complying with the requirements given in EN 482 and either one of EN 838, EN 1076, EN 13205, EN 13890 and EN 13936 - Choice of procedures

Exposition am Arbeitsplatz - Messung von chemischen Arbeitsstoffen, welche die Anforderungen nach EN 482 sowie nach einer von EN 838, EN 1076, EN 13205, EN 13890 und EN 13936 erfüllen - Auswahl von Verfahren

Exposition sur les lieux de travail - Mesurage des agents chimiques conformément aux exigences de l'EN 482 et de l'une des normes EN 838, EN 1076, EN 13205, EN 13890 et EN 13936 - Choix des procédures

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Workplace exposure - Measurement of chemical agents complying with the requirements given in EN 482 and either one of EN 838, EN 1076, EN 13205, EN 13890 and EN 13936 - Choice of procedures

Exposition sur les lieux de travail - Mesurage des agents chimiques conformément aux exigences spécifiées dans l'EN 482 et dans l'une des normes EN 838, EN 1076, EN 13205, EN 13890 et EN 13936 - Choix des modes opératoires

Exposition am Arbeitsplatz - Messung von chemischen Arbeitsstoffen, welche die Anforderungen nach EN 482 sowie nach einer von EN 838, EN 1076, EN 13205, EN 13890 und EN 13936 erfüllen - Auswahl von Verfahren

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EUROPEAN COMMITTEE FOR STANDARDIZATION
COMITÉ EUROPÉEN DE NORMALISATION
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European foreword

This document (CEN/TR 17055:2017) 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.

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Introduction

Article 3 (10) of the Chemical Agents Directive 98/24/EC [1] called for suitable analytical methods for hazardous substances in workplace atmospheres. However, CEN/TC 137 has adopted a significantly different strategy of standardization which has not involved preparation of separate European Standards for measuring procedures. Instead, CEN/TC 137 has developed several European Standards that present general requirements for measuring procedures and which are used to test whether measuring procedures meet these requirements. A measuring procedure that fulfils these requirements is suitable for the measurement of hazardous substances in workplace atmospheres in the sense of Directive 98/24/EC. To fulfil the demand of Directive 98/24/EC it is necessary to find out whether measuring procedures are available that meet the requirements of the European Standards elaborated by CEN/TC 137.

Several EU Members have committees or organisations which issue measuring procedures. Furthermore, for example, the US National Institute for Occupational Safety and Health (NIOSH) and other institutions of Non-EU-Members publish suitable measuring procedures. The main aim of this CEN Technical Report is to check whether these measuring procedures fulfil the requirements of EN 482.

EN 482 is one of the basic standards elaborated by CEN/TC 137. Whereas, its first edition was already published in 1994, the second edition was published in 2006 subsequent to a major revision that took the principles on laid down in ISO/IEC Guide 98-3 (GUM). As consequence of the issue of the revised EN 482 in 2006 its "daughter standards" EN 838, EN 1076, EN 13890 and EN 13936 needed to be revised fundamentally, too. In 2012, a third edition of EN 482 was published taking into account the changes introduced to its daughter standards during their revisions. In 2015, EN 482 has been amended by introducing a new sub-clause dealing with chemical agents with low limit values and republished as fourth edition of EN 482 consolidated with its Amendment 1.

The "major revision" of EN 482 was one main task of the European project "Analytical methods for chemical agents" funded by the Commission under the Mandate BC/CEN/EN/TR 000/2002-16. The second part of this project was the selection and examination of existing measuring procedures.

The European project report comprises measuring procedures for 126 high profile hazardous substances. The measuring procedures were listed in "methods sheets" and selected (analytical) methods were rated with regard to the requirements of the first edition of EN 482 published in 1994. To make these lists and method sheets easily accessible, a database was established and made publicly available on the IFA homepage designated as "GESTIS - Analytical methods" [2].

From today's point of view, the lists and method sheets are no longer up to date. For some chemical agents the occupational exposure limit values have changed in recent years. Additionally, in the meantime several new measuring procedures have been published which base on the requirements of subsequent editions of EN 482.

For those reasons, it was decided to update the database "Analytical methods for chemical agents" accordingly.

1 Scope

This CEN Technical Report describes how the measuring procedures for chemical agents complying with the requirements given in EN 482 and either one of EN 838, EN 1076, EN 13890, EN 13936 and/or the EN 13205 series, as far as applicable, have been chosen.

This document refers on the selection of chemical agents and related substance groups and the establishment of corresponding method lists. It describes the evaluation of available measuring procedures in order to select for a particular chemical agent the most appropriate one.

This document is also intended to:

— provide a means to compare for a given chemical agent a new measuring procedure with those listed in the database GESTIS Analytical methods [2];

— to evaluate and rate a given measuring procedure (from an accepted source) for a given chemical agent not yet selected in the database GESTIS Analytical methods [2].

2 Measuring procedures

2.1 General

Measuring procedures (“analytical methods”) for chemical agents in workplace atmospheres are available from many sources. In Europe, for example in France, Germany, Spain and UK “official” measuring procedures for workplace atmospheres are published. Furthermore, a number of International Standards have been promulgated the use in this field, but the most important sources of measuring procedures from countries outside Europe are those published by OSHA and NIOSH.

2.2 Selection of chemical agents

Further surveys show that there are about 2000 different chemical agents, mixtures and preparations with existing limit values in Europe [3]. Beyond, many so called “derived no-effect levels” (DNEL's) have been published by the European Chemical Agency (ECHA) since 2010 [4]. It is far beyond the application range of the database to select measuring procedures for all chemical agents with a limit value. In any case for many chemical agents no measuring procedure exists. Furthermore, due to the very specific problems of fibre measurements and measurements of nanoparticles, no procedures for these chemical agents are listed.

The selection of chemical agents is based mainly on the number of measurements carried out in France and Germany. Both countries have similar databases for measurements in workplace atmospheres, and in both countries several hundred thousand measurements have been performed since the early 1970s [5], [6]. These databases give a very good overview about chemical agents of high priority. The chemical agents for the method lists are mainly selected from that group of chemical agents which remained more or less unchanged since 2006, and a few other criteria:

— high number of measurements;

— high profile substances (e.g. diesel fume);

— EU limit value and a reasonable number of measurements;

— limit values in most countries of the EU.

The following substances or groups of chemical agents were selected:

a) aerosols

- inhalable and respirable dust;
- crystalline silica;
- diesel fume;
- metal working fluids/oil mist.

b) metals

- Ag, As, Ba-soluble, Be, Cd, Co, Cr, Cr (VI), Cu, Hg, Mn, Ni, Ni-soluble, Pb, Sb, Sn.

c) Organic substances

- Acetonitrile, Acrylates, Alcohols, Aldehydes, Aliphatic amines, Aliphatic ester alcohols, Aliphatic ethers, Alkanolamines, N-Alkyl-2-pyrrolidons, Amides, Chlorinated aromatic hydrocarbons, Cresols, Cyclic ethers, hydrocarbons (aliphatic, aromatic, cyclic), Esters, Glycol esters, Halogenated hydrocarbons (aliphatic), Isocyanates, Ketones (aliphatic and cyclic), Organic acids, Oxiranes, Phenol

d) Gases

- CO, CO_2, NH_3, N_2O, NO, NO_2, PH_3, SO_2, halogens

e) Inorganic acids and alkaline substances

- Hydrogen cyanide and Cyanides, Hydrogen fluoride and fluorides, Hydroxides, Particulate inorganic acids and anhydrides, Volatile inorganic acids

A list of the chemical agents selected for the database GESTIS – Analytical methods [2] is given in Annex A.

3 Method lists

3.1 General

After selection of chemical agents and related substance groups the basic requirements given in 3.2 are specified.

3.2 Origin of the measuring procedure

The following criteria are taken into account for the compilation of the measuring procedures:

a) The measuring procedure is examined by an independent group and has already been published in another set of (measuring) procedures for measurements in workplace atmospheres.

b) The measuring procedure has been designed for personal exposure measurement and requires the use of a personal sampler.

c) Measuring procedures either using static (area) sampling only or developed for ambient air are excluded from further considerations.

The accepted sources are listed in Table 1.

Table 1 — Accepted sources of methods for workplace air measurements

Abbreviation	Language	Source	Web address
EN	English (French/ German)	European Organization for Standardization (CEN), CEN-CENELEC Management Centre Avenue Marnix 17, B-1000 Brussels, Belgium European Standards Also available from National Standards Bodies, e.g. AFNOR, AENOR, BSI, DIN, SIS etc.	http://www.cen.eu/ with costs
ISO	English (French)	International Organization for Standardization (ISO), ISO Central Secretariat Chemin de Blandonnet 8, Case Postale 401 CH-1214 Vernier, Geneva, Switzerland: International Standards Also available from National Standards Bodies, e.g. AFNOR, AENOR, BSI, DIN, SIS etc.	http://www.iso.org with costs
DGUV I	German	Deutsche Gesetzliche Unfallversicherung (DGUV): Von den Berufsgenossenschaften anerkannte Analysenverfahren zur Feststellung der Konzentration krebserzeugender Arbeitsstoffe in der Luft in Arbeitsbereichen 83 methods since 1983 (some methods are published in DFG (E))	http://publikationen.dguv.de/dguv/udt_dguv_main.aspx?QPX=TUlEPSZDSUQ9MTAwNzI6U0cjR2VmYWhyc3RvZmZl for free
IFA	German	Institut für Arbeitsschutz der Deutschen Gesetzlichen Unfallversicherung IFA-Arbeitsmappe, Messung von Gefahrstoffen, Sankt Augustin. Erich Schmidt Verlag, Berlin, Loose leaf edition, > 50 supplements since 1988	http://bgia-arbeitsmappedigital.de/login.html with costs
DFG (D)	German	Deutsche Forschungsgemeinschaft (DFG): Analytische Methoden zur Prüfung gesundheitsschädlicher Arbeitsstoffe – Luftanalysen, Ed. H. Greim, Wiley-VCH, Weinheim, Germany Loose leaf edition, 18 supplements since 1976	http://onlinelibrary.wiley.com/book/10.1002/3527600418/topics for free

Abbreviation	Language	Source	Web address
DFG (E)	English	Deutsche Forschungsgemeinschaft (DFG): Analyses of Hazardous Substances in Air, Wiley-VCH. Weinheim, New York	http://onlinelibrary.wiley.com/book/10.1002/3527600418/topics for free
MDHS	English	Health and Safety Laboratory (HSL), Harpur Hill, Buxton, Derbyshire SK17 9JN, UK: Methods for the Determination of Hazardous Substances (MDHS) 100 methods since 1979	http://www.hse.gov.uk/pubns/mdhs/ for free
Metropol	French (English)	Institut National de Recherche et de Sécurité (INRS) MétroPol – Métrologie des polluants (Recueil des méthodes de prélèvement et d'analyse de l'air pour l'évaluation de l'exposition professionnelle aux agents chimiques) – INRS, Paris CD edition with cost (new edition every 1 or 2 years) and Website (free downloadable PDF files) updated as needed. 124 methods (1998 to 2016) New database: > 300 methods available from 2016	http://www.inrs.fr/publications/bdd/metropol.html for free
MTA	Spanish	Instituto Nacional de Seguridad e Higiene en el Trabajo (INSHT), c/ Torrelaguna 73, 28027 Madrid Métodos de Toma de muestra y Análisis (MTA) 80 methods since1987	http://www.insht.es/portal/site/Insht/menuitem.a82abc159115c8090128ca10060961ca/?vgnextoid=f6a8908b51593110VgnVCM100000dc0ca8c0RCRD for free
NIOSH	English	National Institute for Occupational Safety and Health (NIOSH), 4676 Columbia Parkway, Cincinnati, OH 45226–1998, USA:	http://www.cdc.gov/niosh/docs/2003-154/ for free
OSHA	English	Occupational Safety and Health Administration (OSHA), Salt Lake Technical Center, 8660 South Sandy Parkway, Sandy, UT 84070, USA: OSHA Sampling and Analytical Methods	http://www.osha.gov/dts/sltc/methods/ for free
IRSST	English French	Institut de recherche Robert-Sauvé en santé et en sécurité de travail (IRSST) 505 Maisonneuve Blvd West, Montréal, Québec H3A 3C2, CANADA	http://www.irsst.qc.ca/laboratoires/outils-references/methodes-laboratoire for free
NOTE For lack of space only the abbreviations of the method publisher are given in the first table column and in the method lists.			

3.3 Structure of the method lists

The aim of the lists of measuring procedures ("method lists") is to give the reader for the chemical agent of interest a first overview and basic information about existing measuring procedures and a first impression of their potential usefulness.

Each method list comprises the following fields of information:

Page header:

— **List Number**

List numbers are ordered from the table where the substances are sorted by WORD by rising CAS-numbers.

— **Substance name, CAS- number, EINECS-Number**

These characters are for identification of the substance.

— **Occupational Exposure Limit Values (8 h, 15 min, ceiling)**

Occupational Exposure Limit values (OELs) can easily be found in the database "GESTIS - International limit values for chemical agents"[3]. Only OELs from European countries are considered.

NOTE 1 OELs can vary over a wide range.

— **Aerosol fraction** (if applicable)

Table Header:

— **Number**

Sequential number of the measuring procedure in the individual method table.

— **Source and method name**

Short form of the source of the measuring procedure (see Table 1) and name of the measuring procedure, web address for the method download

— **Language**

Language of the measuring procedure

NOTE 2 Some measuring procedures are published in the native language and in English for international users.

— **Year of publication**

Year when the measuring procedure was issued.

NOTE 3 E.g. the DFG methods (Germany) are normally published as a group of methods, and for this reason the year of publication and the year of completing the method can be different.

— **Principle of the method**

Brief description of the principle of the measuring procedure. Contains information on the sampling substrate, sample preparation and analytical technique.

— **Flow rate/ recommended air volume**

The column gives information about the sampling conditions (flow rate, recommended air volume) described in the measuring procedure.

— **LOQ/ Validated working range /Expanded uncertainty/Variability**

These data are given in the method description, when available. According to the recommended sampling conditions and the analytical conditions the basic validation data LOQ (Limit of quantification) and/or the validated working range are given. LOQ and the expanded uncertainty (*U*) are the preferred values. Where alternative data are given in that entry, e.g. limit of detection (LOD), overall precision or accuracy, this is mentioned accordingly.

— **Rating**

Rating of the measuring procedure based on the available information (see Clause 4)

— **Remarks**

Brief additional information about e.g. similar measuring procedures, special interferences, reasons for rating

4 Evaluation of measuring procedures

4.1 General

Evaluation and rating is based on the requirements given in EN 482 and either one of EN 838, EN 1076, EN 13890, EN 13936 and/or the EN 13205 series, as far as applicable.

4.2 Rating

For the measuring procedures three method categories are defined:

— **Category A**

The measuring procedure meets the general requirements specified in EN 482 and the specific requirements given in EN 838, EN 1076, EN 13890, EN 13936 and/or the EN 13205 series, as far as applicable.

— **Category B**

The validation data are incomplete but the measuring procedure has the potential to meet the general requirements of EN 482 and the specific requirements given in EN 838, EN 1076, EN 13890, EN 13936 and/or the EN 13205 series, as far as applicable.

NOTE 1 – Usually, only methods assigned “A” or “B” will appear in the method lists.

— **Category C**

The measuring procedure has not the potential to meet the general requirements of EN 482.