



National Institute for Public Health
and the Environment
Ministry of Health, Welfare and Sport

Overview of Occupational Exposure Limits within Europe

RIVM Letter report 2014-0151
M.J. Visser et al.



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Colophon

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Publiekssamenvatting

Overzicht van Europese grenswaarden voor de blootstelling aan stoffen op de werkplek

Het RIVM heeft van 47 (groepen van) stoffen een overzicht gemaakt van de in de EU beschikbare grenswaarden voor beroepsmatige blootstelling en de classificatie die er op basis van mogelijke kankerverwekkende eigenschappen aan wordt gegeven. De overzichten maken het mogelijk om de bestaande grenswaarden en classificaties direct te vergelijken.

Om een veilige en gezonde werkomgeving te creëren voor werknemers die met gevaarlijke stoffen werken, is het belangrijk dat de blootstelling zoveel mogelijk wordt beperkt. Hiervoor is het nodig te bepalen welke concentratie van een stof maximaal in de lucht mag zitten die nog veilig wordt geacht. Deze grenswaarden kunnen worden vastgelegd op Europees niveau, op nationaal niveau of door bedrijven. De regelgeving hiervoor kan echter verschillen, waardoor er voor één stof binnen Europa meerdere grenswaarden kunnen bestaan. Naast de grenswaarden kunnen stoffen worden ingedeeld in categorieën op basis van hun mogelijk kankerverwekkende eigenschappen. Ook voor deze zogeheten classificatie bestaan er binnen Europa verschillende systemen en verschillende criteria.

De gegevens over grenswaarden zijn overgenomen van de beoordelingen van het Wetenschappelijk Comité inzake grenswaarden voor beroepsmatige blootstelling (SCOEL), de Europese wetgeving voor chemische stoffen (REACH)-registratiedossiers, en gepubliceerde grenswaarden in Nederland, Duitsland, Frankrijk, het Verenigd Koninkrijk en Finland. Daarnaast zijn gegevens over classificatie op basis van kankerverwekkende eigenschappen overgenomen van de Europese Commissie en het Internationaal Agentschap voor Kankeronderzoek (IARC).

Trefwoorden: grenswaarden, werkplek, classificatie, Europa

Abstract

Overview of Occupational Exposure Limits within Europe

This report provides an overview of occupational exposure limit values and classifications for carcinogenicity within the EU for 47 (groups of) substances. The data presented allow a direct comparison of the available limit values and classifications.

To assure a safe and healthy workplace for employees working with hazardous chemicals, it is important that the exposure to these substances is minimized. For this purpose, it is necessary to determine the maximum concentration of a chemical in air that may still be considered safe. These occupational exposure limits (OELs) can be set at European level, at national level or by companies themselves. However, regulations for setting OELs may vary, so that for one substance several different OELs may exist within Europe. In addition to OELs, substances can be classified based on their possible carcinogenic properties.

Information on OELs was obtained from the Scientific Committee on Occupational Exposure Limits (SCOEL), the European chemicals legislation (REACH) –dossiers, and statutory OELs published by the Netherlands, Germany, France, the United Kingdom and Finland. Further, data on classification for carcinogenicity was obtained from the European Commission and the International Agency for Research on Cancer (IARC).

Keywords: occupational exposure limits, workplace, classification, Europe.

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1 Introduction

Occupational Exposure Limits (OELs) can be derived by different methods, which may result in a variety of OELs. In 2012, at request of the Dutch Ministry of Social Affairs and Employment, an overview was prepared of OELs and classification of 25 selected carcinogens (van Kesteren *et.al.*, 2012). As a continuation of this work, the current report provides an overview of OELs and classifications of another 47 (groups of) substances. Data on OELs were obtained from the Scientific Committee on Occupational Exposure Limits (SCOEL), five EU member states (the Netherlands, Germany, France, United Kingdom and Finland) and REACH registrant dossiers. In addition, information on classification for carcinogenicity was obtained from the International Agency for Research on Cancer (IARC website, 2014) and the EU Regulation on classification, labelling and packaging of substances (CLP) (EC, 2008). Chapter 2 gives a brief overview of the different methods for the derivation of OELs and classification for carcinogenicity according to the sources consulted. Chapter 3 presents the information on OELs per substance (group) in tabular form and in alphabetical order. Classifications for carcinogenicity, as well as notations for a risk of skin absorption (if derived) and risk of sensitization (general and specific skin or respiratory sensitization) are also reported. The resulting overviews allow direct comparison of the existing OELs and classifications between the five different EU member states, SCOEL, EU CLP and IARC. An investigation into the cause of existing differences between OELs from different sources was beyond the scope of this project.

2 Background

This report provides tabular overviews of Occupational Exposure Limits (OELs), classifications for carcinogenicity and notations for skin absorption and sensitization potential within the EU for 47 (groups of) substances. The tables display the applicable limit values and classifications for carcinogenicity for each of the authorities and evaluating bodies consulted, including some substance-specific remarks that were present in the consulted lists of OELs. The tables do not provide extensive background information on the derivation and setting of the OELs. Therefore, in Section 2.1 some general background information is given on the establishing of OELs by the different authorities that were consulted in this report.

2.1 Occupational Exposure Limits (OELs)

An OEL is the maximum allowed concentration of a given substance in the air at the workplace. The OELs considered in this document are time-weighted averages measured over an 8-hour period (8-h TWA) and short-term exposure limits for a 15 min period (15-min STEL). The methods for derivation of OELs by SCOEL (EU), the Netherlands, Germany, France, UK and Finland are briefly described below. In the REACH legislation another system is utilized, describing the derivation of so-called Derived No-Effect Levels (DNELs) instead of an OEL.

For the derivation of OELs, information from human epidemiological or clinical data (when available) and animal toxicity studies is used. For toxicity endpoints for which a threshold can be identified, health-based OELs are usually based on a No Observed Adverse Effect Level (NOAEL) or a Lowest Observed Adverse Effect Level (LOAEL) identified by animal or human studies. As an alternative, a Benchmark Dose may be used as point of departure. A health-based OEL is a threshold considered to be safe, meaning that no adverse health effects are expected at exposure below this limit value. Health-based OELs usually apply to inhalatory exposure and are thus expressed as mg/m³ or ppm. More information on the derivation of health-based OELs can be found in publications by for instance the European Commission (EC, 2013), the French Agency for Food, Environmental and Occupational Health and Safety (ANSES, 2014) and the European Chemicals Agency (ECHA, 2012). A short description of the process of setting health-based OELs used by the different authorities that were consulted in this report is presented in section 2.2.

For endpoints for which a threshold cannot be derived, as for instance is the case for genotoxic carcinogens and for some sensitizers, concentrations associated with a predefined risk level is in place. For these substances, a safe level of exposure cannot be established because any exposure, however small, may result in adverse health effects. Instead of defining a no-effect concentration, a certain additional risk of developing disease is accepted (for example, an additional mortality risk of 1:100,000 exposed workers per working year). More information on the derivation of risk-based OELs can be found in (Pronk, 2014). Where applicable, information on the accepted risk level accompanying a risk-based OEL is provided in the remarks column of the tables.

2.2 Authorities consulted in the overview of OELs

2.2.1 SCOEL / EU

The Scientific Committee on Occupational Exposure Limits (SCOEL) is an EU commission consisting of independent scientific experts. The SCOEL advises the European Commission on occupational exposure limits for chemicals in the workplace. Recommendations by SCOEL are presented in the results tables including information on the critical effect and critical studies on which the recommendation was based.

Based on SCOEL advice, the EU Directorate-General (DG) for Employment, Social Affairs and Equal Opportunities establishes OELs. EU Member States are obliged to set up national standards for all substances for which an OEL has been published. The EU DG may publish two types of OELs:

- *Indicative OELs*. Indicative OELs apply to substances for which a scientifically based limit value can be set, below which no adverse health effects are expected. Indicative OELs solely consider health effects and do not take into account technical feasibility or socio-economic factors. Member states are allowed to set national OELs that deviate from the indicative OEL, provided that the foundation of their OEL is scientifically based.
- *Binding OELs*. These apply to substances for which a health-based exposure limit cannot be set (such as carcinogenic substances, see section 2.3), as well as for substances with strong socio-economic interest or important technical feasibility constraints. In contrast to indicative OELs, binding OELs do account for technical and socio-economic factors. Member States must apply national OELs that may be lower, but not higher, than the binding OEL.

2.2.2 SER (The Netherlands)

Since 2007, a new system of setting OELs is in force in the Netherlands, in which responsibility for workers' safety has shifted from the government towards industry itself. Until then, the Dutch system of setting legally binding OELs comprised three steps: recommendation of a health-based exposure limit by the Health Council, followed by evaluation of the health-based value by a subcommittee of the Social and Economic Council (SER) of the Netherlands – taking into account socio-economic factors and technical feasibility – and eventually adoption by the State Secretary of the Ministry of Social Affairs and Employment. At the introduction of the new OEL system in 2007, most of these legally binding OELs were withdrawn. Statutory OELs have been maintained for those substances for which a European OEL has been published, for substances that have no 'owner' within the field of industry (e.g., wood dust) and for substances of high concern (e.g., carcinogens). When there is no statutory OEL, the legal responsibility to derive an OEL is a private responsibility, meaning that OELs need to be set by the individual companies themselves. This report includes only the statutory OELs, as obtained from the Social and Economic Council of the Netherlands (SER, website) and the website "overheid.nl".

2.2.3 DFG (Germany)

Each year, the German Research Organisation (DFG) publishes a list of "MAK-werte" ("Maximale Arbeitsplatz Konzentration", or maximum concentration value in the workplace). These are scientifically substantiated recommendations on average 8-hour exposure limits for workers, which are derived by the Senate Commission for testing hazardous substances ('MAK'- commission) of the DFG. The exposure limits proposed by DFG are not legally binding. However, they can

be adopted as legal limits by the Federal Institute for Occupational Safety and Health (BAuA).

In addition to the list of exposure values, further recommendations on substances with carcinogenic, mutagenic, reprotoxic, or sensitizing properties, or substances that have toxic effects after absorption through the skin, are included in the 'MAK-werte' document in separate appendices.

According to DFG, short-term exposure (measured as 15-min average) may sometimes exceed the 8-h TWA by a so-called 'exceedance factor', which lies between 1 and 8. The application of an exceedance factor is equivalent to a 15-min STEL. For the application of exceedance factors, two categories of substances are distinguished:

- **Category I: Substances with local effects or airway sensitizers.** For these substances, the 8-h TWA may not be exceeded (standard exceedance factor = 1), unless indicated otherwise by a substance-specific exceedance factor. If a substance-specific exceedance factor > 1 is reported, the 8-h TWA may be exceeded by this factor for an exposure duration of maximum 15 minutes, which may happen maximally 4 times per shift, at intervals of minimum 1 hour apart. For some substances in Category I, a ceiling value is reported, also expressed as an exceedance factor. For example, a ceiling value expressed as an exceedance factor of 4 means that the exposure may not be higher than 4 times the 8-h TWA *at any time*.
- **Category II: Substances with systemic effects.** For these substances the standard exceedance factor is 2, unless a substance-specific exceedance factor > 2 is reported. For substances in Category II, the duration of short-term exposure exceeding the 8-h TWA is allowed to be longer than 15 minutes, *as long as the product of the exceedance factor and the exposure time, measured in 15-min intervals, does not exceed the 8-h TWA by the reported factor*. For example, if an exceedance factor of 8 is reported, the exposure may exceed the 8-h TWA with a factor of 8 during a 15-min exposure period, or with a factor of 4 during a 30-min exposure period, or with a factor of 2 during a 60-min exposure period. The total duration of exposure exceeding the 8-h TWA may be 60 minutes per shift, and multiple short-term exposure intervals should be at minimum 1 hour apart.

In the results tables of this report, 15-min STEL values are reported that are based on the exceedance factors presented by DFG. The accompanying substance category and exceedance factors are reported in footnotes at the bottom of the tables.

2.2.4 BAuA (Germany)

In Germany, legal OELs are established by the Federal Institute for Occupational Safety and Health (BAuA). A document with technical rules for hazardous substances (Technische Regeln für Gefahrstoffe; TRGS) is set up by the German Committee on Hazardous Substances (Ausschuss für Gefahrstoffe; AGS), an advisory body of the BAuA. This committee develops OELs taking into account the scientific advice from the Senate Commission for testing hazardous substances of the DFG, the Dutch 'Committee on Updating of Occupational Exposure Limits' (a commission of the Health Council of the Netherlands), and existing EU limit values. The TRGS documents are made official through publication by the German Ministry of Occupational and Social Affairs. The OELs in this report were taken from *TRGS 900*. Like DFG, BAuA also reports exceedance factors, which have been used to calculate 15-min STEL values as described above.

2.2.5 *INRS (France)*

The French National Institute for Research and Safety (INRS) regularly publishes a list of OELs, which have been established by the ministry of Occupation. Three types of OELs are distinguished:

- Restrictive statutory limit values ('valeurs limites réglementaires contraignants'), which are legally binding (e.g., for asbestos),
- Indicative statutory limit values ('valeurs limites réglementaires indicatives'), which are indicative OELs (e.g., as recommended by SCOEL) that have been officially adopted by the French *Code du Travail*,
- Indicative limit values ('valeurs limites indicatives'), which can be used for prevention purposes. These values will be gradually replaced by indicative or restrictive statutory limits.

The derivation of indicative exposure limits based on scientific evidence is done by the French Agency of Food, Environmental and Occupational Health and Safety, ANSES.

2.2.6 *HSE (UK)*

In the United Kingdom, exposure to hazardous substances at the workplace is regulated by the Control of Substances Hazardous to Health Regulations, version 2002 (COSHH, 2002). Under COSHH, Workplace Exposure Limits (WELs) are set by the Health and Safety Executive (HSE). The WELs are largely based on the Indicative OELs proposed by the SCOEL. WELs are reported as 8-h TWA values and 15-min STEL values.

2.2.7 *Finnish Ministry of Social Affairs and Health (Finland)*

In Finland, OELs (8-h TWA values and 15-min STEL values) are set by the Ministry of Social Affairs and Health, according to the Decree on Concentrations Known to be Hazardous. In addition to the OELs, risk of skin absorption is indicated and applicable H-phrases and R-phrases are mentioned. The H- and R-phrases, however, have not been included in the results tables of this report as they correspond to international classification systems and are not specific for the Finnish assignment of OELs.

2.2.8 *REACH*

REACH (Registration, Evaluation, Authorisation and restriction of Chemical substances) is the European Community Regulation on chemicals and their safe use (EC 1907/2006), which has entered into force on June 1st, 2007. The publicly available information of REACH dossiers that are submitted by manufacturers and/or importers were obtained from the European Chemicals Agency (ECHA, website). The toxicological information in these dossiers may contain Derived No-Effect Levels (DNELs). The DNEL must address differences in exposure duration (acute, repeated) and routes (such as inhalation or skin contact), different exposed (sub)populations (e.g. at the workplace, general public) and differentiate between systemic and local effects, as appropriate for the identified use(s). Thus, several DNELs may be presented for each individual substance (REACH, Annex I, 1.4.1). Only the DNELs derived for workers are considered in the present document. According to the 'Guidance on information requirements and chemical safety assessment' (ECHA, 2012), long-term DNELs (DNEL_{long-term}) for inhalatory exposure are derived from human data (if available) or from repeated dose toxicity studies in animals (either chronic or sub-chronic). DNEL_{long-term} values are reported as 8-h TWA values in the tables. If an acute toxicity hazard exists, or if high peak exposures are expected (as a rule of thumb: when peak exposures significantly exceed the DNEL_{long-term}), a DNEL for

acute exposure (DNEL_{acute}) is also derived. Derivation of DNEL_{acute} values is usually based on NOAEC or LOAEC values from animal studies. Before any assessment factors are applied (e.g., to correct for inter-species differences), a time-scaling step is performed to correct for differences in exposure duration. The DNEL_{acute} values for the worker population always represent exposure duration of 15 minutes. Therefore, these have been included in the tables as 15-min STEL values. If DNELs were reported for both systemic and local effects, the lowest DNEL reported was chosen. DNELs for exposure via the dermal routes are included in the remarks.

Of note, the derivation of a DNEL is only required for substances manufactured, imported or used in quantities from 10 tonnes per year onwards that are classified (ECHA, 2010). Additionally, the data on which DNELs are based differ between the tonnage levels and the use.

2.3 Classification systems for carcinogenicity used by the authorities consulted in this report

Between different agencies, different systems are applied for the carcinogenic classification of substances. This section briefly summarizes the different classification systems that are included in this report's results tables.

2.3.1 IARC

The International Agency for Research on Cancer (IARC) is an intergovernmental agency that is part of the World Health Organisation of the United Nations. IARC maintains a series of 'Monographs on the Evaluation of Carcinogenic Risks to Humans'. The Monographs are based on expert reviews of scientific evidence by an interdisciplinary working group. In addition to the potential carcinogenicity of chemical agents, physical agents, biological agents and lifestyle factors are also considered. IARC distinguishes five classes:

- Group 1: Carcinogenic to humans
- Group 2A: Probably carcinogenic to humans
- Group 2B: Possibly carcinogenic to humans
- Group 3: Not classifiable as to its carcinogenicity to humans
- Group 4: Probably not carcinogenic to humans

Up-to-date classifications (last update on March 31st, 2014) and the corresponding monographs were obtained from the IARC list of classified agents (IARC website, 2014).

2.3.2 EU

The EU Regulation on classification, labelling and packaging of substances (CLP) entered into force in 2009. The methods for classification used within CLP are based on the United Nations' Globally Harmonised System (GHS). CLP classifications are legally binding within the European Union. Three classes are distinguished (EC, 2008):

- CLP class 1A: known carcinogenic potential for humans
- CLP class 1B: presumed carcinogenic potential for humans
- CLP class 2: suspected human carcinogens.

2.3.3 SCOEL

The SCOEL distinguishes four main groups of mutagens and carcinogens (EC, 2013):

- Group A: Non-threshold genotoxic carcinogens
- Group B: Genotoxic carcinogens, for which the existence of a threshold cannot be sufficiently supported

- Group C: Genotoxic carcinogens for which a practical threshold is supported
 - Group D: Non-genotoxic carcinogens and non-DNA-reactive carcinogens, for which a true threshold is associated with a clearly funded NOAEL.
- For substances in Groups C and D, SCOEL can derive health-based OELs. For substances in Groups A and B for which sufficient data is available, a carcinogenic risk assessment is carried out using a linear non-threshold model.

2.3.4 *Germany (DFG)*

In their scientific substance evaluations, the German DFG applies a 5-scale classification for carcinogenicity:

- Class 1: Substances for which carcinogenicity to humans is established through epidemiological data and/or known working mechanisms in humans. For these substances, no OEL is derived.
- Class 2: Substances that are considered to be carcinogenic to humans based on animal and in vitro data. For these substances, no OEL is derived.
- Class 3: Substances that are suspected to be carcinogenic to humans, but for which insufficient data is available for classification. A preliminary classification is attributed:
 - o 3A: Substances that fulfill the conditions for classification in class 4 or 5, but for which no sufficient information is available to derive an exposure limit or a bioconcentration limit.
 - o 3B: Substances for which carcinogenicity is indicated by in vitro and/or animal data but for which the available information is not sufficient for classification. Exposure or bioconcentration limits can be derived if the substance or its metabolites is not genotoxic.
- Class 4: Substances for which the primary mechanism of carcinogenicity is known to be non-genotoxic and no genotoxic effects are expected at concentrations below the OEL.
- Class 5: Genotoxic substances for which a safe threshold OEL can be derived supported by information on working mechanism, toxicokinetics and dose-response.

Where applicable, these classifications are also included in the results tables of this report.

3 Overview of substances

3.1 Overview by compound name

Compound name	CAS-number	Table #
1,4-Dichlorobenzene	106-46-7	1
2-Ethylhexanol	104-76-7	2
4-aminotoluene	106-49-0	3
Acetic acid	64-19-7	4
Acrolein	107-02-8	5
Acrylic acid	79-10-7	6
Aerosols of Severely Refined Mineral Oils		7
Amitrole	61-82-5	8
Bisphenol-A	80-05-7	9
But-2-yne-1,4-diol	110-65-6	10
Cadmium	7440-43-9	11
Calcium dihydroxide	1305-62-0	12
Carbon monoxide	630-08-0	13
Carbon tetrachloride	56-23-5	14
Copper and inorganic compounds		15
Cresols (all isomers)	1319-77-3	16
Diacetyl	431-03-8	17
Dinickel trioxide	1314-06-3	33/ 33b
Diphenyl ether	101-84-8	18
DPBDE	32536-52-0	19
Ehtyl Acetate	141-78-6	20
Flour dust		21
Glyceryl trinitrate	55-63-0	22
Hydrogen cyanide (HCN)	74-90-8	23 / 23a
Hydrogenated terphenyl	61788-32-7	24
Lead chromate		25
Lithium hydride	7580-67-8	26
Man made mineral fibres (MMMF)		27
Man made vitreous fibres (MMVF-10)		28
Manganese and inorganic manganese compounds		29
Methyl formate	107-31-3	30
Methylene chloride	75-09-2	31
Naphtalene	91-20-3	32
Nickel (metallic)	7440-02-0	33/ 33a
Nickel acetate	373-02-4	33/ 33b
Nickel carbonate	3333-67-3	33/ 33b
Nickel chloride	7718-54-9	33/ 33b
Nickel dioxide,nickel (IV) oxide	12035-36-8	33/ 33b
Nickel hydroxide	12054-48-7	33/ 33b
Nickel monoxide, nickel (II) oxide	1313-99-1	33/ 33b
Nickel nitrate	13138-45-9	33/ 33b
Nickel subsulphide	12035-72-2	33/ 33b
Nickel sulphate	7786-81-4	33/ 33b
Nickel sulphide	16812-54-7	33/ 33b
Nitroethane	79-24-3	34

Nitrogen dioxide	10102-44-0	35
Nitrogen monoxide	10102-43-9	36
N-methylaniline	100-61-8	37
Picric acid	88-89-1	38
Platinum (metallic)	7440-06-4	39
Potassium cyanide (KCN)	151-50-8	23 /23b
Pyridine	110-86-1	40
Sodium cyanide (NaCN)	143-33-9	23 /23c
Sulphur Dioxide	7446-09-5	41
Tetrachloroethylene (PER)	127-18-4	42
Tetraethylsilicate	78-10-4	43
Tin (inorganic compounds as Sn)		44
Tributyltin	56-35-9	45
Vinylidene chloride	75-35-4	46
White Spirit		47
White Spirit Type 1	64742-82-1	47
White Spirit Type 3	64742-48-9	47

3.2 Overview by CAS number

Compound name	CAS-number	Table #
Aerosols of Severely Refined Mineral Oils		7
Copper and inorganic compounds		15
Flour dust		21
Lead chromate		25
Man made mineral fibres (MMMF)		27
Man made vitreous fibres (MMVF-10)		28
Manganese and inorganic manganese compounds		29
Tin (inorganic compounds as Sn)		44
White Spirit		47
Glyceryl trinitrate	00055-63-0	22
Carbon tetrachloride	00056-23-5	14
Tributyltin	00056-35-9	45
Amitrole	00061-82-5	8
Acetic acid	00064-19-7	4
Hydrogen cyanide (HCN)	00074-90-8	23 / 23a
Methylene chloride	00075-09-2	31
Vinylidene chloride	00075-35-4	46
Tetraethylsilicate	00078-10-4	43
Acrylic acid	00079-10-7	6
Nitroethane	00079-24-3	34
Bisphenol-A	00080-05-7	9
Picric acid	00088-89-1	38
Naphtalene	00091-20-3	32
N-methylaniline	00100-61-8	37
Diphenyl ether	00101-84-8	18
2-Ethylhexanol	00104-76-7	2
1,4-Dichlorobenzene	00106-46-7	1
4-aminotoluene	00106-49-0	3
Acrolein	00107-02-8	5
Methyl formate	00107-31-3	30

But-2-yne-1,4-diol	00110-65-6	10
Pyridine	00110-86-1	40
Tetrachloroethylene (PER)	00127-18-4	42
Ehtyl Acetate	00141-78-6	20
Sodium cyanide (NaCN)	00143-33-9	23 /23c
Potassium cyanide (KCN)	00151-50-8	23 /23b
Nickel acetate	00373-02-4	33/ 33b
Diacetyl	00431-03-8	17
Carbon monoxide	00630-08-0	13
Calcium dihydroxide	01305-62-0	12
Nickel monoxide, nickel (II) oxide	01313-99-1	33/ 33b
Dinickel trioxide	01314-06-3	33/ 33b
Cresols (all isomers)	01319-77-3	16
Nickel carbonate	03333-67-3	33/ 33b
Nickel (metallic)	07440-02-0	33/ 33a
Platinum (metallic)	07440-06-4	39
Cadmium	07440-43-9	11
Sulphur Dioxide	07446-09-5	41
Lithium hydride	07580-67-8	26
Nickel chloride	07718-54-9	33/ 33b
Nickel sulphate	07786-81-4	33/ 33b
Nitrogen monoxide	10102-43-9	36
Nitrogen dioxide	10102-44-0	35
Nickel dioxide,nickel (IV) oxide	12035-36-8	33/ 33b
Nickel subsulphide	12035-72-2	33/ 33b
Nickel hydroxide	12054-48-7	33/ 33b
Nickel nitrate	13138-45-9	33/ 33b
Nickel sulphide	16812-54-7	33/ 33b
DPBDE	32536-52-0	19
Hydrogenated terphenyl	61788-32-7	24
White Spirit Type 3	64742-48-9	47
White Spirit Type 1	64742-82-1	47

3.3 Table 1: 1,4-Dichlorobenzene (*p*-dichlorobenzene, *p*-chlorophenyl chloride) (CAS 106-46-7)

CARC: Carcinogenicity classification; SKIN: Risk of skin absorption; SENS: Risk of sensitization; YoE: Year of Evaluation

Evaluation	Occupational Exposure Limits				CARC	SKIN	SENS	YoE	Remarks	Reference
	8-hour TWA (mg/m ³)	8-hour TWA (ppm)	15-min STEL (mg/m ³)	15-min STEL (ppm)						
IARC/WHO	-	-	-	-	2B	-	-	1999	Based on induction of liver tumors in mice, and DNA damage in mouse liver and spleen.	IARC, 1999b
EU	122	20	306	50	2	-	-	2000	Indicative OEL	IFA (GESTIS), website EC, 2000
SCOEL	12	2	60	10	D	Yes	-	2014	8-h TWA based on NOAEC for effects on lung, liver and kidney in dogs after oral exposure. 15-min STEL based on NOAEC for effects at nasal epithelium in long-term inhalation study in rats. Skin notation based on model calculations.	SCOEL, 2014b
NL	150	-	300	-	-	-	-	1994	Based on SCOEL advice, 1994. The latest SCOEL recommendation update (2014) has not been adopted yet	Overheid.nl, website SER, website
GE (DFG)	-	-	-	-	2	Yes	-	-	-	DFG, 2014
GE (AGS)	6	1	12*	2*				2009	No risk for teratogenic effects if OEL is not exceeded	BAuA, 2014
UK	153	25	306	50	-	-	-	-	-	HSE, 2011
FR	4.5	0.75	306	50	2			2004	Indicative statutory limit values.	INRS, 2012
FI	120	20	300	50	-	-	-	-	-	Social- och hälsovårdsminist eriets, 2014
REACH	46.1	-	300	-	-	-	-	2011	DNEL _{long-term} based on NOAEC in repeated dose inhalation study in rats. DNEL _{acute} based on EU IOEL. DNELs for dermal exposure: DNEL _{long-term} = 1.4 mg/kg bw/day, based on repeated dose toxicity; DNEL _{acute} = 7 mg/kg bw/day, extrapolated from DNEL _{long-term} .	ECHA, website

* Category II; exceedance factor=2 (see Introduction section 2.2.3)

3.4 Table 2: 2-ethylhexanol (CAS 104-76-7)

CARC: Carcinogenicity classification; SKIN: Risk of skin absorption; SENS: Risk of sensitization; YoE: Year of Evaluation

Evaluation	Occupational Exposure Limits				CARC	SKIN	SENS	YoE	Remarks	Reference
	8-hour TWA (mg/m ³)	8-hour TWA (ppm)	15-min STEL (mg/m ³)	15-min STEL (ppm)						
IARC/WHO	-	-	-	-	-	-	-	-	-	-
EU	-	-	-	-	-	-	-	-	-	-
SCOEL	5.42	1	-	-	-	-	-	2011	OEL based on NOAEL of 1.5 ppm, critical effect: irritation of eyes and airways.	SCOEL, 2011e
NL	-	-	-	-	-	-	-	-	Former 8-hour TWA = 110 mg/m ³ , withdrawn 01-01-2007.	SER, website
GE (DFG)	54	10	54*	10*	-	-	-	-	Chemical can be present as vapour and/or aerosol. No risk for teratogenic effects if OEL is not exceeded.	DFG, 2014 IFA (GESTIS), website
GE (AGS)	110	20	110*	20*	-	-	-	2013	Chemical can be present as vapour and/or aerosol. No risk for teratogenic effects if OEL is not exceeded.	BAuA, 2014 IFA (GESTIS), website
UK	-	-	-	-	-	-	-	-	-	-
FR	-	-	-	-	-	-	-	-	-	-
FI	5.4	1	-	-	-	-	-	-	-	Social- och hälsovårdsmi nisteriets, 2014
REACH	12.8	-	53.2	-	-	-	-	2011	DNEL _{long-term} based on NOAEC in repeated dose toxicity, inhalation study. DNEL _{acute} based on NOAEC for local effect (respiratory tract irritation) derived from human data. DNEL _{long-term} for dermal exposure = 23 mg/kg bw/day, based on NOAEL for systemic effects in repeated dose toxicity (extrapolated from oral route).	ECHA, website

* Category I; exceedance factor=2 (see Introduction section 2.2.3)

3.6 Table 3: 4-aminotoluene (*p*-Toluidine, 4-toluidine, 4-methylaniline, *p*-methylaniline) (CAS 106-49-0)

CARC: Carcinogenicity classification; SKIN: Risk of skin absorption; SENS: Risk of sensitization; YoE: Year of Evaluation

Evaluation	Occupational Exposure Limits				CARC	SKIN	SENS	YoE	Remarks	Reference
	8-hour TWA (mg/m ³)	8-hour TWA (ppm)	15-min STEL (mg/m ³)	15-min STEL (ppm)						
IARC/WHO	-	-	-	-	-	-	-	-	-	-
EU	-	-	-	-	2	-	Yes	-	-	EC, 2008
SCOEL	-	1	-	2	-	Yes	-	2013	Provisional assignment based on induction of methaemoglobinaemia. Further data on genotoxicity and carcinogenicity <i>in vivo</i> are needed.	SCOEL, 2013
NL	-	-	-	-	-	-	-	-	Former 8-h TWA of 9 mg/m ³ , based on advice of the American Conference of Governmental Industrial Hygienists, withdrawn 01-01-2007	SER, website
GE (DFG)	-	-	-	-	3B	Yes	Yes	-	-	DFG, 2014
GE (AGS)	-	-	-	-	-	-	-	-	-	-
UK	-	-	-	-	-	-	-	-	-	-
FR	-	-	-	-	-	-	-	-	-	-
FI	-	-	-	-	-	-	-	-	-	-
REACH	-	-	-	-	-	-	-	2011	No DNELs reported	ECHA, website

3.7 Table 4: Acetic acid (CAS 64-19-7)

CARC: Carcinogenicity classification; SKIN: Risk of skin absorption; SENS: Risk of sensitization; YoE: Year of Evaluation

Evaluation	Occupational Exposure Limits				CARC	SKIN	SENS	YoE	Remarks	Reference
	8-hour TWA (mg/m ³)	8-hour TWA (ppm)	15-min STEL (mg/m ³)	15-min STEL (ppm)						
IARC/WHO	-	-	-	-	-	-	-	-	-	-
EU	25	10	-	-	-	-	-	-	-	IFA (GESTIS), website
SCOEL	25	10	50	20	-	-	-	2012	OELs based on volunteers studies with irritation of the skin and mucous membranes as critical effect.	SCOEL, 2012b
NL	-	-	-	-	-	-	-	-	-	-
GE (DFG)	25	10	50*	20*	-	-	-	-	-	DFG, 2014 IFA (GESTIS), website
GE (AGS)	25	10	50*	20*	-	-	-	2007	No risk for teratogenic effects if OEL is not exceeded.	BAuA, 2014 IFA (GESTIS), website
UK	-	-	-	-	-	-	-	-	Former 8-hr TWA of 25 mg/m ³ and 15-min STEL of 37 mg/m ³ , withdrawn since 2005.	HSE, 2011
FR	-	-	25	10	-	-	-	1982	Indicative limit value.	INRS, 2012
FI	13	5	25	10	-	-	-	-	-	Social- och hälsovårdsminist eriets, 2014
REACH	25	-	25	-	-	-	-	2011	DNELs based on NOAEC for local effect (respiratory tract irritation). No threshold effect or dose response information available for dermal DNEL.	ECHA, website

* Category I; exceedance factor=2 (see Introduction section 2.2.3)

3.8 Table 5: Acrolein (Propenal, Prop-2-enal, Acraldehyde, Acrylic Aldehyde, Allyl Aldehyde, Ethylene Aldehyde) (CAS 107-02-8)

CARC: Carcinogenicity classification; SKIN: Risk of skin absorption; SENS: Risk of sensitization; YoE: Year of Evaluation

Evaluation	Occupational Exposure Limits				CARC	SKIN	SENS	YoE	Remarks	Reference
	8-hour TWA (mg/m ³)	8-hour TWA (ppm)	15-min STEL (mg/m ³)	15-min STEL (ppm)						
IARC/WHO	-	-	-	-	3	-	-	1995	There is insufficient evidence in humans as well as in experimental animals for a carcinogenicity classification. Due to its intense irritancy, exposure to acrolein may be limited.	IARC, 1995
EU	-	-	-	-	-	-	-	-	-	EC, 2008
SCOEL	0.05	0.02	0.12	0.05	-	-	-	2007	TWA based on LOAEL for bronchial damage in rat. STEL based on human volunteer studies.	SCOEL, 2007a
NL	-	-	-	-	-	-	-	-	Former 8-hour TWA = 0.05 mg/m ³ and 15-min STEL 0.12 mg/m ³ based on SCOEL (1997), withdrawn 01-01-2007.	SER, website
GE (DFG)	-	-	-	-	-	-	-	-	-	-
GE (AGS)	0.2	0.09	0.4*	0.18*	-	Yes	-	2007	-	BAuA, 2014 IFA (GESTIS), website
UK	0.23	0.1	0.7	0.3	-	-	-	-	-	HSE, 2011
FR	-	-	0.25	0.1	-	-	-	1982	Indicative limit value.	INRS, 2002
FI	-	-	0.23	0.1	-	-	-		Ceiling value.	Social-och Halsovarndsministeriet, 2014
REACH	0.2	-	-	-	-	-	-	2011	DNEL _{long-term} based on NOAEC in repeated dose toxicity. DNEL _{long-term} for dermal exposure = 0.08 mg/kg bw/day, based on LOAEL in repeated dose toxicity. No-threshold effect and/or no dose-response information available for acute exposure.	ECHA, website

* Category I; exceedance factor=2 (see Introduction section 2.2.3)

3.9 Table 6: Acrylic acid (CAS No. 79-10-7)

CARC: Carcinogenicity classification; SKIN: Risk of skin absorption; SENS: Risk of sensitization; YoE: Year of Evaluation

Evaluation	Occupational Exposure Limits				CARC	SKIN	SENS	YoE	Remarks	Reference
	8-hour TWA (mg/m ³)	8-hour TWA (ppm)	15-min STEL (mg/m ³)	15-min STEL (ppm)						
IARC/WHO	-	-	-	-	3	-	-	1999	-	IARC, 1999
EU	-	-	-	-	-	-	-	-	-	-
SCOEL	29	10	59	20	-	-	-	2012	8-hour TWA based on NOAEL of 75 mg/m ³ (25 ppm) (irritation of olfactory epithelium). STEL limited to 1 minute.	SCOEL, 2012c
NL	-	-	-	-	-	-	-	-	Former 8-hour TWA = 5.9 mg/m ³ (1994), withdrawn 01-01-2007.	SER, website
GE (DFG)	30	10	30*	10*	-	-	-	-		DFG, 2014 IFA (GESTIS), website
GE (AGS)	30	10	30*	10*	-	-	-	2007	No risk for teratogenic effects if OEL is not exceeded.	BAuA, 2014 IFA (GESTIS), website
UK	-	-	-	-	-	-	-	-	Former limits: 8-hour TWA of 30 mg/m ³ (10 ppm) and STEL of 60 mg/m ³ (20 ppm). The UK Advisory Committee on Toxic Substances has expressed concern that health may not be adequately protected, because of doubts that the limit was not soundly based. The 8-hour TWA and STEL are omitted from the published EH40 list in 2005.	IFA (GESTIS), website
FR	6	2	30	10	-	-	-	1996	Indicative limit values.	INRS, 2012
FI	6	2	45	15	-	-	-	-	-	Social-och Halsovardsministeriet, 2014

* Category I; exceedance factor=2 (see Introduction section 2.2.3)

Evaluation	Occupational Exposure Limits				CARC	SKIN	SENS	YoE	Remarks	Reference
	8-hour TWA (mg/m ³)	8-hour TWA (ppm)	15-min STEL (mg/m ³)	15-min STEL (ppm)						
REACH	30	-	30	-	-	-	-	2011	Derivation of DNELs not reported, except for the critical effects: respiratory tract irritation and skin corrosion (DNEL _{acute} = 1 mg/cm ²)	ECHA, website

3.10 Table 7: Aerosols of Severely Refined Mineral Oils (CAS: 8012-95-1)

CARC: Carcinogenicity classification; SKIN: Risk of skin absorption; SENS: Risk of sensitization; YoE: Year of Evaluation

Evaluation	Occupational Exposure Limits				CARC	SKIN	SENS	YoE	Remarks	Reference
	8-hour TWA (mg/m ³)	8-hour TWA (ppm)	15-min STEL (mg/m ³)	15-min STEL (ppm)						
IARC/WHO	-	-	-	-	3	-	-	-	Inadequate evidence in humans and animals.	IARC, 1987
EU	-	-	-	-	-	-	-	-	-	-
SCOEL	5	-	-	-	-	-	-	-	OELS applies to inhalable fraction.	SCOEL, 2011g
NL	5	-	-	-	-	-	-	-	Adapted from the American Conference of Governmental Industrial Hygienists	SER, website. Overheid.nl, website
GE (DFG)	-	-	-	-	-	-	-	-	-	-
GE (AGS)	-	-	-	-	-	-	-	-	-	-
UK	-	-	-	-	-	-	-	-	Former 8-h TWA of 5 mg/m ³ and STEL of 10 mg/m ³ , withdrawn in 2005	IFA (GESTIS), website
FR	-	-	-	-	-	-	-	-	-	-
FI	-	-	-	-	-	-	-	-	-	-
REACH	5	-	5	-	-	-	-	-	DNEL applies to paraffin oils. No information on derivation of DNELs.	ECHA, website.

3.11 Table 8: Amitrole (1,2,4-triazol-3-ylamine) (CAS 61-82-5)

CARC: Carcinogenicity classification; SKIN: Risk of skin absorption; SENS: Risk of sensitization; YoE: Year of Evaluation

Evaluation	Occupational Exposure Limits				CARC	SKIN	SENS	YoE	Remarks	Reference
	8-hour TWA (mg/m ³)	8-hour TWA (ppm)	15-min STEL (mg/m ³)	15-min STEL (ppm)						
IARC/WHO	-	-	-	-	3	-	-	2001	Overall evaluation downgraded to Group 3 with supporting evidence from other relevant data	IARC, 2001a
EU	-	-	-	-	-	-	-	-	-	EC, 2008
SCOEL	0.2	-	-	-	D	-	-	-	OEL Derived from NOAEL for thyroid gland effects in rat and dog.	SCOEL, 2009e
NL	-	-	-	-	-	-	-	-	Former 8-hour TWA = 0.2 mg/m ³ (1989), withdrawn 01-01-2007.	SER, website
GE (DFG)	0.2 ^{*†}	-	1.6 ^{*†}	-	4	Yes	-	-	-	DFG, 2014 IFA (GESTIS), website
GE (AGS)	0.2 ^{*†}	-	1.6 ^{*†}	-	-	Yes	-	2013	No risk for teratogenic effects if OEL is not exceeded	BAuA, 2014 IFA (GESTIS), website
UK	-	-	-	-	-	-	-	-	-	-
FR	0.2	0.06	-	-	-	-	-	1996	Indicative limit value.	INRS, 2002
FI	-	-	-	-	-	-	-	-	On the list for upcoming evaluation	Social-och Halsovards- ministeriet, 2014
REACH	-	-	-	-	-	-	-	-	-	-

* Category II; exceedance factor=8 (see Introduction section 2.2.3)

† Measured as respirable fraction

3.12 Table 9: Bisphenol-A (= 4,4'-Isopropylidenediphenol) (CAS 80-05-7)

CARC: Carcinogenicity classification; SKIN: Risk of skin absorption; SENS: Risk of sensitization; YoE: Year of Evaluation

Evaluation	Occupational Exposure Limits				CARC	SKIN	SENS	YoE	Remarks	Reference
	8-hour TWA (mg/m ³)	8-hour TWA (ppm)	15-min STEL (mg/m ³)	15-min STEL (ppm)						
IARC/WHO	-	-	-	-	-	-	-	-	-	-
EU	10	-	-	-	-	-	-	-	Indicative OEL for Bisphenol A (inhalable dust)	EU, 2009 EC, 2008
SCOEL	10	-	-	-	-	-	-	2004	Key study: 13-week repeated inhalation study in rats (NOAEL of 10 mg/m ³)	SCOEL, 2004c
NL	10	-	-	-	-	-	-	2011	Legally binding exposure limit by adoption of SCOEL advice.	SER, website, Overheid.nl, website
GE (DFG)	5 ^{*†}	-	5 ^{*†}	-	-	-	-	-	-	DFG, 2014 IFA (GESTIS), website
GE (AGS)	5 ^{*†}	-	5 ^{*†}	-	-	-	-	2006	At this TWA there is no risk for reproductive effects.	BAuA, 2014 IFA (GESTIS), website
UK	10	-	-	-	-	-	-	-	-	HSE, 2011
FR	10	-	-	-	-	-	-	2012	Restrictive statutory limit value.	INRS, 2012
FI	5	-	-	-	-	-	-	-	-	Social-och Halsovards- ministeriet, 2014
REACH	10	-	10	-	-	-	-	-	DNELs based on NOAEC in repeated dose toxicity. DNELs for dermal exposure: 1.4 mg/kg bw/day for both acute and long-term exposure, based on NOAEL in repeated dose toxicity.	ECHA, website

* Category I; exceedance factor=1 (see Introduction section 2.2.3)

† Measured as respirable fraction.

3.13 Table 10: But-2-yne-1,4-diol (CAS no 110-65-6)

CARC: Carcinogenicity classification; SKIN: Risk of skin absorption; SENS: Risk of sensitization; YoE: Year of Evaluation

Evaluation	Occupational Exposure Limits				CARC	SKIN	SENS	YoE	Remarks	Reference
	8-hour TWA (mg/m ³)	8-hour TWA (ppm)	15-min STEL (mg/m ³)	15-min STEL (ppm)						
IARC/WHO	-	-	-	-	-	-	-	-	-	-
EU	-	-	-	-	-	-	-	-	-	-
SCOEL	0.5	0.14	-	-	-	-	-	2011	OEL based on NOAEC = 0.5 mg/m ³ , critical effect: irritation.	SCOEL, 2011f
NL	-	-	-	-	-	-	-	-	-	SER (website)
GE (DFG)	0.36	0.1	0.36*	0.1*	-	Yes	Yes	-	Chemical can be present as vapour and/or aerosol. No risk for teratogenic effects if OEL is not exceeded.	DFG, 2014 IFA (GESTIS), website
GE (AGS)	0.36	0.1	0.36*	0.1*	-	Yes	Yes	2013	Chemical can be present as vapour and/or aerosol. No risk for teratogenic effects if OEL is not exceeded.	BAuA, 2014 IFA (GESTIS), website
UK	-	-	-	-	-	-	-	-	-	HSE, 2011
FR	-	-	-	-	-	-	-	-	-	INRS, 2012
FI	-	-	-	-	-	-	-	-	-	Social- och hälsovårdsmi nisteriets, 2014
REACH	0.02	-	2	-	-	-	-	2011	DNEL _{long-term} based on NOAEC for respiratory tract irritation. DNEL _{acute} based on LOAEC for respiratory tract irritation. Type of study was not reported. DNEL _{long-term} for dermal exposure: 0.01 mg/kg bw/day, based on NOAEL in repeated dose toxicity. DNEL _{acute} for dermal exposure: 4 mg/kg bw/day, based on NOAEL in acute toxicity.	ECHA, website

* Category I; exceedance factor=1 (see Introduction section 2.2.3)

3.14 Table 11: Cadmium (CAS 7440-43-9)

CARC: Carcinogenicity classification; SKIN: Risk of skin absorption; SENS: Risk of sensitization; YoE: Year of Evaluation

Evaluation	Occupational Exposure Limits				CARC	SKIN	SENS	YoE	Remarks	Reference
	8-hour TWA (mg/m ³)	8-hour TWA (ppm)	15-min STEL (mg/m ³)	15-min STEL (ppm)						
IARC/WHO	-	-	-	-	1	-	-	-	Sufficient evidence for carcinogenicity of cadmium metal and cadmium compounds in humans. Critical effects: lung cancer and prostate cancer in cadmium workers.	IARC, 2012
EU	-	-	-	-	1B	-	-	-	-	EC, 2008
SCOEL	0.004*	-	-	-	C	-	-	2010	OEL based on non-cancer respiratory effects, derived from LOAEL in human data. OEL also applies to cadmium compounds.	SCOEL, 2010d
NL	-	-	-	-	-	-	-	1995	For cadmium chloride (CAS 10108-64-2), cadmium oxide (CAS 1306-19-0) and cadmium sulphate (CAS 10124-36-4), an 8-h TWA applies of 0.005 mg/m ³ based on advice from the Health Council of the Netherlands, established as legal value in 2007.	SER, website Overheid.nl, website Health Council of the Netherlands, 1995 [†]
GE (DFG)	-	-	-	-	1	Yes	-	-	-	DFG, 2014 IFA (GESTIS), website
GE (AGS)	-	-	-	-	-	-	-	-	-	BAuA, 2014 IFA (GESTIS), website
UK	0.025 [‡]	-	-	-	Yes [§]	-	-	-	-	HSE, 2011
FR	0.05	-	-	-	-	-	-	1992	Indicative limit value. Cadmium compounds are classified as carcinogenic, category 1B.	INRS, 2012
FI	0.02	-	-	-	-	Yes	-	-	-	Social- och hälsovårdsministeriets, 2014

* Respirable dust fraction

[†] Of note, a new advise from the Health Council of the Netherlands has been published in July 2013, but has not been adopted by the Dutch government yet.[‡] Except cadmium oxide fume, cadmium sulphide and cadmium sulphide pigments (as Cd)[§] Cadmium metal, cadmium chloride, fluoride and sulphate

Evaluation	Occupational Exposure Limits				CARC	SKIN	SENS	YoE	Remarks	Reference
	8-hour TWA (mg/m ³)	8-hour TWA (ppm)	15-min STEL (mg/m ³)	15-min STEL (ppm)						
REACH	0.004	-	-	-	-	-	-	2011	DNEL _{long-term} based on LOAEC in repeated dose toxicity. No hazard was identified for the dermal exposure route.	ECHA, website

3.15 Table 12: Calcium dihydroxide (Calcium hydroxide) (CAS 1305-62-0)

CARC: Carcinogenicity classification; SKIN: Risk of skin absorption; SENS: Risk of sensitization; YoE: Year of Evaluation

Evaluation	Occupational Exposure Limits				CARC	SKIN	SENS	YoE	Remarks	Reference
	8-hour TWA (mg/m ³)	8-hour TWA (ppm)	15-min STEL (mg/m ³)	15-min STEL (ppm)						
IARC/WHO	-	-	-	-	-	-	-	-	-	-
EU	5	-	-	-	-	-	-	-	-	IFA (GESTIS), website
SCOEL	1*	-	4	-	-	-	-	2008	OELs based on human volunteers study with sensory irritation as critical effect.	SCOEL, 2008e
NL	5	-	-	-	-	-	-	-	-	Overheid.nl, website
GE (DFG)	1 [†]	-	2 [‡]	-	-	-	-	-	-	DFG, 2014 IFA (GESTIS), website
GE (AGS)	1 [†]	-	2 [‡]	-	-	-	-	2014	No risk for teratogenic effects if OEL is not exceeded	BAuA, 2014
UK	5	-	-	-	-	-	-	-	-	HSE, 2011
FR	5	-	-	-	-	-	-	1987	Indicative limit value	INRS, 2012
FI	5	-	-	-	-	-	-	-	-	Social- och hälsovårdsministeriets, 2014
REACH	1	-	4	-	-	-	-	2011	DNELs based on respiratory tract irritation (dose descriptor not specified).	ECHA, website

* Respirable dust fraction

† Inhalable dust fraction

‡ Category I; exceedance factor=2 (see Introduction section 2.2.3)

3.16 Table 13: Carbon monoxide (CAS 630-08-0)

CARC: Carcinogenicity classification; SKIN: Risk of skin absorption; SENS: Risk of sensitization; YoE: Year of Evaluation

Evaluation	Occupational Exposure Limits				CARC	SKIN	SENS	YoE	Remarks	Reference
	8-hour TWA (mg/m ³)	8-hour TWA (ppm)	15-min STEL (mg/m ³)	15-min STEL (ppm)						
IARC/WHO	-	-	-	-	-	-	-	-	-	-
EU	-	-	-	-	-	-	-	-	-	EC, 2008
SCOEL	23	20	117	100	-	-	-	1995	Based on epidemiological data. Critical effects: changes in CNS activity and cardiovascular disease.	SCOEL, 1995
NL	29	-	-	-	-	-	-	1999	Legally binding limit by adoption of SCOEL advice (1995) and recommendations of the Health Council of the Netherlands (1999)	SER, website Overheid.nl, website Health Council of the Netherlands, 1999
GE (DFG)	35	30	70*	60*	-	-	-	-	-	DFG, 2014 IFA (GESTIS), website
GE (AGS)	35	30	70*	60*	-	-	-	2012	Risk of teratogenic effects cannot be excluded at the level of the OEL.	BAuA, 2014 IFA (GESTIS), website
UK	35	30	232	200	-	-	-	-	-	HSE, 2011
FR	55	50	-	-	-	-	-	1985	Indicative limit value.	INRS, 2002
FI	35	30	87	75	-	-	-	-	-	Social-och Halsovarsministeriet, 2014
REACH	23	-	117	-	-	-	-	2011	Derivation of DNELs for inhalatory exposure not specified. Exposure-based waiving for dermal route.	ECHA, website

* Category II; exceedance factor=2 (see Introduction section 2.2.3)

3.17 Table 14: Carbon tetrachloride (Tetrachloromethane, Benzinoform, Carbona) (CAS 56-23-5)

CARC: Carcinogenicity classification; SKIN: Risk of skin absorption; SENS: Risk of sensitization; YoE: Year of Evaluation

Evaluation	Occupational Exposure Limits				CARC	SKIN	SENS	YoE	Remarks	Reference
	8-hour TWA (mg/m ³)	8-hour TWA (ppm)	15-min STEL (mg/m ³)	15-min STEL (ppm)						
IARC/WHO	-	-	-	-	2B	-	-	1999	Inadequate evidence in humans (critical effect: non-Hodgkin lymphoma); Sufficient evidence in experimental animals (tumours and neoplasms in liver and mammary neoplasms).	IARC, 1999a
EU	-	-	-	-	2	-	-	-	-	EU, 2008
SCOEL	6.4	1	5	32	D	Yes	-	2009	TWA based on occupational field study. STEL based on hepatotoxicity in rats. Skin notation based on several animal studies and one study with human volunteers.	SCOEL, 2009b
NL	-	-	-	-	-	-	-	-	Former 8-hour TWA = 3.2 mg/m ³ and 15-min STEL 6.4 mg/m ³ and skin notation (2004), withdrawn 01-01-2007.	SER, website
GE (DFG)	3.2	0.5	6.4*	1.0*	-	Yes	-	-	-	DFG, 2014 IFA (GESTIS), website
GE (AGS)	3.2	0.5	6.4*	1.0*	-	Yes	-	2009	At this TWA there is no risk for reproductive effects.	BAuA, 2014 IFA (GESTIS), website
UK	13	2	-	-	-	Yes	-	-	-	HSE, 2011
FR	12	2	60	10	C2	-	-	1983	Indicative limit values.	INRS, 2002
FI	6.3	1	31	5	-	Yes	-	-	-	Social-och Halsovards-ministeriet, 2014
REACH	6.4	-	-	-	-	-	-	2011	DNEL _{long-term} based on NOAEC in repeated dose toxicity. DNEL _{long-term} for dermal exposure = 0.91 mg/kg bw/day, based on NOAEL in repeated dose toxicity.	ECHA, website

* Category II; exceedance factor=2 (see Introduction section 2.2.3)

3.18 Table 15: Copper (CAS 7440-50-8) and its inorganic compounds

CARC: Carcinogenicity classification; SKIN: Risk of skin absorption; SENS: Risk of sensitization; YoE: Year of Evaluation

Evaluation	Occupational Exposure Limits				CARC	SKIN	SENS	YoE	Remarks	Reference
	8-hour TWA (mg/m ³)	8-hour TWA (ppm)	15-min STEL (mg/m ³)	15-min STEL (ppm)						
IARC/WHO	-	-	-	-	-	-	-	-	-	-
EU	-	-	-	-	-	-	-	-	-	-
SCOEL	0.01*	-	-	-	-	-	-	-	Insufficient information available to derive a STEL or a carcinogenicity classification.	SCOEL, 2014e
NL	0.01 [†]	-	-	-	-	-	-	-	OEL applies to copper metal and inhalable inorganic copper compounds. OEL was adopted from Germany (DFG).	SER, website Overheid.nl, website
GE (DFG)	0.01 [‡]	-	0.02 [§]	-	-	-	-	-	OEL applies to copper metal (CAS 7440-50-8)	DFG, 2014 IFA (GESTIS), website
GE (AGS)	-	-	-	-	-	-	-	-	-	-
UK	0.2	-	-	-	-	-	-	-	OEL applies to copper fume (as Cu) (CAS 7440-50-8). Additional OEL for copper dusts and mists (as Cu): 8-h TWA: 1 mg/m ³ ; 15-min STEL: 2 mg/m ³ .	HSE, 2011
FR	0.2	-	-	-	-	-	-	1987	Indicative limit value, applies to copper fume (as Cu) (CAS 7440-50-8). Additional OEL for copper dust (as Cu): 8-h TWA: 1 mg/m ³ ; 15-min STEL: 2 mg/m ³ . (YoE: 1984).	INRS, 2012
FI	1 ^{**}	-	-	-	-	-	-	-	OEL applies to several copper compounds (see footnote). Additional OEL for copper fume and fine dust: 8-h TWA =0.1 mg/m ³	Social- och hälsovårdsministeriets, 2014

* OEL Applies to: Copper metal (CAS 7440-50-8), Copper-(II)-acetate (CAS 142-71-2), Copper-(II)-carbonate (CAS 1184-64-1), Copper-(I)-chloride (CAS 7758-89-6), Copper-(II)-chloride (CAS 7447-39-4), Copper-(II)-hydroxide (CAS 20427-59-2), Copper-(II)-nitrate (3251-23-8), Copper-(II)-oxide (CAS 1317-38-0), Copper-(I)-oxide (CAS 1317-39-1), Copper-(II)-oxysulfate (CAS 12158-97-3), Copper-(II)-sulfate (7758-98-7), Copper-(II)-sulfate pentahydrate (CAS 7758-99-8).

[†] Inhalable dust fraction

[‡] Respirable dust fraction

[§] Category II; exceedance factor=2 (see Introduction section 2.2.3)

** OEL Applies to: Copper-(I)-cyanid (CAS 544-92-3), Copper-(I)-chloride (CAS 7758-89-6), Copper-(I)-oxide (CAS 1317-39-1), Copper-(I)-thiocyanate (CAS 1111-67-7), Copper-(II)-8-hydroxyquinoline (CAS 10380-28-6), Copper-(II)-hydroxycarbonate (CAS 12069-69-1), Copper-(II)-chloride (CAS 7447-39-4), Copper-(II)-chloride dehydrate (CAS 10125-13-0), Copper-(II)-naphthenate (CAS 1338-02-9), Copper-(II)-

Evaluation	Occupational Exposure Limits				CARC	SKIN	SENS	YoE	Remarks	Reference
	8-hour TWA (mg/m ³)	8-hour TWA (ppm)	15-min STEL (mg/m ³)	15-min STEL (ppm)						
REACH	1		1					2011	DNELs apply to copper metal (CAS 7440-50-8), based on local effects (not further specified). No hazards identified for local effects.	ECHA, website

nitrate (CAS 3251-23-8), Copper-(II)-oxide (CAS 1317-38-0), Copper-(II)-oxychloride (CAS 1332-40-7), Copper-(II)-sulfate (CAS 7758-98-7), Copper-(II)-sulfate pentahydrate (CAS 7758-99-8), Copper metal (CAS 7440-50-8), Copper ethylhexanoate (CAS 2221-10-9), Copper chloride (1344-67-8).

3.19 Table 16: Cresols (mixture of isomers: *o*-cresol (2-methylphenol), *m*-cresol (3-methylphenol) and *p*-cresol (4-methylphenol)) (CAS 1319-77-3)

CARC: Carcinogenicity classification; SKIN: Risk of skin absorption; SENS: Risk of sensitization; YoE: Year of Evaluation

Evaluation	Occupational Exposure Limits				CARC	SKIN	SENS	YoE	Remarks	Reference
	8-hour TWA (mg/m ³)	8-hour TWA (ppm)	15-min STEL (mg/m ³)	15-min STEL (ppm)						
IARC/WHO	-	-	-	-	-	-	-	-	-	-
EU	22	5	-	-	-	-	-	-	Indicative OEL	IFA (GESTIS), website
SCOEL	-	-	-	-	-	Yes	-	2002	Critical effect is local airway irritation, however no inhalation studies available. No information on carcinogenicity. Database is insufficient to derive OELs, however, the existing 8-h TWA of 5 ppm (22 mg/m ³) seems to be too high.	SCOEL, 2002a
NL	22	-	-	-	-	Yes	-	-	-	Overheid.nl, website
GE (DFG)	-	-	-	-	3A	Yes	-	-	-	DFG, 2014 IFA (GESTIS), website
GE (AGS)	-	-	-	-	-	-	-	-	-	-
UK	-	-	-	-	-	-	-	-	Former 8-h TWA of 22 mg/m ³ (5 ppm), withdrawn in 2005.	IFA (GESTIS), website
FR	22	5	-	-	-	-	-	1983	Indicative limit value.	INRS, 2012
FI	22	5	45	10	-	Yes	-	-	-	Social- och hälsovårdsministeriets, 2014
REACH	0.9	-	0.9	-	-	-	-	2011	DNELs for long-term and short-term exposure both based on NOAEC for local effect (respiratory tract irritation). No DNEL for dermal exposure was derived.	ECHA, website

3.20 Table 17: Diacetyl (CAS 431-03-8)

CARC: Carcinogenicity classification; SKIN: Risk of skin absorption; SENS: Risk of sensitization; YoE: Year of Evaluation

Evaluation	Occupational Exposure Limits				CARC	SKIN	SENS	YoE	Remarks	Reference
	8-hour TWA (mg/m ³)	8-hour TWA (ppm)	15-min STEL (mg/m ³)	15-min STEL (ppm)						
IARC/WHO	-	-	-	-	-	-	-	-	-	-
EU	-	-	-	-	-	-	-	-	-	-
SCOEL	0.07	0.02	0.36	0.10	-	-	-	2014	Indicative value (based on NOAEC of 0.5 ppm in workers). An arbitrary assessment factor of 5 was applied for derivation of the STEL. These values are an update (2014) of the SCOEL (2010), in which a TWA of 0.1 ppm was recommended.	SCOEL, 2014d
NL	-	-	-	-	-	-	-	-	-	-
GE (DFG)	0.071	0.02	0.071*	0.02*	3B	Yes	Yes	-	-	DFG, 2014 IFA (GESTIS), website
GE (AGS)	-	-	-	-	-	-	-	-	-	-
UK	-	-	-	-	-	-	-	-	-	-
FR	-	-	-	-	-	-	-	-	-	-
FI	-	-	-	-	-	-	-	-	-	-
REACH	-	-	-	-	-	-	-	-	-	-

* Category II; exceedance factor=1 (see Introduction section 2.2.3)

3.21 Table 18: Diphenyl ether (CAS 101-84-8)

CARC: Carcinogenicity classification; SKIN: Risk of skin absorption; SENS: Risk of sensitization; YoE: Year of Evaluation

Evaluation	Occupational Exposure Limits				CARC	SKIN	SENS	YoE	Remarks	Reference
	8-hour TWA (mg/m ³)	8-hour TWA (ppm)	15-min STEL (mg/m ³)	15-min STEL (ppm)						
IARC/WHO	-	-	-	-	-	-	-	-	-	-
EU	-	-	-	-	-	-	-	-	-	-
SCOEL	7	1	14	2	-	-	-	2012	OELs based on NOAEL for irritation of the eyes and respiratory tract in rats and rabbits. STEL also based on NOAEL for irritation in humans.	SCOEL, 2012f
NL	-	-	-	-	-	-	-	-	-	-
GE (DFG)	7.1	1	7.1*	1*	-	-	-	-	Chemical can be present as vapour and/or aerosol.	DFG, 2014 IFA (GESTIS), website
GE (AGS)	7.1	1	7.1*	1*	-	-	-	2013	No risk for teratogenic effects if OEL is not exceeded.	BAuA, 2014 IFA (GESTIS), website
UK	7.1	1	-	-	-	-	-	-	-	HSE, 2011
FR	7	1	-	-	-	-	-	1983	Indicative limit value.	INRS, 2012
FI	7.1	1	21	3	-	-	-	-	-	Social- och hälsovårdsminist eriets, 2014
REACH	9.68	-	-	-	-	-	-	2011	DNEL _{long-term} based on NOAEC for skin irritation/corrosion. DNEL _{long-term} for dermal exposure = 0.15 mg/cm ² , based on NOAEL for skin irritation/corrosion.	ECHA, website

* Category I; exceedance factor=1 (see Introduction section 2.2.3)

3.22 Table 19: Diphenyl ether, octabromoderivative (DPBDE) (CAS No. 32536-52-0)

CARC: Carcinogenicity classification; SKIN: Risk of skin absorption; SENS: Risk of sensitization; YoE: Year of Evaluation

Evaluation	Occupational Exposure Limits				CARC	SKIN	SENS	YoE	Remarks	Reference
	8-hour TWA (mg/m ³)	8-hour TWA (ppm)	15-min STEL (mg/m ³)	15-min STEL (ppm)						
IARC/WHO	-	-	-	-	-	-	-	-	-	-
EU	-	-	-	-	-	-	-	-	-	-
SCOEL	0.2	-	-	-	-	-	-	2012	OEL applies to commercial mixture. 8-hour TWA based on LOAEL of 1.1 mg/m ³ (minimal chronic active inflammation; no effects in workers exposed to 1 to 4 mg/m ³ of the closely related decaBDE). STEL not indicated.	SCOEL, 2012d
NL	-	-	-	-	-	-	-	-	-	-
GE (DFG)	-	-	-	-	-	-	-	-	-	-
GE (AGS)	-	-	-	-	-	-	-	-	-	-
UK	-	-	-	-	-	-	-	-	-	-
FR	-	-	-	-	-	-	-	-	-	-
FI	-	-	-	-	-	-	-	-	-	-
REACH	-	-	-	-	-	-	-	-	-	-

3.23 Table 20: Ethyl acetate (CAS no 141-78-6)

CARC: Carcinogenicity classification; SKIN: Risk of skin absorption; SENS: Risk of sensitization; YoE: Year of Evaluation

Evaluation	Occupational Exposure Limits				CARC	SKIN	SENS	YoE	Remarks	Reference
	8-hour TWA (mg/m ³)	8-hour TWA (ppm)	15-min STEL (mg/m ³)	15-min STEL (ppm)						
IARC/WHO	-	-	-	-	-	-	-	-	-	-
EU	-	-	-	-	-	-	-	-	-	-
SCOEL	734	200	1468	400	-	-	-	2008	Based on irritant properties in a volunteer study with no significant irritation up to 400 ppm with 4 hours exposure	SCOEL, 2008a
NL	-	-	-	-	-	-	-	-	Former OELs were 550 mg/m ³ (8-hour TWA) and 1100 mg/m ³ (15-min STEL), withdrawn 01-01-2007	SER, website
GE (DFG)	1500	400	3000*	800*	-	-	-	-	No risk for teratogenic effects if OEL is not exceeded	DFG, 2014 IFA (GESTIS), website
GE (AGS)	1500	400	3000*	800*	-	-	-	2006	No risk for teratogenic effects if OEL is not exceeded	BAuA, 2014 IFA (GESTIS), website
UK	730	200	1460	400	-	-	-	-	-	HSE, 2011
FR	1400	400	-	-	-	-	-	1983	Indicative limit value.	INRS, 2012
FI	1100	300	1800	500	-	-	-	-	-	Social- och hälsvårdsministeriets, 2014
REACH	734	-	1468	-	-	-	-	2011	DNELs based on IOELV. DNEL _{long-term} for dermal exposure = 63 mg/kg bw/day, derived from route-to-route extrapolation from the inhalation DNEL.	ECHA, website

* Category I; exceedance factor=2 (see Introduction section 2.2.3)

3.24 Table 21: Flour dust

CARC: Carcinogenicity classification; SKIN: Risk of skin absorption; SENS: Risk of sensitization; YoE: Year of Evaluation

Evaluation	Occupational Exposure Limits				CARC	SKIN	SENS	YoE	Remarks	Reference
	8-hour TWA (mg/m ³)	8-hour TWA (ppm)	15-min STEL (mg/m ³)	15-min STEL (ppm)						
IARC/WHO	-	-	-	-	-	-	-	-	-	-
EU	-	-	-	-	-	-	-	-	-	-
SCOEL	-	-	-	-	-	-	Yes	-	Risk assessment by SCOEL includes wheat, rye, barley and oats. Maize, soy and buckwheat are excluded. A health-based OEL cannot be established because of the risk of sensitization. However, SCOEL recognizes that exposure below 1 mg/m³ of inhalable flour dust would protect the majority of workers from the onset of symptoms. Although a STEL cannot be established, peak exposures should be controlled.	SCOEL, 2008c
NL	-	-	-	-	-	-	-	-	-	SER, website
GE (DFG)	-	-	-	-	-	-	Yes	-	-	DFG, 2014
GE (AGS)	-	-	-	-	-	-	-	-	-	-
UK	10	-	30	-	-	-	Yes	-	Flour dust is defined as finely ground particles of cereals or pulses (including contaminants) that result from any grinding process and from any subsequent handling and use.	HSE, 2011
FR	-	-	-	-	-	-	-	-	-	-
FI	2	-	-	-	-	-	-	-	-	Social- och hälsovårdsministeriets, 2014
REACH	-	-	-	-	-	-	-	-	-	-

3.25 Table 22: Glyceryl trinitrate / glycerol trinitrate (=nitroglycerine) (CAS No. 55-63-0)

CARC: Carcinogenicity classification; SKIN: Risk of skin absorption; SENS: Risk of sensitization; YoE: Year of Evaluation

Evaluation	Occupational Exposure Limits				CARC	SKIN	SENS	YoE	Remarks	Reference
	8-hour TWA (mg/m ³)	8-hour TWA (ppm)	15-min STEL (mg/m ³)	15-min STEL (ppm)						
IARC/WHO	-	-	-	-	-	-	-	-	-	-
EU	-	-	-	-	-	-	-	-	-	-
SCOEL	0.095	0.01	0.19	0.02	C	Yes	-	2011	8-hour TWA based on LOAEL of 0.1 mg/m ³ (vasodilatory action), absence of effects below this level. STEL based on LOAEL of 0.3 mg/m ³ (irritation in workers).	SCOEL, 2011c
NL	-	-	-	-	-	-	-	-	Former 15-min STEL = 0.05 mg/m ³ (2006), withdrawn 01-01-2007. Risk of skin absorption.	SER, website
GE (DFG)	0.094	0.01	0.094*	0.01*	3B	Yes	-	-		DFG, 2014 IFA (GESTIS), website
GE (AGS)	0.094	0.01	0.094*	0.01*	-	Yes	-	2011	No risk for teratogenic effects if OEL is not exceeded.	BAuA, 2014 IFA (GESTIS), website
UK	-	-	-	-	-	-	-	-	Former limits: 8-hour TWA of 1.9 mg/m ³ (0.2 ppm) and STEL of 1.9 mg/m ³ (0.2 ppm). [†]	IFA (GESTIS), website
FR	1	0.1	-	-	-	Yes	-	1995	Indicative limit value. Does not take into account the risk on headache.	INRS, 2012
FI	0.3	0.03	1	0.1	-	-	-	-	Risk cannot solely be assessed on concentrations in air.	Social-och Halsovardsministeriet, 2014
REACH	-	-	-	-	-	-	-	2011	Exposure based waiving for inhalation route. DNEL _{long-term} for dermal exposure = 0.5 mg/kg bw/day, based on LOAEL after route-to-route extrapolation (not further specified).	ECHA, website

* Category II; exceedance factor=1 (see Introduction section 2.2.3)

[†] The UK Advisory Committee on Toxic Substances has expressed concern that health may not be adequately protected, because of doubts that the limit was not soundly based. The 8-hour TWA and STEL are omitted from the published EH40 list in 2005

3.26 Table 23: Cyanide: Combination of Hydrogen cyanide (CAS 74-90-8), Potassium cyanide (CAS 151-50-8) and Sodium cyanide (CAS 143-33-9)

CARC: Carcinogenicity classification; SKIN: Risk of skin absorption; SENS: Risk of sensitization; YoE: Year of Evaluation

Evaluation	Occupational Exposure Limits				CARC	SKIN	SENS	YoE	Remarks	Reference
	8-hour TWA (mg/m ³)	8-hour TWA (ppm)	15-min STEL (mg/m ³)	15-min STEL (ppm)						
IARC/WHO	-	-	-	-	-	-	-	-	-	-
EU	-	-	-	-	-	-	-	-	-	-
SCOEL	1*	0.9	5	-	-	Yes	-	2010	OELs apply to any combination of HCN, KCN and NaCN	SCOEL, 2010c
NL	1	-	10	-	-	Yes	-	2002	Based on advice of the Dutch Health Council (Gezondheidsraad), which recommended 8-hr TWA values of 1.8 mg/m ³ for NaCN, 2.4 mg/m ³ for KCN, and 1.0 mg/m ³ for any combination of HCN, KCN and NaCN. OEL was adopted as legal limit in 2007.	Overheid.nl, website SER, website Gezondheidsraad, 2002
GE (DFG)	2*†	-	2†‡	-	-	Yes	-	-	-	DFG, 2014 IFA (GESTIS), website
GE (AGS)	-	-	-	-	-	-	-	-	-	-
UK	5	-	-	-	-	Yes	-	-	OEL applies to cyanides with exception of HCN, cyanogen, and cyanogen chloride.	HSE, 2011
FR	5*	-	-	-	-	Yes	-	1987	Indicative limit value.	INRS, 2012
FI	1	-	5	-	-	YEs	-	-	-	Social- och hälsovårdsministeriets, 2014
REACH	-	-	-	-	-	-	-	-	-	-

* Expressed as cyanide (CN)

† Inhalable fraction

‡ Category II; exceedance factor=1 (see Introduction section 2.2.3)

3.26.1 Table 23a: Hydrogen cyanide (CAS 74-90-8)

CARC: Carcinogenicity classification; SKIN: Risk of skin absorption; SENS: Risk of sensitization; YoE: Year of Evaluation

Evaluation	Occupational Exposure Limits				CARC	SKIN	SENS	YoE	Remarks	Reference
	8-hour TWA (mg/m ³)	8-hour TWA (ppm)	15-min STEL (mg/m ³)	15-min STEL (ppm)						
IARC/WHO	-	-	-	-	-	-	-	-	-	-
EU	-	-	-	-	-	-	-	-	-	-
SCOEL	-	-	-	-	-	-	-	-	-	-
NL	1*	-	10	-	-	-	-	-	Based on advice of the Dutch Health Council (Gezondheidsraad),	Overheid.nl, website SER, website Gezondheidsraad, 2002
GE (DFG)	2.1	1.9	4.2 [†]	3.8	-	Yes	-	-	-	DFG, 2014 IFA (GESTIS), website
GE (AGS)	-	-	-	-	-	-	-	-	-	-
UK	5	-	-	-	-	Yes	-	-	OEL applies to cyanides with exception of HCN, cyanogen, and cyanogen chloride.	HSE, 2011
FR	2	2	10	10	-	Yes	-	2007	Restrictive statutory limit value.	INRS, 2012 IFA (GESTIS), website
FI	1	-	5	-	-	Yes	-	-	-	Social- och hälsovårdsministeriets, 2014
REACH	0.78	-	-	-	-	-	-	-	DNEL _{long-term} based on NOAEC in repeated dose toxicity. DNEL _{long-term} for dermal exposure = 0.054 mg/kg bw/day, based on NOAEL (not further specified). Note: registration as intermediate only.	ECHA, website

* Expressed as CN

[†] Category II; exceedance factor=2 (see Introduction section 2.2.3)

3.26.2 Table 23b: Potassium cyanide (CAS 151-50-8)

CARC: Carcinogenicity classification; SKIN: Risk of skin absorption; SENS: Risk of sensitization; YoE: Year of Evaluation

Evaluation	Occupational Exposure Limits				CARC	SKIN	SENS	YoE	Remarks	Reference
	8-hour TWA (mg/m ³)	8-hour TWA (ppm)	15-min STEL (mg/m ³)	15-min STEL (ppm)						
IARC/WHO	-	-	-	-	-	-	-	-	-	-
EU	-	-	-	-	-	-	-	-	-	-
SCOEL	-	-	-	-	-	-	-	-	-	-
NL	2.4	-	24	-	-	Yes	-	-	Based on advice of the Dutch Health Council (Gezondheidsraad)	Overheid.nl, website SER, website Gezondheidsraad, 2002
GE (DFG)	5*	-	5 [†]	-	-	Yes	-	-	-	DFG, 2014 IFA (GESTIS), website
GE (AGS)	-	-	-	-	-	-	-	-	-	-
UK	-	-	-	-	-	-	-	-	-	-
FR	-	-	-	-	-	-	-	-	-	-
FI	-	-	-	-	-	-	-	-	-	-
REACH	0.94	-	12.5	-	-	-	-	2011	DNEL _{long-term} based on NOAEC in repeated dose toxicity. DNEL _{acute} based on NOAEC in acute toxicity study. DNEL _{long-term} for dermal exposure = 0.14 mg/kg bw/day, based on NOAEL in repeated dose toxicity. DNEL _{acute} for dermal exposure = 4.03 mg/kg bw/day, based on NOAEL in acute toxicity study.	ECHA, website

* Inhalable fraction

[†] Category II; exceedance factor=1 (see Introduction section 2.2.3)

3.26.3 Table 23c: Sodium cyanide (CAS 143-33-9)

CARC: Carcinogenicity classification; SKIN: Risk of skin absorption; SENS: Risk of sensitization; YoE: Year of Evaluation

Evaluation	Occupational Exposure Limits				CARC	SKIN	SENS	YoE	Remarks	Reference
	8-hour TWA (mg/m ³)	8-hour TWA (ppm)	15-min STEL (mg/m ³)	15-min STEL (ppm)						
IARC/WHO	-	-	-	-	-	-	-	-	-	-
EU	-	-	-	-	-	-	-	-	-	-
SCOEL	-	-	-	-	-	-	-	-	-	-
NL	1.8	-	18	-	-	Yes	-	-	Based on advice of the Dutch Health Council (Gezondheidsraad)	Overheid.nl, website SER, website Gezondheidsraad, 2002
GE (DFG)	3.8*	-	3.8 ^{††}	-	-	Yes	-	-	-	DFG, 2014 IFA (GESTIS), website
GE (AGS)	-	-	-	-	-	-	-	-	-	-
UK	-	-	-	-	-	-	-	-	-	-
FR	-	-	-	-	-	-	-	-	-	-
FI	-	-	-	-	-	-	-	-	-	-
REACH	0.72	-	9.4	-	-	-	-	2011	DNEL _{long-term} based on NOAEC in repeated dose toxicity. DNEL _{acute} based on NOAEC in acute toxicity study. DNEL _{long-term} for dermal exposure = 0.102 mg/kg bw/day, based on NOAEL in repeated dose toxicity. DNEL _{acute} for dermal exposure = 3.03 mg/kg bw/day, based on NOAEL in acute toxicity study.	ECHA, website

* Inhalable fraction

† Category II; exceedance factor=1 (see Introduction section 2.2.3)

3.27 Table 24: Hydrogenated terphenyl (CAS 61788-32-7)

CARC: Carcinogenicity classification; SKIN: Risk of skin absorption; SENS: Risk of sensitization; YoE: Year of Evaluation

Evaluation	Occupational Exposure Limits				CARC	SKIN	SENS	YoE	Remarks	Reference
	8-hour TWA (mg/m ³)	8-hour TWA (ppm)	15-min STEL (mg/m ³)	15-min STEL (ppm)						
IARC/WHO	-	-	-	-	-	-	-	-	-	-
EU	-	-	-	-	-	-	-	-	-	-
SCOEL	19	2	48	5	-	-	-	1994	8-hour TWA based on systemic effects in repeated inhalation study in rats. 15-min STEL based on reports of respiratory irritation in workers.	SCOEL, 1994
NL	-	-	-	-	-	-	-	-	-	-
GE (DFG)	-	-	-	-	-	-	-	-	-	-
GE (AGS)	-	-	-	-	-	-	-	-	-	-
UK	-	-	-	-	-	-	-	-	-	-
FR	5	0.5						1987	Indicative limit value, applies to a substance that is named hydrogenated terphenyl, but has CAS nr 37275-59-5 instead of 61788-32-7.	INRS, 2012
FI	-	-	-	-	-	-	-	-	-	-
REACH	8.38	-	-	-	-	-	-	2010	DNEL _{long-term} based on NOAEC in repeated dose toxicity. DNEL _{long-term} for dermal exposure =0.2 mg/cm ² , based on LOAEL for local effects in repeated dose toxicity, or 46.3 mg/kg bw/day, based on NOAEL in repeated dose toxicity.	ECHA, website

3.28 Table 25: Lead chromate (CAS 7758-97-6)

CARC: Carcinogenicity classification; SKIN: Risk of skin absorption; SENS: Risk of sensitization; YoE: Year of Evaluation

Evaluation	Occupational Exposure Limits				CARC	SKIN	SENS	YoE	Remarks	Reference
	8-hour TWA (mg/m ³)	8-hour TWA (ppm)	15-min STEL (mg/m ³)	15-min STEL (ppm)						
IARC/WHO	-	-	-	--	-	-	-	-	-	-
EU	-	-	-	-	1B	-	-	-	-	EC, 2008
SCOEL	0.1* 0.025 [†]	-	-	-	-	-	-	2004	Based on OEL for inorganic lead compounds in general. Due to lack of data, evaluation with regard to carcinogenicity is not feasible.	SCOEL, 2004d
NL	-	-	0.025 [†]	-	-	-	-	-	Risk-based OEL, based on advice of the Health Council of the Netherlands which calculated additional cancer risks of 4*10 ⁻³ after 40 years of exposure to 2 µg/m ³ inhalable dust and 4*10 ⁻⁵ after 40 years of exposure to 0.02 µg/m ³ inhalable dust.	Overheid.nl SER, website Health Council of the Netherlands, 1998
GE (DFG)	-	-	-	-	1	-	-	-	Based on chrome(IV) compounds	DFG, 2014
GE (AGS)	-	-	-	-	-	-	-	-	-	-
UK	0.05	-	-	-	-	-	-	-	-	IFA (GESTIS), website
FR	-	-	-	-	-	-	-	-	-	-
FI	-	-	-	-	-	-	-	-	-	Social- och hälsovårdsminist eriets, 2014
REACH	-	-	-	-	-	-	-	-	-	-

* As mg Pb/m³† As mg Cr/ m³

3.29 Table 26: Lithium hydride (CAS 7580-67-8)

CARC: Carcinogenicity classification; SKIN: Risk of skin absorption; SENS: Risk of sensitization; YoE: Year of Evaluation

Evaluation	Occupational Exposure Limits				CARC	SKIN	SENS	YoE	Remarks	Reference
	8-hour TWA (mg/m ³)	8-hour TWA (ppm)	15-min STEL (mg/m ³)	15-min STEL (ppm)						
IARC/WHO	-	-	-	-	-	-	-	-	-	-
EU	0.025	-	-	-	-	-	-	-	Indicative OEL.	IFA (GESTIS), website
SCOEL	-	-	0.02a	-	-	-	-	2010	STEL based on NOAEL for airway irritation of 0.025 mg/m ³ . No sufficient data available to set an 8-hr TWA.	SCOEL, 2010f
NL	0.025	-	-	-	-	-	-	2007	8-hr TWA adopted from the American Conference of Governmental Industrial Hygienists	Overheid.nl, website SER, website
GE (DFG)	-	-	-	-	-	-	-	-	-	-
GE (AGS)	0.025*	-	-	-	-	-	-	2007	No scientific basis available for the derivation of a health-based OEL	BAuA, 2014 IFA (GESTIS), website
UK	0.025	-	-	-	-	-	-	-	-	HSE, 2011
FR	0.025	-	-	-	-	-	-	1987	Indicative limit value.	INRS, 2012
FI	0.025	-	0.075	-	-	-	-	-	-	Social- och hälsovårdsminist eriets, 2014
REACH	-	-	-	-	-	-	-	2012	No DNELs available. Registered for intermediate use only.	ECHA, website

* Inhalable fraction

3.30 Table 27: Man-made mineral fibres (MMMF)

CARC: Carcinogenicity classification; SKIN: Risk of skin absorption; SENS: Risk of sensitization; YoE: Year of Evaluation

Evaluation	Occupational Exposure Limits				CARC	SKIN	SENS	YoE	Remarks	Reference
	8-hour TWA (mg/m ³)	8-hour TWA (ppm)	15-min STEL (mg/m ³)	15-min STEL (ppm)						
IARC/WHO	-	-	-	-	2B [*] 3 [†]	-	-	-	-	-
EU	-	-	-	-	1B [*] 2 [†]	-	-	-	-	-
SCOEL	0.1 (1 fibre /ml)	-	-	-	-	-	-	2012	8 hour-TWA based on rat studies with several types of fibres, NOAELs between 25-30 fibres/mL of inhaled air, critical effect: inflammation and subsequent fibrosis of the lung. OEL applicable to MMMF without indication of carcinogenicity and the characteristics: length >5 µm, diameter D <3 µm and a ratio L:D >3:1 (WHO fibres).	SCOEL, 2012a
NL	(0.5 fibres/ml) [‡]	-	-	-	-	-	-	-	-	-
GE (DFG)	-	-	-	-	2 [§] 3B ^{**}	-	-	-	-	DFG, 2014
GE (AGS)	-	-	-	-	-	-	-	-	-	-
UK	5 ^{††} (2 fibres/ml) 10 ^{††} 4 ^{§§} 5 [*] (1 fibre/ml) [*]	-	-	-	-	-	-	-	-	HSE, 2011

* Applies to Special-purpose glass fibres (such as E-glass and '475' glass fibres) and refractory ceramic fibres

[†] Applies to Insulation glass wool, continuous glass filament, rock (stone) wool and slag wool[‡] Applies to ceramic fibres, expressed in respirable fibres per cm³[§] Applies to ceramic fibres, glass wool and rock wool^{**} Applies to slag wool^{††} Does not apply to ceramic fibres^{‡‡} Applies to silicon carbide, inhalable fraction^{§§} Applies to silicon carbide, respirable fraction

Evaluation	Occupational Exposure Limits				CARC	SKIN	SENS	YoE	Remarks	Reference
	8-hour TWA (mg/m ³)	8-hour TWA (ppm)	15-min STEL (mg/m ³)	15-min STEL (ppm)						
FR	10* (0.1 fibres/ml) [†] (1 fibre/ml)	-	-	-	1B	-	-	-	For ceramic fibres: restrictive statutory limit.	INRS, 2012
FI	(0.1 fibre/ml) [‡] (0.2 fibres/ml) [‡] (1 fibre/ml) [‡] 5 [§]	-	-	-	-	-	-	-	-	Social- och hälsovårdsminist eriets, 2014
REACH	-	-	-	-	-	-	-	-	-	-

* Applies to silicon carbide

[†] Applies to ceramic fibres, expressed in respirable fibres per cm³

[‡] Applies to mineral wools including glass wool

[§] Applies to mineral wools expressed as inhalable dust

3.31 Table 28: Man-made vitreous fibres (MMVF10)

CARC: Carcinogenicity classification; SKIN: Risk of skin absorption; SENS: Risk of sensitization; YoE: Year of Evaluation

Evaluation	Occupational Exposure Limits				CARC	SKIN	SENS	YoE	Remarks	Reference
	8-hour TWA (mg/m ³)	8-hour TWA (ppm)	15-min STEL (mg/m ³)	15-min STEL (ppm)						
IARC/WHO										IARC, 2002
EU										-
SCOEL	1 (10 fibres /ml)	-	-	-	-	-	-	2002	Based on NOAEL of 30*10 ⁶ WHO- f/m ³ , critical effect: adaptive effects to fibre exposure	SCOEL, 2008c
NL	-	-	-	-	-	-	-	-	-	-
GE (DFG)	-	-	-	-	-	-	-	-	-	-
GE (AGS)	-	-	-	-	-	-	-	-	-	-
UK	-	-	-	-	-	-	-	-	-	-
FR	-	-	-	-	-	-	-	-	-	-
FI	-	-	-	-	-	-	-	-	-	-
REACH	-	-	-	-	-	-	-	-	-	-

3.32 Table 29: Manganese and inorganic manganese compounds *

CARC: Carcinogenicity classification; SKIN: Risk of skin absorption; SENS: Risk of sensitization; YoE: Year of Evaluation

Evaluation	Occupational Exposure Limits				CARC	SKIN	SENS	YoE	Remarks	Reference
	8-hour TWA (mg/m ³)	8-hour TWA (ppm)	15-min STEL (mg/m ³)	15-min STEL (ppm)						
IARC/WHO	-	-	-	-	-	-	-	-	-	-
EU	-	-	-	-	-	-	-	-	-	-
SCOEL	0.05 [†] 0.2 [‡]	-	-	-	-	-	-	-	OELs based on human data; most sensitive endpoint: neurotoxicity. SCOEL recommends to use the respirable fraction for measuring exposure. However, because of variations in particle size (respirable vs inhalable fraction) between industries, an OEL for the inhalable fraction is also derived.	SCOEL, 2011a
NL	-	-	-	-	-	-	-	-	-	SER, website
GE (DFG)	0.02 [†] 0.2 [‡]	-	0.02 ^{† §} 0.16 ^{‡ **} 0.2 ^{† §} 1.6 ^{‡ **}	-	-	-	-	-	-	DFG, 2014 IFA (GESTIS), website
GE (AGS)	0.5 ^{† ††}	-	-	-	-	-	-	2006	No risk for teratogenic effects if OEL is not exceeded	BAuA, 2014 IFA (GESTIS), website
UK	0.5 ^{††}	-	-	-	-	-	-	-	-	HSE, 2011
FR	1 ^{††}	-	-	-	-	-	-	1983	-	INRS, 2012
FI	0.02 [†] 0.2 [‡]	-	-	-	-	-	-	-	-	Social- och hälsovårdsminist eriets, 2014
REACH	0.02	-	-	-	-	-	-	-	DNEL _{long-term} for dermal exposure= 0.00414 mg/kg bw/day.	ECHA, website

* According to SCOEL, the following compounds are included: Manganese metal (CAS 7439-96-5), Manganese (IV) dioxide (CAS 1313-13-9), Manganese (II) oxide (CAS 1344-43-0), Manganese (II, III) oxide (CAS 1317-35-7), Manganese (II) sulphate (CAS 7785-87-7), Potassium permanganate (CAS 7722-64-7), Manganese (II) carbonate (598-62-9), Manganese (III) fluoride (CAS 7783-53-1), Manganese (II) dichloride tetrahydrate (CAS 13446-34-9), Manganese (II) sulphide (CAS 18820-29-6), Manganese (II) nitrate (CAS 15710-66-4).

[†] Respirable fraction

[‡] Inhalable fraction

[§] Only for permanganate; Category II; exceedance factor=1 (see Introduction section 2.2.3)

^{**} Category II; exceedance factor=8 (see Introduction section 2.2.3)

^{††} As Mn

3.33 Table 30: Methyl formate (Methyl methanoate) (CAS 107-31-3)

CARC: Carcinogenicity classification; SKIN: Risk of skin absorption; SENS: Risk of sensitization; YoE: Year of Evaluation

Evaluation	Occupational Exposure Limits				CARC	SKIN	SENS	YoE	Remarks	Reference
	8-hour TWA (mg/m ³)	8-hour TWA (ppm)	15-min STEL (mg/m ³)	15-min STEL (ppm)						
IARC/WHO	-	-	-	-	-	-	-	-	-	-
EU	-	-	-	-	-	-	-	-	-	EC, 2008
SCOEL	125	5	250	100	-	Yes	-	2004	Based on human volunteer study and observational studies in exposed workers. Skin notation based on human case reports.	SCOEL, 2004a
NL	-	-	-	-	-	-	-	-	Former 8-hour TWA = 250 mg/m ³ and 15-min STEL 500 mg/m ³ based on the American Conference of Governmental Industrial Hygienists (1978), withdrawn 01-01-2007.	SER, website
GE (DFG)	120	50	480*	200*	-	Yes	-	-	-	DFG, 2014 IFA (GESTIS), website
GE (AGS)	120	50	480*	200*	-	Yes	-	2006	No risk for reprotoxic effects if OEL is not exceeded.	BAuA, 2014 IFA (GESTIS), website
UK	-	-	-	-	-	-	-	-	Former OELS: 8-hour TWA = 250 mg/m ³ (100 ppm) and 15-min STEL 374 mg/m ³ (150 ppm), withdrawn in 2005. [†]	HSE, 2011 IFA (GESTIS), website
FR	250	100	-	-	-	-	-	1987	Indicative limit value.	INRS, 2002
FI	125	20	370	150	-	-	-	-	-	Social-och Halsovards-ministeriet, 2014
REACH	120 ^b	-	120 ^b	-	-	-	-	2009	DNELs for both long-term and acute exposure based on NOAEC in repeated dose toxicity. DNEL for dermal exposure = 17 mg/kg bw/day for both long-term and acute exposure, based on NOAEL in repeated dose toxicity.	ECHA, website

* Category II; exceedance factor=4 (see Introduction section 2.2.3)

[†] The UK Advisory Committee on Toxic Substances has expressed concern that health may not be adequately protected, because of doubts that the limit was not soundly based. The 8-hour TWA and STEL are omitted from the published EH40 list in 2005.

3.34 Table 31: Methylene chloride (dichloromethane) (CAS no 75-09-2)

CARC: Carcinogenicity classification; SKIN: Risk of skin absorption; SENS: Risk of sensitization; YoE: Year of Evaluation

Evaluation	Occupational Exposure Limits				CARC	SKIN	SENS	YoE	Remarks	Reference
	8-hour TWA (mg/m ³)	8-hour TWA (ppm)	15-min STEL (mg/m ³)	15-min STEL (ppm)						
IARC/WHO	-	-	-	-	2A	-	-	<i>in preparation</i>	-	IARC, website
EU	-	-	-	-	3	-	-	-	-	EU, 2008
SCOEL	353	100	706	200	C	Yes	-	2009	8 hour-TWA based on no adverse effects observed at workplace following occupational exposure concentrations of 100 ppm over several years. 15-min STEL based on possible short-term pre-narcotic effects.	SCOEL, 2009c
NL	-	-	-	-	-	-	-	-	Former OELs were 350 mg/m ³ (100 ppm) (8-hour TWA) and 1740 mg/m ³ (500 ppm) (15-min STEL), withdrawn 01-01-2007	SER, website
GE (DFG)	-	-	-	-	3A	-	-	-	Insufficient information available yet to establish an OEL.	DFG, 2014 IFA (GESTIS), website
GE (AGS)	260	75	1040*	300*	-	-	-	2007	-	BAuA, 2014 IFA (GESTIS), website
UK	350	100	1060	300	-	Yes	-	-	-	HSE, 2011
FR	178	50	356	100	C2	Yes	-	2012	Restrictive statutory limit values.	INRS, 2012
FI	350	100	880	250	-	-	-	-	-	Social- och hälsovårdsministeriets, 2014
REACH	353	-	706	-	-	-	-	2011	DNELs for inhalation route based on SCOEL. DNEL _{long-term} for dermal exposure route = 12 mg/kg bw/day, based on NOAEL from repeated dose toxicity with oral exposure.	ECHA, website

* Category II; exceedance factor=4 (see Introduction section 2.2.3)

3.35 Table 32: Naphtalene (CAS 91-20-3)

CARC: Carcinogenicity classification; SKIN: Risk of skin absorption; SENS: Risk of sensitization; YoE: Year of Evaluation

Evaluation	Occupational Exposure Limits				CARC	SKIN	SENS	YoE	Remarks	Reference
	8-hour TWA (mg/m ³)	8-hour TWA (ppm)	15-min STEL (mg/m ³)	15-min STEL (ppm)						
IARC/WHO	-	-	-	-	2B	-	-	2002	Inadequate evidence in humans ; Sufficient evidence in experimental animals.	IARC, 2002b
EU	50	10	-	-	2	-	-	-	Indicative OEL.	EC. 2008 IFA (GESTIS), website
SCOEL	-	-	-	-	-	-	-	-	No OEL established because of too many uncertainties about possible carcinogenicity to the nasal epithelium. OEL will be established when more data are available. Along with an OEL, a skin notation will be proposed.	SCOEL, 2010a
NL	50	-	80	-	-	-	-	-	Adopted from Swedish OEL	SER, website Overheid.nl, website
GE (DFG)	-	-	-	-	2	Yes				DFG, 2014 IFA (GESTIS), website
GE (AGS)	0.5*	0.1*	0.5*†	0.1*†		Yes		2011	Chemical can be present as vapour and/or aerosol. No risk for teratogenic effects if OEL is not exceeded	BAuA, 2014 IFA (GESTIS), website
UK	-	-	-	-	-	-	-	-	Former 8-h TWA of 53 mg/m ³ (10 ppm) and 15-min STEL of 80 mg/m ³ (15 ppm); withdrawn in 2005 because of doubts that the limit was not soundly based.	HSE, 2011
FR	50	10	-	-	2	-	-	1983	Indicative limit value.	INRS, 2012
FI	5	1	10	2	-	-	-	-	-	Social- och hälsovårdsministeriets, 2014

* Inhalable aerosol

† Category I; exceedance factor=1 (see Introduction section 2.2.3)

Evaluation	Occupational Exposure Limits				CARC	SKIN	SENS	YoE	Remarks	Reference
	8-hour TWA (mg/m ³)	8-hour TWA (ppm)	15-min STEL (mg/m ³)	15-min STEL (ppm)						
REACH	25	-	-	-	-	-	-	2011	DNEL derived from National OEL (EU and USA) of generally 50 mg/m ³ based on human experience (in accordance with ECHA REACH Guidance R8), with assessment factor of 2. No short-term DNEL derived because of low hazard for acute toxicity. DNEL _{long-term} for dermal exposure = 3.57 mg/kg bw/d, based on route-to-route extrapolation from the inhalation DNEL.	ECHA, website

3.36 Table 33: Nickel and its inorganic compounds

3.36.1 Table 33a: Nickel, metal (CAS 7440-02-0)

CARC: Carcinogenicity classification; SKIN: Risk of skin absorption; SENS: Risk of sensitization; YoE: Year of Evaluation

Evaluation	Occupational Exposure Limits				CARC	SKIN	SENS	YoE	Remarks	Reference
	8-hour TWA (mg/m ³)	8-hour TWA (ppm)	15-min STEL (mg/m ³)	15-min STEL (ppm)						
IARC/WHO	-	-	-	-	2B	-	-	1990	For metallic nickel, there is sufficient evidence of carcinogenicity in experimental animals, but insufficient evidence in humans.	IARC, 1990
EU	-	-	-	-	2	-	-	-	-	EC, 2008
SCOEL	0.005	-	-	-	-	-	-	2012	OEL based on chronic lung inflammation, but should also protect against carcinogenic and reproductive effects. Contact sensitization is not taken into account.	SCOEL, 2012a
NL	-	-	-	-	-	-	-	-	Former 8-hr TWA of 0.1 mg/m ³ for nickel and water-soluble nickel compounds, based on advice of the American Conference of Governmental Industrial Hygienists (1978), withdrawn 01-01-2007.	SER website
GE (DFG)	-	-	-	-	1	-	Yes	-	Respiratory sensitization potency has only been established for water-soluble nickel compounds.	DFG, 2014 IFA (GESTIS), website
GE (AGS)	-	-	-	-	-	-	-	-	-	-
UK	0.5	-	-	-	Yes	Yes	-	-	-	HSE, 2011
FR	1	-	-	-	C2	-	-	1987	Indicative limit value.	INRS, 2012
FI	0.01*	-	-	-	-	-	-	-	-	Social- och hälsovårdsministeriets, 2014

* Respiratory fraction

Evaluation	Occupational Exposure Limits				CARC	SKIN	SENS	YoE	Remarks	Reference
	8-hour TWA (mg/m ³)	8-hour TWA (ppm)	15-min STEL (mg/m ³)	15-min STEL (ppm)						
REACH	0.05	-	4	-	-	-	-	2011	<p>DNEL_{long-term} based on NOAEC for developmental toxicity / teratogenicity in inhalation study and on repeated dose toxicity.</p> <p>DNEL_{acute} based on LOAEC in repeated dose toxicity.</p> <p>DNEL_{long-term} for dermal exposure = 0.035 mg/cm², based on NOAEL for skin sensitization.</p>	ECHA, website

3.36.2 Table 33b: Nickel, Inorganic Nickel compounds*

CARC: Carcinogenicity classification; SKIN: Risk of skin absorption; SENS: Risk of sensitization; YoE: Year of Evaluation

Evaluation	Occupational Exposure Limits				CARC	SKIN	SENS	YoE	Remarks	Reference
	8-hour TWA (mg/m ³)	8-hour TWA (ppm)	15-min STEL (mg/m ³)	15-min STEL (ppm)						
IARC/WHO	-	-	-	-	1A	-	-	2012	Carcinogenicity is caused by the nickel (II) ion, which can be released after cellular uptake of nickel or compounds. There is sufficient evidence for carcinogenicity of nickel compounds in experimental animals and in humans (target organs: lung, nasal cavity, paranasal sinuses).	IARC, 2012
EU	-	-	-	-	2	-	-	-	-	EC, 2008
SCOEL	0.005 [†] 0.01 [‡]	-	-	-	C	-	-	2012	OELs based on chronic lung inflammation, but should also protect against carcinogenic and reproductive effects. Contact sensitization is not taken into account.	SCOEL, 2012a
NL	-	-	-	-	-	-	-	-	-	-
GE (DFG)	-	-	-	-	1	-	Yes	-	-	DFG, 2014 IFA (GESTIS), website
GE (AGS)	-	-	-	-	-	-	-	-	-	-
UK	0.1 [§] 0.5 ^{**}	-	-	-	Yes	Yes	Yes	-	Carcinogenicity and skin notations apply to nickel oxides and sulphides; Sensitisation notation applies to nickel sulphate.	HSE, 2011
FR	0.1 ^{††} 1 ^{††}	-	-	-	1A	-	-	1995	Indicative limit values, apply to a selection of compounds (see footnotes)	INRS, 2012

* This table represents OELs for the following compounds: Nickel monoxide / nickel (II) oxide (CAS 1313-99-1), Nickel dioxide / nickel (IV) oxide (CAS 12035-36-8), Dinickel trioxide / nickel (III) oxide (CAS 1314-06-3), Nickel hydroxide (CAS 12054-48-7), Nickel carbonate (CAS 3333-67-3), Nickel sulphide (CAS 16812-54-7), Nickel subsulphide (CAS 12035-72-2), Nickel chloride (CAS 7718-54-9), Nickel nitrate (CAS 13138-45-9), Nickel sulphate (CAS 7786-81-4), and Nickel acetate (CAS 373-02-4).

[†] As Ni, respirable fraction

[‡] As Ni, inhalable fraction

[§] As Ni, water-soluble compounds

^{**} As Ni, water-insoluble compounds

^{††} For nickel sulphate (CAS 7786-81-4)

^{††} For Nickel monoxide / nickel (II) oxide (CAS 1313-99-1), Nickel hydroxide (CAS 12054-48-7), Nickel carbonate (CAS 3333-67-3), Nickel sulphide (CAS 16812-54-7), and Nickel subsulphide (CAS 12035-72-2).

Evaluation	Occupational Exposure Limits				CARC	SKIN	SENS	YoE	Remarks	Reference
	8-hour TWA (mg/m ³)	8-hour TWA (ppm)	15-min STEL (mg/m ³)	15-min STEL (ppm)						
FI	0.01 [†] 0.05 [‡] **	-	-	-	-	-	-	-	OEL of 0.05 mg/m ³ applies to a selection of compounds (see footnotes)	Social- och hälsovårdsministeriets, 2014
REACH	0.05		0.7 * 3.9 [†] 4.7 [‡]						DNEL _{long-term} based on inhalation study and repeated dose toxicity. DNEL _{acute} values based on local effects in repeated dose toxicity (LOAEC and NOEAC). DNEL for dermal exposure, based on NOAEL for sensitization: 0.44 µg/m ² for nickel acetate, nickel chloride, nickel sulphate, and nickel nitrate; 1300 µg/m ² for nickel hydroxide and nickel oxide; 4 µg/m ² for nickel subsulphide, and 2.4 µg/m ² for nickel sulphide.	ECHA, website

* For Nickel chloride (CAS 7718-54-9), Nickel nitrate (CAS 13138-45-9), Nickel sulphate (CAS 7786-81-4), and Nickel acetate (CAS 373-02-4).

[†] For Nickel monoxide / nickel (II) oxide (CAS 1313-99-1), Nickel hydroxide (CAS 12054-48-7).

[‡] For Nickel sulphide (CAS 16812-54-7), Nickel subsulphide (CAS 12035-72-2).

3.37 Table 34: Nitroethane (CAS 79-24-3)

CARC: Carcinogenicity classification; SKIN: Risk of skin absorption; SENS: Risk of sensitization; YoE: Year of Evaluation

Evaluation	Occupational Exposure Limits				CARC	SKIN	SENS	YoE	Remarks	Reference
	8-hour TWA (mg/m ³)	8-hour TWA (ppm)	15-min STEL (mg/m ³)	15-min STEL (ppm)						
IARC/WHO	-	-	-	-	-	-	-	-	-	-
EU	-	-	-	-	-	-	-	-	-	-
SCOEL	62	20	312	100	-	Yes	-	2012	8-h TWA based on LOAEL (decreased body weight) in mice; 15-min STEL based on sensory irritation threshold in humans. Skin notation based on QSAR modelling.	SCOEL, 2012g
NL	-	-	-	-	-	-	-	-	Former 8-h TWA of 20 mg/m ³ , based on advice from the Health Council of the Netherlands (2004) , withdrawn 01-01-2007.	SER website
GE (DFG)	310	100	1240*	400*	-	-	-	-	-	DFG, 2014 IFA (GESTIS), website
GE (AGS)	310	100	1240*	400*	-	-	-	-	-	BAuA, 2014 IFA (GESTIS), website
UK	-	-	-	-	-	-	-	-	Former 8-h TWA of 310 mg/m ³ , withdrawn in 2005. [†]	HSE, 2011
FR	310	100	-	-	-	-	-	1987	Indicative limit value.	INRS, 2012
FI	310	100	470	150	-	-	-	-	-	Social- och hälsovårdsminist eriets, 2014
REACH	8.4	-	17	-	-	-	-	2013	DNELs based on LOAEC for systemic effects in repeated dose toxicity. DNEL _{long-term} for dermal exposure = 350 mg/kg bw/day; DNEL _{acute} for dermal exposure = 2100 mg/kg bw/day, both based on NOAEL in repeated dose toxicity.	ECHA, website

* Category II; exceedance factor=4 (see Introduction section 2.2.3)

[†] The UK Advisory Committee on Toxic Substances has expressed concern that health may not be adequately protected, because of doubts that the limit was not soundly based. The 8-hour TWA and STEL are omitted from the published EH40 list in 2005.

3.38 Table 35: Nitrogen dioxide (CAS 10102-44-0)

CARC: Carcinogenicity classification; SKIN: Risk of skin absorption; SENS: Risk of sensitization; YoE: Year of Evaluation

Evaluation	Occupational Exposure Limits				CARC	SKIN	SENS	YoE	Remarks	Reference
	8-hour TWA (mg/m ³)	8-hour TWA (ppm)	15-min STEL (mg/m ³)	15-min STEL (ppm)						
IARC/WHO	-	-	-	-	-	-	-	-	-	-
EU	0.2	-	-	-	-	-	-	-	Incidative OEL	IFA (GESTIS), website
SCOEL	0.955	0.5	1.91	1	-	-	-	2014	Primary target organ: deep respiratory tract (NOAEC of 0.5 ppm derived from human data and supported by animal data). STEL based on increased bronchial reactivity and changes in BALF in volunteers exposed to 1.5 ppm for ≥ 3 hours.	SCOEL, 2014a
NL	0.4	-	1	-	-	-	-	2004	Legally binding exposure limit by adoption of recommendations of the Health Council of the Netherlands	SER, website, Overheid.nl, website Health Council of the Netherlands, 2004
GE (DFG)	0.95	0.5	0.95 [*]	0.5 ^a	-	-	-	-	-	DFG, 2014 IFA (GESTIS), website
GE (AGS)	-	-	-	-	-	-	-	-	-	-
UK	-	-	6	3	-	-	-	1982	-	INRS, 2012
FR	-	-	-	-	-	-	-	-	-	-
FI	5.7	3	11	6	-	-	-	-	-	Social-och Halsovardsministeriet, 2014
REACH	-	-	-	-	-	-	-	-	-	-

* Category I; exceedance factor=1 (see Introduction section 2.2.3)

3.39 Table 36: Nitrogen monoxide (CAS 10102-43-9)

CARC: Carcinogenicity classification; SKIN: Risk of skin absorption; SENS: Risk of sensitization; YoE: Year of Evaluation

Evaluation	Occupational Exposure Limits				CARC	SKIN	SENS	YoE	Remarks	Reference
	8-hour TWA (mg/m ³)	8-hour TWA (ppm)	15-min STEL (mg/m ³)	15-min STEL (ppm)						
IARC/WHO	-	-	-	-	-	-	-	-	-	-
EU	-	-	-	-	-	-	-	-	-	-
SCOEL	2.5	2	Not applicable*	Not applicable	-	-	-	2014	OEL is based on human field studies with a NOAEC of 2.5 ppm.	SCOEL, 2014c
NL	0.25	-	-	-	-	-	-	2003	Legally binding exposure limit by adoption of SCOEL (2003) advice; the more recent SCOEL (2014) advice has not been implemented yet.	SER, website, Overheid.nl, website SCOEL, 2003
GE (DFG)	0.63	0.5	1.26 [†]	1.0 ^b	-	-	-	-	-	DFG, 2014 IFA (GESTIS), website
GE (AGS)	-	-	-	-	-	-	-	-	-	-
UK	30	25	-	-	-	-	-	1987	-	INRS, 2012
FR	-	-	-	-	-	-	-	-	-	-
FI	31	25	-	-	-	-	-	-	-	Social-och Halsovardsministeriet, 2014
REACH	-	-	-	-	-	-	-	-	-	-

* Because of low acute toxicity in humans.

[†] Category I; exceedance factor=2 (see Introduction section 2.2.3)

3.40 Table 37: N-methylaniline (CAS no 100-61-8)

CARC: Carcinogenicity classification; SKIN: Risk of skin absorption; SENS: Risk of sensitization; YoE: Year of Evaluation

Evaluation	Occupational Exposure Limits				CARC	SKIN	SENS	YoE	Remarks	Reference
	8-hour TWA (mg/m ³)	8-hour TWA (ppm)	15-min STEL (mg/m ³)	15-min STEL (ppm)						
IARC/WHO	-	-	-	-	-	-	-	-	-	-
EU	-	-	-	-	-	-	-	-	-	-
SCOEL	0.89	0.2	2.2	0.5	-	Yes	-	2010	OEL based on analogy with aniline, twice as potent in inducing methemoglobine formation.	SCOEL, 2011e
NL	-	-	-	-	-	-	-	-	Former 8-hour TWA = 2 mg/m ³ , withdrawn 01-01-2007.	SER (website)
GE (DFG)	2.2	0.5	4.4*	1*	-	Yes	-	-	Not enough data to assess teratogenicity.	DFG, 2014 IFA (GESTIS), website
GE (AGS)	2.2	0.5	4.4*	1*	-	Yes	-	2006	May cause formation of carcinogenic N-nitrosamines when combined with nitrosing agents.	BAuA, 2014 IFA (GESTIS), website
UK	2.2	0.5	-	-	-	Yes	-	-	-	HSE, 2011
FR	2	0.5	-	-	-	Yes	-	1987	Indicative limit value.	INRS, 2012
FI	-	-	-	-	-	-	-	-	-	Social- och hälsovårdsminist eriets, 2014
REACH	0.0495	-	22	-	-	-	-	2011	DNELs for inhalation route based on LOAEC in repeated dose toxicity. DNEL _{long-term} for dermal exposure route = 0.0417 mg/kg bw/day, based on NOAEL in repeated dose toxicity.	ECHA, website

* Category II; exceedance factor=2 (see Introduction section 2.2.3)

3.41 Table 38: Picric acid (CAS 88-89-1)

CARC: Carcinogenicity classification; SKIN: Risk of skin absorption; SENS: Risk of sensitization; YoE: Year of Evaluation

Evaluation	Occupational Exposure Limits				CARC	SKIN	SENS	YoE	Remarks	Reference
	8-hour TWA (mg/m ³)	8-hour TWA (ppm)	15-min STEL (mg/m ³)	15-min STEL (ppm)						
IARC/WHO	-	-	-	-	-	-	-	-	-	-
EU	0.1	-	-	-	-	-	-	-	Indicative OEL	IFA (GESTIS), website
SCOEL	-	-	-	-	-	-	Yes	2010	The available toxicological data on picric acid do not provide a scientific basis for the establishment of a health based OEL. A weak skin sensitizing potential was concluded from animal data and human case studies.	SCOEL, 2010b
NL	0.1	-	-	-	-	-	-	-	-	Overheid.nl, website
GE (DFG)	-	-	-	-	3B	Yes	Yes	-	-	DFG, 2014 IFA (GESTIS), website
GE (AGS)	0.1a*	-	0.1*†	-	-	Yes	-	2007	No scientific basis available for the derivation of a health-based OEL. OEL was adapted from EU.	BAuA, 2014 IFA (GESTIS), website
UK	0.1	-	0.3	-	-	-	-	-	-	HSE, 2011
FR	0.1	-	-	-	-	Yes	-	1987	Indicative limit value.	INRS, 2012
FI	-	-	-	-	-	-	-	-	-	-
REACH	-	-	-	-	-	-	-	-	-	-

* Inhalable fraction

† Category I; exceedance factor= (see Introduction section 2.2.3)

3.42 Table 39: Platinum (metallic) (CAS 7440-06-4)

CARC: Carcinogenicity classification; SKIN: Risk of skin absorption; SENS: Risk of sensitization; YoE: Year of Evaluation

Evaluation	Occupational Exposure Limits				CARC	SKIN	SENS	YoE	Remarks	Reference
	8-hour TWA (mg/m ³)	8-hour TWA (ppm)	15-min STEL (mg/m ³)	15-min STEL (ppm)						
IARC/WHO	-	-	-	-	-	-	-	-	-	-
EU	1	-	-	-	-	-	-	-	Indicative OEL	IFA (GESTIS), website
SCOEL	-	-	-	-	-	-	-	2011	Insufficient data to allow recommendation of a health-based OEL.	SCOEL, 2011d
NL	1	-	-	-	-	-	-	-	Adopted from Directive 91/322/EG.	SER, website Overheid.nl, website
GE (DFG)	-	-	-	-	-	-	-	-	-	-
GE (AGS)	1*	-	-	-	-	-	-	2007	Motivation for the derivation of a health-based OEL is not available. OEL was adopted from EU.	BAuA, 2014 IFA (GESTIS), website
UK	5	-	-	-	-	-	-	-	-	HSE, 2011
FR	1	-	-	-	-	-	-	1987	Indicative limit value.	INRS, 2012
FI	1	-	-	-	-	-	-	-	-	Social- och hälsovårdsministeriets, 2014
REACH	-	-	-	-	-	-	-	-	-	-

* Inhalable aerosol

3.43 Table 40: Pyridine (CAS 110-86-1)

CARC: Carcinogenicity classification; SKIN: Risk of skin absorption; SENS: Risk of sensitization; YoE: Year of Evaluation

Evaluation	Occupational Exposure Limits				CARC	SKIN	SENS	YoE	Remarks	Reference
	8-hour TWA (mg/m ³)	8-hour TWA (ppm)	15-min STEL (mg/m ³)	15-min STEL (ppm)						
IARC/WHO	-	-	-	-	3	-	-	2000	Limited evidence for carcinogenicity in animal studies; inadequate evidence in humans.	IARC, 2000
EU	15	5	-	-	-	-	-	-	Indicative OEL	IFA (GESTIS), website
SCOEL	-	-	-	-	-	Yes	-	2004	Too much uncertainty to derive an OEL, however, levels should be well below 5 ppm.	SCOEL, 2004b
NL	0.9	-	-	-	-	-	-	1994	Based on advice from the Health Council of the Netherlands (1993)	SER, website
GE (DFG)	-	-	-	-	3B	Yes	-	-	-	DFG, 2014 IFA (GESTIS), website
GE (AGS)	-	-	-	-	-	-	-	-	-	-
UK	16	5	33	10	-	-	-	-	-	HSE, 2011
FR	15	5	30	10	-	-	-	1983	Indicative limit value.	INRS, 2012
FI	-	-	-	-	-	-	-	-	-	-
REACH	2.5	-	7.5	-	-	-	-	2011	DNELs for long-term and acute exposure based on NOAEC in repeated dose toxicity. DNEL _{long-term} for dermal exposure = 0.14 mg/kg bw/day, based on NOAEL in repeated dose toxicity. DNEL _{acute} for dermal exposure = 0.42 mg/kg bw/day, based on repeated dose toxicity.	ECHA, website

3.44 Table 41: Sulphur dioxide (CAS no 7446-09-5)

CARC: Carcinogenicity classification; SKIN: Risk of skin absorption; SENS: Risk of sensitization; YoE: Year of Evaluation

Evaluation	Occupational Exposure Limits				CARC	SKIN	SENS	YoE	Remarks	Reference
	8-hour TWA (mg/m ³)	8-hour TWA (ppm)	15-min STEL (mg/m ³)	15-min STEL (ppm)						
IARC/WHO	-	-	-	-	3	-	-	1992	Inadequate evidence for carcinogenicity (lung, stomach) in humans, and limited evidence for carcinogenicity in experimental animals.	IARC, 1992
EU	-	-	-	-	-	-	-	-	-	-
SCOEL	1.3	0.5	2.7	1.0	-	-	-	2009	8-hour TWA, critical effect: chronic irritation and increased susceptibility to airway inflammations. 15-min STEL, critical effect: nose/throat irritation, depressed lung function, increased airway resistance. OELs should afford protection to most but not all individuals suffering from bronchial asthma or chronic bronchitis. For asthmatics it is recommended to keep exposure below 0.2 ppm.	SCOEL, 2009a
NL	-	-	0.7	-	-	-	-	2008	-	SER, website Wetten, website
GE (DFG)	2.7	1	2.7*	1*	-	-	-	-	OEL also applies as ceiling value. No risk for teratogenic effects if OEL is not exceeded.	DFG, 2014 IFA (GESTIS), website
GE (AGS)	2.5	1	2.5*	1*	-	-	-	2011	No risk for teratogenic effects if OEL is not exceeded.	BAuA, 2014 IFA (GESTIS), website

* Category I; exceedance factor=1(see Introduction section 2.2.3)

Evaluation	Occupational Exposure Limits				CARC	SKIN	SENS	YoE	Remarks	Reference
	8-hour TWA (mg/m ³)	8-hour TWA (ppm)	15-min STEL (mg/m ³)	15-min STEL (ppm)						
UK	-	-	-	-	-	-	-	-	The UK Advisory Committee on Toxic Substances has expressed concern that health may not be adequately protected because of doubts that the limit was not soundly-based. The 8-hour TWA of 5.3 mg/m ³ (2 ppm) and 15-min STEL of 13 mg/m ³ (5 ppm) are omitted from the published EH40 list in 2005.	IFA (GESTIS), website
FR	5	2	10	5	-	-	-	1982	Indicative limit values.	INRS, 2012
FI	2.7	1	11	4	-	-	-	-	-	Social- och hälsovårdsministeriets, 2014
REACH	1.3	-	2.7	-	-	-	-	2011	DNELs for inhalation route based on local effects (respiratory tract irritation); not further specified. No DNEL available for dermal exposure.	ECHA, website

3.45 Table 42: Tetrachloroethylene (perchloroethylene) (CAS no 127-18-4)

CARC: Carcinogenicity classification; SKIN: Risk of skin absorption; SENS: Risk of sensitization; YoE: Year of Evaluation

Evaluation	Occupational Exposure Limits				CARC	SKIN	SENS	YoE	Remarks	Reference
	8-hour TWA (mg/m ³)	8-hour TWA (ppm)	15-min STEL (mg/m ³)	15-min STEL (ppm)						
IARC/WHO	-	-	-	-	2A	-	-	2014	Limited evidence in humans for carcinogenicity to the bladder. Sufficient evidence for carcinogenicity in experimental animals.	IARC, 2014
EU	-	-	-	-	3	-	-	-	-	EC, 2008
SCOEL	138	20	275	40	D	Yes	-	2009	8-hour TWA based on NOAEL of 138 mg/m ³ , critical effect: central nervous system effects. 15-min STEL based on NOAEL of 750 mg/m ³ , critical effect: irritation effects, corrected for limited database.	SCOEL, 2009d
NL	-	-	-	-	-	Yes	-	-	Former 8-hour TWA = 138 mg/m ³ , withdrawn 01-01-2007.	SER, website
GE (DFG)	-	-	-	-	3B	Yes	-	-	Indications for carcinogenicity, further investigations necessary.	DFG, 2014 IFA (GESTIS), website
GE (AGS)	138	20	275*	40*	-	Yes	-	2011	No risk for teratogenic effects if OEL is not exceeded. OEL	BAuA, 2014 IFA (GESTIS), website
UK	345	50	689*	100*	-	-	-	-	-	HSE, 2011
FR	138	20	275	40	C2	-	-	2012	Restrictive statutory limit values.	INRS, 2012
FI	70	10	-	-	-	Yes	-	-	Risk cannot solely be assessed on concentrations in air.	Social- och hälsovårdsministeriets, 2014
REACH	138	-	275	-	-	-	-	2011	DNELs based on SCOEL. DNEL _{long-term} for dermal exposure route = 39.4 mg/kg bw/day, also based on SCOEL.	ECHA, website

* Category II; exceedance factor=2 (see Introduction section 2.2.3)

3.46 Table 43: Tetraethylsilicate (ethyl orthosilicate; ethyl silicate; tetraethoxysilane; tetraethylorthosilicate; silicic acid tetraethyl ester) (CAS 78-10-4)

CARC: Carcinogenicity classification; SKIN: Risk of skin absorption; SENS: Risk of sensitization; YoE: Year of Evaluation

Evaluation	Occupational Exposure Limits				CARC	SKIN	SENS	YoE	Remarks	Reference
	8-hour TWA (mg/m ³)	8-hour TWA (ppm)	15-min STEL (mg/m ³)	15-min STEL (ppm)						
IARC/WHO	-	-	-	-	-	-	-	-	-	-
EU	-	-	-	-	-	-	-	-	-	-
SCOEL	44	5	-	-	-	-	-	2008	TWA based on NOAEL for kidney effects in mice, with application of 10-fold assessment factor because of inflammatory effects in nasal cavity of the mice. Insufficient data for calculating a STEL, however, a maximum 2-fold exceedance of the TWA is recommended. No data were available for a skin notation.	SCOEL, 2008b
NL	-	-	-	-	-	-	-	-	Former 8-hour TWA = 10 mg/m ³ based recommendations of the Health Council of the Netherlands (2006), withdrawn 01-01-2007.	SER, website Health Council of the Netherlands, 2006
GE (DFG)	86	10	86*	10*	-	-	-	-	-	DFG, 2014 IFA (GESTIS), website
GE (AGS)	12	1.4	12*	1.4*	-	-	-	2010	-	BAuA, 2014 IFA (GESTIS), website
UK	-	-	-	-	-	-	-	-	Former OELS: 8-hour TWA = 87 mg/m ³ (10 ppm) and 15-min STEL 260 mg/m ³ (30 ppm), withdrawn in 2005.	HSE, 2011 IFA (GESTIS), website
FR	85	10	-	-	-	-	-	1987	Indicative limit value.	INRS, 2002
FI	86	10	170	20	-	-	-	-	-	Social-och Halsovardsministeriet, 2014

Evaluation	Occupational Exposure Limits				CARC	SKIN	SENS	YoE	Remarks	Reference
	8-hour TWA (mg/m ³)	8-hour TWA (ppm)	15-min STEL (mg/m ³)	15-min STEL (ppm)						
REACH	85		85		-	-	-	2011	DNELs for inhalatory exposure based on SCOEL OEL. DNEL _{long-term} for dermal exposure = 56 mg/kg bw/day, based on repeated dose toxicity from inhalation study. DNELs for actue exposure (both inhalatory and dermal) were extrapolated from the DNEL _{long-term}	ECHA, website

* Category I; exceedance factor=1 (see Introduction section 2.2.3)

3.47 Table 44: Tin (inorganic compounds as Sn) (CAS 7440-31-5)

CARC: Carcinogenicity classification; SKIN: Risk of skin absorption; SENS: Risk of sensitization; YoE: Year of Evaluation

Evaluation	Occupational Exposure Limits				CARC	SKIN	SENS	YoE	Remarks	Reference
	8-hour TWA (mg/m ³)	8-hour TWA (ppm)	15-min STEL (mg/m ³)	15-min STEL (ppm)						
IARC/WHO	-	-	-	-	-	-	-	-	-	-
EU	2*	-	-	-	-	-	-	-	Indicative OEL	IFA (GESTIS), website
SCOEL	-	-	-	-	-	-	-	2003	Insufficient data to derive an OEL.	SCOEL, 2003b
NL	-	-	-	-	-	-	-	-	-	-
GE (DFG)	-	-	-	-	-	-	-	-	Insufficient data to derive an OEL.	DFG, 2014 IFA (GESTIS), website
GE (AGS)	8 [†] 2 [‡]	-	-	-	-	-	-	2007	Tin(IV)-compounds: motivation for the derivation of a health-based OEL is not available. OEL was adopted from EU.	BAuA, 2014 IFA (GESTIS), website
UK	2c	-	4c	-	-	-	-	-	-	HSE, 2011
FR	-	-	-	-	-	-	-	-	-	-
FI	-	-	-	-	-	-	-	-	-	-
REACH	11.75	-	11.75	-	-	-	-	2010	DNELs for long-term and acute exposure based on NOAEC in repeated dose toxicity. DNELs for dermal exposure = 133 mg/kg bw/day, based on NOAEL in repeated dose toxicity.	ECHA, website

* Applies to tin and inorganic compounds, with exception of SnH₄[†] Inhalable aerosol, Tin(II)-compounds as Sn[‡] Inhalable aerosol, Tin(IV)-compounds as Sn

3.48 Table 45: Tributyltin (CAS 56-35-9)

CARC: Carcinogenicity classification; SKIN: Risk of skin absorption; SENS: Risk of sensitization; YoE: Year of Evaluation

Evaluation	Occupational Exposure Limits				CARC	SKIN	SENS	YoE	Remarks	Reference
	8-hour TWA (mg/m ³)	8-hour TWA (ppm)	15-min STEL (mg/m ³)	15-min STEL (ppm)						
IARC/WHO	-	-	-	-	-	-	-	-	-	-
EU	-	-	-	-	-	-	-	-	-	-
SCOEL	0.02	-	-	-	-	-	-	2011	OEL based on tributyltin (TBT) oxide data, corresponds to 0.008 mg Sn/m ³ . NOAEL of 0.16 mg/m ³ as starting point, critical effect inflammatory reactions in respiratory tract and immunotoxic effects in lymphatic organs. Applies also to TBT fluoride, TBT benzoate, TBT chloride, TBT linoleate, TBT methacrylate, TBT naphthenate	SCOEL, 2011e
NL	-	-	-	-	-	-	-	-	Former 8-hour TWA = 0.05 mg/m ³ , withdrawn 01-01-2007.	SER, website
GE (DFG)	0.02* 0.05 [†]	0.004* 0.0021 [†]	0.02** 0.05 ^{†‡}	0.004** 0.0021 ^{†‡}	4	Yes	-	-	Chemical can be present as vapour and/or aerosol.	DFG, 2013 IFA (GESTIS), website
GE (AGS)	0.009* 0.05 [†]	0.0018* 0.0021 [†]	0.009** 0.05 ^{†‡}	0.0018** 0.0021 ^{†‡}	-	Yes	-	2014	OELs concern the elementary (Sn) content of the compound. Risk of teratogenic effects cannot be excluded at the level of the OEL. Chemical can be present as vapour and/or aerosol.	BAuA, 2014 IFA (GESTIS), website
UK	0.1 [†]	-	0.2 [†]	-	-	-	-	-	-	IFA (GESTIS), website
FR	-	-	-	-	-	-	-	-	-	INRS, 2012
FI	-	-	-	-	-	-	-	-	-	Social- och hälsovårdsministeriets, 2014
REACH	-	-	-	-	-	-	-	2011	No DNELs provided.	ECHA, website

* Tributyltin compounds

[†] Tributyltin oxide (TBTO); according to IFA (GESTIS) website[‡] Category I; exceedance factor=1 (see Introduction section 2.2.3)

3.49 Table 46: Vinylidene chloride (1,1-dichloroethene) (CAS no 75-35-4)

CARC: Carcinogenicity classification; SKIN: Risk of skin absorption; SENS: Risk of sensitization; YoE: Year of Evaluation

Evaluation	Occupational Exposure Limits				CARC	SKIN	SENS	YoE	Remarks	Reference
	8-hour TWA (mg/m ³)	8-hour TWA (ppm)	15-min STEL (mg/m ³)	15-min STEL (ppm)						
IARC/WHO	-	-	-	-	3	-	-	1999	Inadequate evidence for carcinogenicity in humans, as available epidemiological studies had major limitations. Limited evidence for carcinogenicity in experimental animals.	IARC, 1999a
EU	-	-	-	-	3	-	-	-	-	EC, 2008
SCOEL	8	2	20	5	-	-	-	2008	Point of departure for setting OEL based on hepato- and nephrotoxicity, LOAEL 100 mg/m ³ .	SCOEL, 2008d
NL	-	-	-	-	-	-	-	-	Former 8-hour TWA = 20 mg/m ³ , expired since 2007.	SER, website
GE (DFG)	8	2	16*	4*	3B	-	-	-	No risk for teratogenic effects if OEL is not exceeded.	DFG, 2014 IFA (GESTIS), website
GE (AGS)	8	2	16*	4*	-	-	-	2006	No risk for teratogenic effects if OEL is not exceeded.	BAuA, 2014 IFA (GESTIS), website
UK	40	10	-	-	-	-	-	-	-	HSE, 2011
FR	20	5	-	-	-	-	-	1987	Indicative limit values.	INRS, 2012
FI	8	2	20	5	-	-	-	-	-	Social- och hälsovårdsministeriets, 2014
REACH	4	-	38	-	-	-	-	2011	DNEL _{long-term} based on NOAEC in repeated dose toxicity. DNEL _{acute} based on acute toxicity (not further specified). DNEL _{long-term} for dermal exposure = 1.5 mg/kg bw/day, based on NOAEL in repeated dose toxicity.	ECHA, website

* Category II; exceedance factor=2 (see Introduction section 2.2.3)

3.50 Table 47: White spirit* (CAS No. 64742-82-1 / 8052-41-3 / 64741-92-0 / 64742-48-9 / 64742-88-7)

CARC: Carcinogenicity classification; SKIN: Risk of skin absorption; SENS: Risk of sensitization; YoE: Year of Evaluation

Evaluation	Occupational Exposure Limits				CARC	SKIN	SENS	YoE	Remarks	Reference
	8-hour TWA (mg/m ³)	8-hour TWA (ppm)	15-min STEL (mg/m ³)	15-min STEL (ppm)						
IARC/WHO	-	-	-	-	3	-	-	1989	Applies to petroleum solvents, including white spirit.	IARC, 1989
EU	-	-	-	-	1B	-	-	-	White Spirit Type 0: Solvent naphtha (petroleum), medium aliph. White Spirit Type 1: Naphtha (petroleum), hydrodesulfurized heavy. White Spirit: Stoddard solvent. White Spirit Type 2: Naphta (petroleum), solvent-refined heavy. White Spirit Type 3: Naphtha (petroleum), hydrotreated heavy.	EC, 2008
SCOEL	116	20	290	50	-	Yes	-	2007	OEL for white spirit considered to apply to all complex hydrocarbon mixtures with main compounds in the range from C6 to C12. 8-hour TWA based on NOAEL range of 40 to 90 ppm (eye/airway irritation and impairment of neurobehavioural functions). STEL based on NOAEL range from 34 ppm (7-hours) to 100 ppm (6-hours) and LOAEL of 100 ppm (7-hours). Labelling as a carcinogen is not obligatory if the content of benzene is < 0.1% w/v.	SCOEL, 2007b
NL	-	-	-	-	-	-	-	-	Former 8-hour TWA = 575 mg/m ³ for Stoddard solvent (1978), withdrawn 01-01-2007.	SER, website
GE (DFG)	-	-	-	-	-	-	-	-	-	-
GE (AGS)	-	-	-	-	-	-	-	-	-	-
UK	-	-	-	-	-	-	-	-	-	-
FR	-	-	-	-	-	-	-	-	-	-

* White spirit is a mixture of several complex hydrocarbons. CAS No. are not exhaustive.

Evaluation	Occupational Exposure Limits				CARC	SKIN	SENS	YoE	Remarks	Reference
	8-hour TWA (mg/m ³)	8-hour TWA (ppm)	15-min STEL (mg/m ³)	15-min STEL (ppm)						
FI	-	-	-	-	-	-	-	-	-	-
REACH	-	-	-	-	-	-	-	-	REACH dossiers are available for CAS No. 64742-82-1, 64742-48-9 and 64742-88-7. No DNELs are provided in any of these dossiers.	ECHA, website

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