# SAFETY DATA SHEET

According to Regulation (EC) No. 1907/2006 (REACH) Article 31, Annex II as amended by Commission Regulation (EU) 2020/878

## SECTION 1: Identification of the substance/mixture and of the company/undertaking

**1.1 Product identifier**
**Product Name:** FINCORD M
**Product Size:** 3.2 mm (1/8")

**Other means of identification**
**SDS number:** 200000010800

**1.2 Relevant identified uses of the substance or mixture and uses advised against**
**Identified uses:** SMAW (Shielded Metal Arc Welding)
**Uses advised against:** Not known. Read this SDS before using this product.

**1.3 Details of the supplier of the safety data sheet**
**Manufacturer/Importer/Supplier/Distributor Information**

| | |
|---|---|
| Company Name: | Lincoln Electric Europe B.V. |
| Address: | Collse Heide 12<br>Nuenen 5674 VN<br>The Netherlands |
| Telephone: | +31 243 522 911 |
| Contact Person: | SDS@lincolnelectric.com<br>Safety Data Sheet Questions: www.lincolnelectric.com/sds<br>Arc Welding Safety Information: www.lincolnelectric.com/safety |

**1.4 Emergency telephone number:**

| | |
|---|---|
| USA/Canada/Mexico | +1 (888) 609-1762 |
| Americas/Europe | +1 (216) 383-8962 |
| Asia Pacific | +1 (216) 383-8966 |
| Middle East/Africa | +1 (216) 383-8969 |

**3E Company Access Code:** 333988

| | | | |
|---|---|---|---|
| BG (Bulgaria) България | +359 2 9154 233 | IT (Italy) Italia | +39 055 794 7819 |
| CH (Switzerland) Suisse, Schweiz, Svizzera | 145 | LV (Latvia) Latvija | +371 67042473 |
| CZ (Czech Republic) Česká republika | +420 224 919 293 | LT (Lithuania) Lietuva | +370 (5) 2362052 |
| DE (Germany) Deutschland | +49 (0) 89 19240 | NL (Netherlands) Holland | 31(0)30 274 8888 |
| DK (Denmark) Danmark | +45 8212 1212 | NO (Norway) Norge | 22 59 13 00 |
| ES (Spain) España | +34 91 562 04 20 | PL (Poland) Polska | +48 12 411 99 99 |
| FI (Finland) | 0800 147 111 | PT (Portugal) | +351 800 250 250 |
| FR (France) | +33 1 45 42 59 59 | RO (Romania) România | +40 21 599 2300 |
| GB (United Kingdom) | 0344 892 0111 | SE (Sweden) Sverige | 112 |
| GR (Greece) Ελλάδα | (0030) 2107793777 | SI (Slovenia) Slovenija | 112 |
| HR (Croatia) Hrvatska | +3851 2348 342 | SK (Slovakia) Slovensko | +421 2 5477 4166 |

| | | | |
|---|---|---|---|
| HU (Hungary)<br>Magyarország | +36-80-201-199 | TR (Turkey) Türkiye | 112 |

## SECTION 2: Hazards identification

### 2.1 Classification of the substance or mixture

The product has not been classified as hazardous according to the legislation in force.

**Classification according to Regulation (EC) No 1272/2008 as amended.**

Not classified

**2.2 Label Elements** Not applicable

**Supplemental label information**

EUH210: Safety data sheet available on request.

**2.3 Other hazards**

Electrical Shock can kill. If welding must be performed in damp locations or with wet clothing, on metal structures or when in cramped positions such as sitting, kneeling or lying, or if there is a high risk of unavoidable or accidental contact with work piece, use the following equipment: Semiautomatic DC Welder, DC Manual (Stick) Welder, or AC Welder with Reduced Voltage Control.

Arc rays can injure eyes and burn skin. Welding arc and sparks can ignite combustibles and flammable materials. Overexposure to welding fumes and gases can be hazardous. Read and understand the manufacturer's instructions, Safety Data Sheets and the precautionary labels before using this product. Refer to Section 8.

**Substance(s) formed under the conditions of use:**

The welding fume produced from this welding electrode may contain the following constituent(s) and/or their complex metallic oxides as well as solid particles or other constituents from the consumables, base metal, or base metal coating not listed below.

| Chemical name | CAS-No. |
|---|---|
| Carbon dioxide | 124-38-9 |
| Carbon monoxide | 630-08-0 |
| Nitrogen dioxide | 10102-44-0 |
| Ozone | 10028-15-6 |
| Manganese | 7439-96-5 |

## SECTION 3: Composition/information on ingredients

### 3.2 Mixtures

| Chemical name | Concentration | CAS-No. | EC No. | Classification | Notes | REACH Registration No. |
|---|---|---|---|---|---|---|
| Iron | 50 - <100% | 7439-89-6 | 231-096-4 | Not classified | | 01-2119462838-24; |
| Titanium dioxide | 10 - <20% | 13463-67-7 | 236-675-5 | Not classified | # | No data available. |

| | | | | | | |
|---|---|---|---|---|---|---|
| (naturally occurring) | | | | | | |
| Quartz | 1 - <5% | 14808-60-7 | 238-878-4 | STOT RE: 1: H372; | # | No data available. |
| Manganese | 1 - <5% | 7439-96-5 | 231-105-1 | Not classified | # | 01-2119449803-34; |
| Potassium silicate | 1 - <5% | 1312-76-1 | 215-199-1 | Eye Irrit.: 2: H319; Skin Corr.: 2: H315; | | 01-2119456888-17; |
| Zircon | 1 - <5% | 14940-68-2 | 239-019-6 | Not classified | # | No data available. |
| Feldspar | 1 - <5% | 68476-25-5 | 270-666-7 | Not classified | | No data available. |
| Limestone | 0,1 - <1% | 1317-65-3 | 215-279-6 | Not classified | # | No data available. |
| Magnesite | 0,1 - <1% | 546-93-0 | 208-915-9 | Not classified | # | No data available. |
| Mica | 0,1 - <1% | 12001-26-2 | | Not classified | # | No data available. |
| Silicon dioxide (amorphous) | 0,1 - <1% | 7631-86-9 | 231-545-4 | Not classified | # | No data available. |
| Cellulose, pulp | 0,1 - <1% | 65996-61-4 | 265-995-8 | Not classified | | No data available. |
| Aluminum oxide | 0,1 - <1% | 1344-28-1 | 215-691-6 | Not classified | # | 01-2119529248-35; |
| Iron oxide | 0,1 - <1% | 1309-37-1 | 215-168-2 | Not classified | # | No data available. |
| Zirconium oxide | 0,1 - <1% | 1314-23-4 | 215-227-2 | Not classified | # | No data available. |
| Sodium carbonate | 0,1 - <1% | 497-19-8 | 207-838-8 | Eye Irrit.: 2: H319; | | No data available. |
| Titanium dioxide (synthetic) | 0,1 - <1% | 13463-67-7 | 236-675-5 | Carc.: 2: H351; Note V, Note W, Note 10 | # | 01-2119489379-17; |
| Carboxymethyl cellulose, sodium salt | 0,1 - <1% | 9004-32-4 | | Not classified | | No data available. |
| Silicon | 0,1 - <1% | 7440-21-3 | 231-130-8 | Not classified | # | 01-2119480401-47; |

* All concentrations are percent by weight unless ingredient is a gas. Gas concentrations are in percent by volume.
# This substance has workplace exposure limit(s).
## This substance is listed as SVHC

The full text for all statements is displayed in section 16.

**Composition Comments:** The term “Hazardous Ingredients” should be interpreted as a term defined in Hazard Communication standards and does not necessarily imply the existence of a welding or allied process hazard. The product may contain additional non-hazardous ingredients or may form additional compounds under the condition of use. Refer to Sections 2 and 8 for more information.

## SECTION 4: First aid measures

### 4.1 Description of first aid measures

**Inhalation:** Move to fresh air if breathing is difficult. If breathing has stopped, perform artificial respiration and obtain medical assistance at once.

**Skin Contact:** Remove contaminated clothing and wash the skin thoroughly with soap and water. For reddened or blistered skin, or thermal burns, obtain medical assistance at once.

**Eye contact:** Dust or fume from this product should be flushed from the eyes with copious amounts of clean, tepid water until transported to an emergency medical facility. Do not allow victim to rub or keep eyes tightly closed. Obtain medical assistance at once.

Arc rays can injure eyes. If exposed to arc rays, move victim to dark room, remove contact lenses as necessary for treatment, cover eyes with a padded dressing and rest. Obtain medical assistance if symptoms persist.

**Ingestion:** Avoid hand, clothing, food, and drink contact with fluxes, metal fume or powder which can cause ingestion of particulate during hand to mouth activities such as drinking, eating, smoking, etc. If ingested, do not induce vomiting. Contact a poison control center. Unless the poison control center advises otherwise, wash out mouth thoroughly with water. If symptoms develop, seek medical attention at once.

**4.2 Most important symptoms and effects, both acute and delayed:** Short-term (acute) overexposure to fumes and gases from welding and allied processes may result in discomfort such as metal fume fever, dizziness, nausea, or dryness or irritation of nose, throat, or eyes. May aggravate pre-existing respiratory problems (e.g. asthma, emphysema). Long-term (chronic) overexposure to fumes and gases from welding and allied processes can lead to siderosis (iron deposits in lung), central nervous system effects, bronchitis and other pulmonary effects. Refer to Section 11 for more information.

**4.3 Indication of any immediate medical attention and special treatment needed**

**Hazards:** The hazards associated with welding and its allied processes such as soldering and brazing are complex and may include physical and health hazards such as but not limited to electric shock, physical strains, radiation burns (eye flash), thermal burns due to hot metal or spatter and potential health effects of overexposure to fumes, gases or dusts potentially generated during the use of this product. Refer to Section 11 for more information.

**Treatment:** Treat symptomatically.

## SECTION 5: Firefighting measures

**General Fire Hazards:** As shipped, this product is nonflammable. However, welding arcs, sparks, open flames, and hot surfaces associated with welding, brazing, and soldering can ignite combustible and flammable materials. Implement fire protection measures according to the place of use risk assessment, local regulations, and all relevant safety standards. Read and understand the American National Standard Z49.1, "Safety in Welding, Cutting, and Allied Processes," and the National Fire Protection Association NFPA 51B, "Standard for Fire Prevention during Welding, Cutting, and Other Hot Work," before using this product.

**5.1 Extinguishing media**

**Suitable extinguishing media:** As shipped, the product will not burn. In case of fire in the surroundings: use appropriate extinguishing agent.

**Unsuitable extinguishing media:** Do not use water jet as an extinguisher, as this will spread the fire.

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| **5.2 Special hazards arising from the substance or mixture:** | Welding arc and sparks can ignite combustibles and flammable products. |

**5.3 Advice for firefighters**

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| **Special fire-fighting procedures:** | Use standard firefighting procedures and consider the hazards of other involved materials. |
| **Special protective equipment for fire-fighters:** | Selection of respiratory protection for fire fighting: follow the general fire precautions indicated in the workplace. Self-contained breathing apparatus and full protective clothing must be worn in case of fire. |

## SECTION 6: Accidental release measures

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| **6.1 Personal precautions, protective equipment and emergency procedures:** | If airborne dust and/or fume is present, use adequate engineering controls and, if needed, personal protection to prevent overexposure. Refer to recommendations in Section 8. |
| **6.2 Environmental Precautions:** | Avoid release to the environment. Prevent further leakage or spillage if safe to do so. Do not contaminate water sources or sewer. Environmental manager must be informed of all major spillages. |
| **6.3 Methods and material for containment and cleaning up:** | Absorb with sand or other inert absorbent. Stop the flow of material, if this is without risk. Clean up spills immediately, observing precautions in the personal protective equipment in Section 8. Avoid generating dust. Prevent product from entering any drains, sewers or water sources. Refer to Section 13 for proper disposal. |
| **6.4 Reference to other sections:** | For further specification, refer to section 8 of the SDS. |

## SECTION 7: Handling and storage:

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|---|---|
| **7.1 Precautions for safe handling:** | Prevent formation of dust. Provide appropriate exhaust ventilation at places where dust is formed.<br>Read and understand the manufacturer's instruction and the precautionary label on the product. Refer to Lincoln Safety Publications at www.lincolnelectric.com/safety, ISO/TR 18786:2014, ISO/TR 13392:2014, American National Standard Z49.1, "Safety In Welding, Cutting and Allied Processes" published by the American Welding Society, http://pubs.aws.org and OSHA Publication 2206 (29CFR1910), U.S. Government Printing Office, www.gpo.gov. |
| **7.2 Conditions for safe storage, including any incompatibilities:** | Store in closed original container in a dry place. Store in accordance with local/regional/national regulations. Store away from incompatible materials. |

**7.3 Specific end use(s):** No data available.

## SECTION 8: Exposure controls/personal protection

**8.1 Control Parameters**

MAC, PEL, TLV and other exposure limit values may vary per element and form - as well as per country. All country-specific values are not listed. If no occupational exposure limit values are listed below, your local authority may still have applicable values. Refer to your local or national exposure limit values.

**Occupational Exposure Limits: European Union**

| Chemical Identity | Type | Exposure Limit Values | Source |
|---|---|---|---|
| Quartz - Respirable fraction and dust | TWA | 0,1 mg/m3 | EU. OELs, Directive 2004/37/EC on carcinogen and mutagens from Annex III, Part A (12 2017) RESPIRABLE CRYSTALLINE SILICA DUST, RESPIRABLE FRACTION |
| Manganese - Respirable fraction. - as Mn | TWA | 0,05 mg/m3 | EU. Indicative Exposure Limit Values in Directives 91/322/EEC, 2000/39/EC, 2006/15/EC, 2009/161/EU (02 2017) Indicative Indicative MANGANESE AND INORGANIC MANGANESE COMPOUNDS (AS MN) (RESPIRABLE FRACTION) |
| Manganese - Inhalable fraction. - as Mn | TWA | 0,2 mg/m3 | EU. Indicative Exposure Limit Values in Directives 91/322/EEC, 2000/39/EC, 2006/15/EC, 2009/161/EU (02 2017) Indicative Indicative MANGANESE AND INORGANIC MANGANESE COMPOUNDS (AS MN) (INHALABLE FRACTION) |
| Manganese - Respirable fraction. | TWA | 0,050 mg/m3 | EU. Scientific Committee on Occupational Exposure Limit Values (SCOELs), European Commission - SCOEL, as amended (2014) |
| Manganese - Inhalable fraction. | TWA | 0,200 mg/m3 | EU. Scientific Committee on Occupational Exposure Limit Values (SCOELs), European Commission - SCOEL, as amended (2014) |

**Occupational Exposure Limits: Austria**

| Chemical Identity | Type | Exposure Limit Values | Source |
|---|---|---|---|
| Zircon - Inhalable fraction. - as Zr | MAK | 5 mg/m3 | Austria. MAK List, OEL Ordinance (GwV), BGBl. II, no. 184/2001, as amended (09 2007) |
| Limestone - Respirable fraction. | MAK | 5 mg/m3 | Austria. MAK List, OEL Ordinance (GwV), BGBl. II, no. 184/2001, as amended (09 2020) |
| | MAK STEL | 10 mg/m3 | Austria. MAK List, OEL Ordinance (GwV), BGBl. II, no. 184/2001, as amended (09 2020) |
| Limestone - Inhalable fraction. | MAK | 10 mg/m3 | Austria. MAK List, OEL Ordinance (GwV), BGBl. II, no. 184/2001, as amended (09 2020) |
| | MAK STEL | 20 mg/m3 | Austria. MAK List, OEL Ordinance (GwV), BGBl. II, no. 184/2001, as amended (09 2020) |
| Magnesite - Respirable fraction. | MAK STEL | 10 mg/m3 | Austria. MAK List, OEL Ordinance (GwV), BGBl. II, no. 184/2001, as amended (09 2020) |
| Magnesite - Inhalable fraction. | MAK STEL | 20 mg/m3 | Austria. MAK List, OEL Ordinance (GwV), BGBl. II, no. 184/2001, as amended (09 2020) |
| Magnesite - Respirable fraction. | MAK | 5 mg/m3 | Austria. MAK List, OEL Ordinance (GwV), BGBl. II, no. 184/2001, as amended (09 2020) |
| Magnesite - Inhalable fraction. | MAK | 10 mg/m3 | Austria. MAK List, OEL Ordinance (GwV), BGBl. II, no. 184/2001, as amended (09 2020) |
| Silicon dioxide (amorphous) - Inhalable fraction. | MAK | 4 mg/m3 | Austria. MAK List, OEL Ordinance (GwV), BGBl. II, no. 184/2001, as amended (09 2007) |
| Iron oxide - Respirable fraction. | MAK STEL | 10 mg/m3 | Austria. MAK List, OEL Ordinance (GwV), BGBl. II, no. 184/2001, as amended (09 2007) |
| Iron oxide - Inhalable fraction. | MAK | 10 mg/m3 | Austria. MAK List, OEL Ordinance (GwV), BGBl. II, no. 184/2001, as amended (09 2007) |
| Iron oxide - Respirable fraction. | MAK | 5 mg/m3 | Austria. MAK List, OEL Ordinance (GwV), BGBl. II, no. 184/2001, as amended (09 2007) |
| Iron oxide - Inhalable fraction. | MAK STEL | 20 mg/m3 | Austria. MAK List, OEL Ordinance (GwV), BGBl. II, no. 184/2001, as amended (09 2007) |
| Zirconium oxide - Inhalable fraction. - as Zr | MAK | 5 mg/m3 | Austria. MAK List, OEL Ordinance (GwV), BGBl. II, no. 184/2001, as amended (09 2007) |
| Zirconium oxide - Respirable fraction. | MAK STEL | 10 mg/m3 | Austria. MAK List, OEL Ordinance (GwV), BGBl. II, no. 184/2001, as amended (09 2020) |
| Zirconium oxide - Inhalable fraction. | MAK STEL | 20 mg/m3 | Austria. MAK List, OEL Ordinance (GwV), BGBl. II, no. 184/2001, as amended (09 2020) |
| | MAK | 10 mg/m3 | Austria. MAK List, OEL Ordinance (GwV), BGBl. II, no. 184/2001, as amended (09 2020) |

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|---|---|---|---|
| Zirconium oxide - Respirable fraction. | MAK | 5 mg/m3 | Austria. MAK List, OEL Ordinance (GwV), BGBl. II, no. 184/2001, as amended (09 2020) |
| Silicon - Inhalable fraction. | MAK | 10 mg/m3 | Austria. MAK List, OEL Ordinance (GwV), BGBl. II, no. 184/2001, as amended (09 2020) |
| Silicon - Respirable fraction. | MAK | 5 mg/m3 | Austria. MAK List, OEL Ordinance (GwV), BGBl. II, no. 184/2001, as amended (09 2020) |
| | MAK STEL | 10 mg/m3 | Austria. MAK List, OEL Ordinance (GwV), BGBl. II, no. 184/2001, as amended (09 2020) |
| Silicon - Inhalable fraction. | MAK STEL | 20 mg/m3 | Austria. MAK List, OEL Ordinance (GwV), BGBl. II, no. 184/2001, as amended (09 2020) |

### Occupational Exposure Limits: Belgium

| Chemical Identity | Type | Exposure Limit Values | Source |
|---|---|---|---|
| Zircon - as Zr | TWA | 5 mg/m3 | Belgium. OELs. Exposure Limit Values to Chemical Substances at Work, Code of Well-being at work, Book VI, Title 1, as amended (06 2007) |
| | STEL | 10 mg/m3 | Belgium. OELs. Exposure Limit Values to Chemical Substances at Work, Code of Well-being at work, Book VI, Title 1, as amended (10 2018) |
| Limestone | TWA | 10 mg/m3 | Belgium. OELs. Exposure Limit Values to Chemical Substances at Work, Code of Well-being at work, Book VI, Title 1, as amended (06 2007) Calcium carbonate |
| Magnesite | TWA | 10 mg/m3 | Belgium. OELs. Exposure Limit Values to Chemical Substances at Work, Code of Well-being at work, Book VI, Title 1, as amended (06 2007) |
| Silicon dioxide (amorphous) - Respirable fraction. | TWA | 3 mg/m3 | Belgium. OELs. Exposure Limit Values to Chemical Substances at Work, Code of Well-being at work, Book VI, Title 1, as amended (12 2020) Particles not otherwise classified (respirable fraction) |
| Silicon dioxide (amorphous) - Inhalable fraction. | TWA | 10 mg/m3 | Belgium. OELs. Exposure Limit Values to Chemical Substances at Work, Code of Well-being at work, Book VI, Title 1, as amended (12 2020) Particles not otherwise classified (inhalable fraction) |
| Iron oxide - Respirable fraction. | TWA | 5 mg/m3 | Belgium. OELs. Exposure Limit Values to Chemical Substances at Work, Code of Well-being at work, Book VI, Title 1, as amended (04 2014) |
| Zirconium oxide - as Zr | TWA | 5 mg/m3 | Belgium. OELs. Exposure Limit Values to Chemical Substances at Work, Code of Well-being at work, Book VI, Title 1, as amended (06 2007) |
| | STEL | 10 mg/m3 | Belgium. OELs. Exposure Limit Values to Chemical Substances at Work, Code of Well-being at work, Book VI, Title 1, as amended (10 2018) Zirconium (compounds of) (as Zr) |
| Zirconium oxide - Respirable fraction. | TWA | 3 mg/m3 | Belgium. OELs. Exposure Limit Values to Chemical Substances at Work, Code of Well-being at work, Book VI, Title 1, as amended (01 2020) |
| Zirconium oxide - Inhalable fraction. | TWA | 10 mg/m3 | Belgium. OELs. Exposure Limit Values to Chemical Substances at Work, Code of Well-being at work, Book VI, Title 1, as amended (01 2020) Particles not otherwise classified (inhalable fraction) |
| Silicon | TWA | 10 mg/m3 | Belgium. OELs. Exposure Limit Values to Chemical Substances at Work, Code of Well-being at work, Book VI, Title 1, as amended (06 2007) |

### Occupational Exposure Limits: Bulgaria

| Chemical Identity | Type | Exposure Limit Values | Source |
|---|---|---|---|
| Feldspar - Inhalable fraction. | TWA | 6,0 mg/m3 | Bulgaria. OELs. Limit Values of Chemical Agents in Air at Work (Reg. No 13, Annex 1, D.V.8/2004), as amended (2004) Pegmatite (feldspar), containing less than 2% free crystalline silicon dioxide, inhalable fraction |
| Feldspar - Respirable fraction. | TWA | 3,0 mg/m3 | Bulgaria. OELs. Limit Values of Chemical Agents in Air at Work (Reg. No 13, Annex 1, D.V.8/2004), as amended (2004) Pegmatite (feldspar), containing less than 2% free crystalline silicon dioxide, respirable fraction |

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|---|---|---|---|
| Limestone | TWA | 10,0 mg/m3 | Bulgaria. OELs. Limit Values of Chemical Agents in Air at Work (Reg. No 13, Annex 1, D.V.8/2004), as amended (2004) Calcium carbonate |
| Limestone - Inhalable fraction. | TWA | 10 mg/m3 | Bulgaria. OELs. Limit Values of Chemical Agents in Air at Work (Reg. No 13, Annex 1, D.V.8/2004), as amended (01 2012) Limestone, containing less than 2% free crystalline silicon dioxide, inhalable fraction |
| Limestone - Respirable fraction. | TWA | 1,0 fibers/cm3 | Bulgaria. OELs. Limit Values of Chemical Agents in Air at Work (Reg. No 13, Annex 1, D.V.8/2004), as amended (01 2012) Limestone, containing less than 2% free crystalline silicon dioxide, fibrous particles, respirable fraction |
| Magnesite - Inhalable fraction. | TWA | 8,0 mg/m3 | Bulgaria. OELs. Limit Values of Chemical Agents in Air at Work (Reg. No 13, Annex 1, D.V.8/2004), as amended (2004) Magnesite, containing less than 2% free crystalline silicon dioxide, inhalable fraction |
| Magnesite - Respirable fraction. | TWA | 3,0 mg/m3 | Bulgaria. OELs. Limit Values of Chemical Agents in Air at Work (Reg. No 13, Annex 1, D.V.8/2004), as amended (2004) Magnesite, containing less than 2% free crystalline silicon dioxide, respirable fraction |
| | TWA | 1,0 fibers/cm3 | Bulgaria. OELs. Limit Values of Chemical Agents in Air at Work (Reg. No 13, Annex 1, D.V.8/2004), as amended (01 2012) Magnesite, containing less than 2% free crystalline silicon dioxide - fibrous particles, respirable fraction |
| Silicon dioxide (amorphous) - Inhalable fraction. | TWA | 10,0 mg/m3 | Bulgaria. OELs. Limit Values of Chemical Agents in Air at Work (Reg. No 13, Annex 1, D.V.8/2004), as amended (2004) Free silicon dioxide, amorphous, synthetic, from sedimentation processes (silica gel), inhalable fraction |
| Silicon dioxide (amorphous) - Respirable fraction. | TWA | 0,07 mg/m3 | Bulgaria. OELs. Limit Values of Chemical Agents in Air at Work (Reg. No 13, Annex 1, D.V.8/2004), as amended (2004) Free silicon dioxide, amorphous, synthetic from condensation and electrothermal processes, respirable fraction |
| Silicon dioxide (amorphous) - Inhalable fraction. | TWA | 4,0 mg/m3 | Bulgaria. OELs. Limit Values of Chemical Agents in Air at Work (Reg. No 13, Annex 1, D.V.8/2004), as amended (01 2020) Free silicon dioxide, amorphous and cryptocrystalline, from natural sedimentation (opal, chalcedony, etc.), inhalable fraction |
| Silicon dioxide (amorphous) - Respirable fraction. | TWA | 1,0 mg/m3 | Bulgaria. OELs. Limit Values of Chemical Agents in Air at Work (Reg. No 13, Annex 1, D.V.8/2004), as amended (01 2020) Free silicon dioxide, amorphous and cryptocrystalline, from natural sedimentation (opal, chalcedony, etc.), respirable fraction |
| Iron oxide - as Fe | TWA | 5,0 mg/m3 | Bulgaria. OELs. Limit Values of Chemical Agents in Air at Work (Reg. No 13, Annex 1, D.V.8/2004), as amended (2004) Iron oxide, as Fe |

## Occupational Exposure Limits: Croatia

| Chemical Identity | Type | Exposure Limit Values | Source |
|---|---|---|---|
| Zircon - as Zr | KGVI | 10 mg/m3 | Croatia. OELs (GVI). Regulation on Protection of Workers against Exposure to Dangerous Chemicals at Work, OELs and Biological Limit Values, Annex I (NN 91/2018), as amended (12 2023) Zirconium and its compounds (as Zr) |
| | GVI | 5 mg/m3 | Croatia. OELs (GVI). Regulation on Protection of Workers against Exposure to Dangerous Chemicals at Work, OELs and Biological Limit Values, Annex I (NN 91/2018), as amended (12 2023) Zirconium and its compounds (as Zr) |
| Limestone - Respirable dust. | GVI | 4 mg/m3 | Croatia. OELs (GVI). Regulation on Protection of Workers against Exposure to Dangerous Chemicals at Work, OELs and Biological Limit Values, Annex I (NN 91/2018), as amended (10 2018) Annex 1: Maximum Allowable Exposure Values Annex 1: Maximum Allowable Exposure Values Limestone; Calcium carbonate [Respirable Dust] |
| Limestone - Total dust. | GVI | 10 mg/m3 | Croatia. OELs (GVI). Regulation on Protection of Workers against Exposure to Dangerous Chemicals at Work, OELs and Biological Limit Values, Annex I (NN 91/2018), as amended (10 2018) Annex 1: Maximum Allowable Exposure Values Annex 1: Maximum Allowable Exposure Values Limestone; Calcium carbonate [Total Dust] |
| | GVI | 10 mg/m3 | Croatia. OELs (GVI). Regulation on Protection of Workers |

| | | | |
|---|---|---|---|
| | | | against Exposure to Dangerous Chemicals at Work, OELs and Biological Limit Values, Annex I (NN 91/2018), as amended (12 2023) |
| Limestone - Respirable dust. | GVI | 4 mg/m3 | Croatia. OELs (GVI). Regulation on Protection of Workers against Exposure to Dangerous Chemicals at Work, OELs and Biological Limit Values, Annex I (NN 91/2018), as amended (12 2023) |
| Magnesite - Total dust. | GVI | 10 mg/m3 | Croatia. OELs (GVI). Regulation on Protection of Workers against Exposure to Dangerous Chemicals at Work, OELs and Biological Limit Values, Annex I (NN 91/2018), as amended (12 2023) Magnesium carbonate (Magnetite) [Total Dust] |
| Magnesite - Respirable dust. | GVI | 4 mg/m3 | Croatia. OELs (GVI). Regulation on Protection of Workers against Exposure to Dangerous Chemicals at Work, OELs and Biological Limit Values, Annex I (NN 91/2018), as amended (12 2023) Magnesium carbonate (Magnetite) [Respirable Dust] |
| Silicon dioxide (amorphous) - Respirable dust. | GVI | 0,1 mg/m3 | Croatia. OELs (GVI). Regulation on Protection of Workers against Exposure to Dangerous Chemicals at Work, OELs and Biological Limit Values, Annex I (NN 91/2018), as amended (12 2023) Silicon dioxide [Respirable Dust] |
| | GVI | 2,4 mg/m3 | Croatia. OELs (GVI). Regulation on Protection of Workers against Exposure to Dangerous Chemicals at Work, OELs and Biological Limit Values, Annex I (NN 91/2018), as amended (12 2023) Diatomite (amorphous) [Respirable Dust] |
| Silicon dioxide (amorphous) - Total dust. | GVI | 6 mg/m3 | Croatia. OELs (GVI). Regulation on Protection of Workers against Exposure to Dangerous Chemicals at Work, OELs and Biological Limit Values, Annex I (NN 91/2018), as amended (12 2023) Diatomite (amorphous) [Total Dust] |
| Iron oxide - Respirable dust. | GVI | 4 mg/m3 | Croatia. OELs (GVI). Regulation on Protection of Workers against Exposure to Dangerous Chemicals at Work, OELs and Biological Limit Values, Annex I (NN 91/2018), as amended (10 2018) Annex 1: Maximum Allowable Exposure Values Annex 1: Maximum Allowable Exposure Values Iron(III) oxide, dust; Reddish brown [Respirable Dust] |
| Iron oxide - Total dust. | GVI | 10 mg/m3 | Croatia. OELs (GVI). Regulation on Protection of Workers against Exposure to Dangerous Chemicals at Work, OELs and Biological Limit Values, Annex I (NN 91/2018), as amended (10 2018) Annex 1: Maximum Allowable Exposure Values Annex 1: Maximum Allowable Exposure Values Iron(III) oxide, dust; Reddish brown [Total Dust] |
| Iron oxide - Respirable dust. | GVI | 4 mg/m3 | Croatia. OELs (GVI). Regulation on Protection of Workers against Exposure to Dangerous Chemicals at Work, OELs and Biological Limit Values, Annex I (NN 91/2018), as amended (12 2023) |
| Iron oxide - Total dust. | GVI | 10 mg/m3 | Croatia. OELs (GVI). Regulation on Protection of Workers against Exposure to Dangerous Chemicals at Work, OELs and Biological Limit Values, Annex I (NN 91/2018), as amended (12 2023) Iron(III) oxide, dust [Total Dust]; Reddish brown [Total Dust] |
| Iron oxide - Fume. - as Fe | GVI | 5 mg/m3 | Croatia. OELs (GVI). Regulation on Protection of Workers against Exposure to Dangerous Chemicals at Work, OELs and Biological Limit Values, Annex I (NN 91/2018), as amended (12 2023) Iron(III) oxide, fumes (as Fe) |
| | KGVI | 10 mg/m3 | Croatia. OELs (GVI). Regulation on Protection of Workers against Exposure to Dangerous Chemicals at Work, OELs and Biological Limit Values, Annex I (NN 91/2018), as amended (12 2023) Iron(III) oxide, fumes (as Fe) |
| Zirconium oxide - as Zr | KGVI | 10 mg/m3 | Croatia. OELs (GVI). Regulation on Protection of Workers against Exposure to Dangerous Chemicals at Work, OELs and Biological Limit Values, Annex I (NN 91/2018), as amended (12 2023) Zirconium and its compounds (as Zr) |
| | GVI | 5 mg/m3 | Croatia. OELs (GVI). Regulation on Protection of Workers against Exposure to Dangerous Chemicals at Work, OELs and Biological Limit Values, Annex I (NN 91/2018), as amended (12 2023) Zirconium and its compounds (as Zr) |
| Silicon - Total dust. | GVI | 10 mg/m3 | Croatia. OELs (GVI). Regulation on Protection of Workers against Exposure to Dangerous Chemicals at Work, OELs and Biological Limit Values, Annex I (NN 91/2018), as amended (12 2023) Silicon [Total Dust] |
| Silicon - Respirable dust. | GVI | 4 mg/m3 | Croatia. OELs (GVI). Regulation on Protection of Workers against Exposure to Dangerous Chemicals at Work, OELs and |

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|---|---|---|---|
| | | | Biological Limit Values, Annex I (NN 91/2018), as amended (12 2023) Silicon [Respirable Dust] |

### Occupational Exposure Limits: Czechia

| Chemical Identity | Type | Exposure Limit Values | Source |
|---|---|---|---|
| Limestone - Dust. | PEL | 10 mg/m3 | Czech Republic. OELs. Government Decree 361, as amended (03 2012) Limestone, marble, dust |
| Silicon dioxide (amorphous) - Dust. | PEL | 4,0 mg/m3 | Czech Republic. OELs. Government Decree 361, as amended (05 2021) Amorphous SiO2, dust |
| Iron oxide - Dust. | PEL | 10,0 mg/m3 | Czech Republic. OELs. Government Decree 361, as amended (10 2018) Ferroxides, dust |
| | PEL | 10,0 mg/m3 | Czech Republic. OELs. Government Decree 361, as amended (11 2023) Iron and its alloys, dust |
| Sodium carbonate - Aerosol, inhalable. | NPK-P | 10 mg/m3 | Czech Republic. OELs. Government Decree 361, as amended (10 2018) Sodium and potassium carbonates and hydrogen carbonates, inhalable aerosol fraction |
| | PEL | 5 mg/m3 | Czech Republic. OELs. Government Decree 361, as amended (10 2018) Sodium and potassium carbonates and hydrogen carbonates, inhalable aerosol fraction |

### Occupational Exposure Limits: Denmark

| Chemical Identity | Type | Exposure Limit Values | Source |
|---|---|---|---|
| Titanium dioxide (naturally occurring) - as Ti | GV | 6 mg/m3 | Denmark. OELs. Annexes 2 & 3, Exposure Limits for Substances & Materials - Order No. 507, WEA, as amended (03 2008) |
| | STEL | 12 mg/m3 | Denmark. OELs. Annexes 2 & 3, Exposure Limits for Substances & Materials - Order No. 507, WEA, as amended (03 2024) Titanium dioxide, calculated as Ti |
| Quartz - Total | GV | 0,3 mg/m3 | Denmark. OELs. Annexes 2 & 3, Exposure Limits for Substances & Materials - Order No. 507, WEA, as amended (03 2008) |
| Quartz - Respirable. | GV | 0,1 mg/m3 | Denmark. OELs. Annexes 2 & 3, Exposure Limits for Substances & Materials - Order No. 507, WEA, as amended (12 2019) |
| Manganese - Inhalable fume. - as Mn | GV | 0,2 mg/m3 | Denmark. OELs. Annexes 2 & 3, Exposure Limits for Substances & Materials - Order No. 507, WEA, as amended (12 2019) Substance has an EU limit value. |
| Manganese - Respirable fume. - as Mn | GV | 0,05 mg/m3 | Denmark. OELs. Annexes 2 & 3, Exposure Limits for Substances & Materials - Order No. 507, WEA, as amended (12 2019) Substance has an EU limit value. |
| Manganese - Dust. - as Mn | GV | 0,2 mg/m3 | Denmark. OELs. Annexes 2 & 3, Exposure Limits for Substances & Materials - Order No. 507, WEA, as amended (12 2019) Substance has an EU limit value. |
| Manganese - Respirable. | GV | 0,05 mg/m3 | Denmark. OELs. Annexes 2 & 3, Exposure Limits for Substances & Materials - Order No. 507, WEA, as amended (12 2019) Substance has an EU limit value. |
| Manganese - Inhalable fume. - as Mn | STEL | 0,4 mg/m3 | Denmark. OELs. Annexes 2 & 3, Exposure Limits for Substances & Materials - Order No. 507, WEA, as amended (06 2022) Substance has an EU limit value. Substance has an EU limit value. Manganese fumes, calculated as Mn, Inhalable |
| Manganese - Respirable fume. - as Mn | STEL | 0,1 mg/m3 | Denmark. OELs. Annexes 2 & 3, Exposure Limits for Substances & Materials - Order No. 507, WEA, as amended (06 2022) Substance has an EU limit value. Substance has an EU limit value. Manganese fumes, calculated as Mn, Respirable |
| Zircon - as Zr | GV | 5 mg/m3 | Denmark. OELs. Annexes 2 & 3, Exposure Limits for Substances & Materials - Order No. 507, WEA, as amended (03 2008) Zirconium compounds, calculated as Zr |
| | STEL | 10 mg/m3 | Denmark. OELs. Annexes 2 & 3, Exposure Limits for Substances & Materials - Order No. 507, WEA, as amended (03 2024) Zirconium compounds, calculated as Zr |
| Limestone - Dust. | GV | 10 mg/m3 | Denmark. OELs. Annexes 2 & 3, Exposure Limits for Substances & Materials - Order No. 507, WEA, as amended (11 2021) Mineral dust, inert |

| | | | |
|---|---|---|---|
| Limestone - Respirable dust. | GV | 5 mg/m3 | Denmark. OELs. Annexes 2 & 3, Exposure Limits for Substances & Materials - Order No. 507, WEA, as amended (11 2021) Mineral dust, inert, respirable |
| | STEL | 10 mg/m3 | Denmark. OELs. Annexes 2 & 3, Exposure Limits for Substances & Materials - Order No. 507, WEA, as amended (03 2024) Mineral dust, inert, respirable |
| Limestone - Dust. | STEL | 20 mg/m3 | Denmark. OELs. Annexes 2 & 3, Exposure Limits for Substances & Materials - Order No. 507, WEA, as amended (03 2024) Mineral dust, inert |
| Magnesite - Respirable dust. | GV | 5 mg/m3 | Denmark. OELs. Annexes 2 & 3, Exposure Limits for Substances & Materials - Order No. 507, WEA, as amended (11 2021) Mineral dust, inert, respirable |
| Magnesite - Dust. | GV | 10 mg/m3 | Denmark. OELs. Annexes 2 & 3, Exposure Limits for Substances & Materials - Order No. 507, WEA, as amended (11 2021) Mineral dust, inert |
| Magnesite - Respirable dust. | STEL | 10 mg/m3 | Denmark. OELs. Annexes 2 & 3, Exposure Limits for Substances & Materials - Order No. 507, WEA, as amended (03 2024) Mineral dust, inert, respirable |
| Magnesite - Dust. | STEL | 20 mg/m3 | Denmark. OELs. Annexes 2 & 3, Exposure Limits for Substances & Materials - Order No. 507, WEA, as amended (03 2024) Mineral dust, inert |
| Silicon dioxide (amorphous) - Respirable dust. | STEL | 0,2 mg/m3 | Denmark. OELs. Annexes 2 & 3, Exposure Limits for Substances & Materials - Order No. 507, WEA, as amended (02 2023) Substance has an EU limit value. Substance has an EU limit value. Crystalline silicon dioxide, respirable dust |
| | GV | 0,1 mg/m3 | Denmark. OELs. Annexes 2 & 3, Exposure Limits for Substances & Materials - Order No. 507, WEA, as amended (03 2024) Substance has an EU limit value. Substance has an EU limit value. Crystalline silicon dioxide, respirable dust |
| Aluminum oxide - Total - as Al | GV | 5 mg/m3 | Denmark. OELs. Annexes 2 & 3, Exposure Limits for Substances & Materials - Order No. 507, WEA, as amended (03 2008) |
| Aluminum oxide - Respirable. - as Al | GV | 2 mg/m3 | Denmark. OELs. Annexes 2 & 3, Exposure Limits for Substances & Materials - Order No. 507, WEA, as amended (03 2008) |
| Aluminum oxide - Total - as Al | STEL | 10 mg/m3 | Denmark. OELs. Annexes 2 & 3, Exposure Limits for Substances & Materials - Order No. 507, WEA, as amended (06 2022) Aluminum oxide, calculated as Al, total |
| Aluminum oxide - Respirable. - as Al | STEL | 4 mg/m3 | Denmark. OELs. Annexes 2 & 3, Exposure Limits for Substances & Materials - Order No. 507, WEA, as amended (03 2024) Aluminum, powder and dust, respirable |
| Iron oxide - as Fe | GV | 3,5 mg/m3 | Denmark. OELs. Annexes 2 & 3, Exposure Limits for Substances & Materials - Order No. 507, WEA, as amended (03 2008) Iron oxide, calculated as Fe |
| | STEL | 7 mg/m3 | Denmark. OELs. Annexes 2 & 3, Exposure Limits for Substances & Materials - Order No. 507, WEA, as amended (02 2023) Iron oxide, calculated as Fe |
| Zirconium oxide - as Zr | GV | 5 mg/m3 | Denmark. OELs. Annexes 2 & 3, Exposure Limits for Substances & Materials - Order No. 507, WEA, as amended (03 2008) Zirconium compounds, calculated as Zr |
| | STEL | 10 mg/m3 | Denmark. OELs. Annexes 2 & 3, Exposure Limits for Substances & Materials - Order No. 507, WEA, as amended (03 2024) Zirconium compounds, calculated as Zr |
| Titanium dioxide (synthetic) - as Ti | GV | 6 mg/m3 | Denmark. OELs. Annexes 2 & 3, Exposure Limits for Substances & Materials - Order No. 507, WEA, as amended (03 2008) |
| | STEL | 12 mg/m3 | Denmark. OELs. Annexes 2 & 3, Exposure Limits for Substances & Materials - Order No. 507, WEA, as amended (03 2024) Titanium dioxide, calculated as Ti |
| Silicon | GV | 10 mg/m3 | Denmark. OELs. Annexes 2 & 3, Exposure Limits for Substances & Materials - Order No. 507, WEA, as amended (03 2008) silicon |
| | STEL | 20 mg/m3 | Denmark. OELs. Annexes 2 & 3, Exposure Limits for Substances & Materials - Order No. 507, WEA, as amended (03 2024) silicon |

**Occupational Exposure Limits: Estonia**

| Chemical Identity | Type | Exposure Limit Values | Source |
|---|---|---|---|

| | | | |
|---|---|---|---|
| Manganese - Fine dust, respiratory fraction - as Mn | TWA | 0,05 mg/m3 | Estonia. OELs. Occupational Exposure Limits of Hazardous Substances (Regulation No. 105/2001, Annex), as amended (04 2024) Manganese and inorganic manganese compounds (calculated as manganese), fine dust |
| Manganese - Total dust, respiratory fraction - as Mn | TWA | 0,2 mg/m3 | Estonia. OELs. Occupational Exposure Limits of Hazardous Substances (Regulation No. 105/2001, Annex), as amended (04 2024) Manganese and inorganic manganese compounds (calculated as manganese), total dust |
| Limestone | TWA | 10 mg/m3 | Estonia. OELs. Occupational Exposure Limits of Hazardous Substances (Regulation No. 105/2001, Annex), as amended (10 2019) Calcium carbonate |
| Limestone - Fine dust. | TWA | 5 mg/m3 | Estonia. OELs. Occupational Exposure Limits of Hazardous Substances (Regulation No. 105/2001, Annex), as amended (04 2024) Calcium carbonate, fine dust |
| Magnesite - Total dust. | TWA | 10 mg/m3 | Estonia. OELs. Occupational Exposure Limits of Hazardous Substances (Regulation No. 105/2001, Annex), as amended (03 2022) Dust, inorganic |
| Magnesite - Fine dust, respiratory fraction | TWA | 5 mg/m3 | Estonia. OELs. Occupational Exposure Limits of Hazardous Substances (Regulation No. 105/2001, Annex), as amended (04 2024) Dust, inorganic, fine dust |
| Mica - Fine dust, respiratory fraction | TWA | 5 mg/m3 | Estonia. OELs. Occupational Exposure Limits of Hazardous Substances (Regulation No. 105/2001, Annex), as amended (04 2024) Dust, inorganic, fine dust |
| Silicon dioxide (amorphous) - Fine dust, respiratory fraction | TWA | 2 mg/m3 | Estonia. OELs. Occupational Exposure Limits of Hazardous Substances (Regulation No. 105/2001, Annex), as amended (04 2024) Silicon (silicon dioxide) (fine dust) (amorphous) |
| Aluminum oxide - Fine dust, respiratory fraction | TWA | 4 mg/m3 | Estonia. OELs. Occupational Exposure Limits of Hazardous Substances (Regulation No. 105/2001, Annex), as amended (04 2024) Aluminium, metal and oxides, fine dust |
| | TWA | 5 mg/m3 | Estonia. OELs. Occupational Exposure Limits of Hazardous Substances (Regulation No. 105/2001, Annex), as amended (04 2024) Dust, inorganic, fine dust |
| Iron oxide - Fine dust, respiratory fraction - as Fe | TWA | 3,5 mg/m3 | Estonia. OELs. Occupational Exposure Limits of Hazardous Substances (Regulation No. 105/2001, Annex), as amended (04 2024) Iron oxide (calculated as iron) |
| Zirconium oxide - Total dust. | TWA | 10 mg/m3 | Estonia. OELs. Occupational Exposure Limits of Hazardous Substances (Regulation No. 105/2001, Annex), as amended (03 2022) Dust, inorganic |
| Zirconium oxide - Fine dust, respiratory fraction | TWA | 5 mg/m3 | Estonia. OELs. Occupational Exposure Limits of Hazardous Substances (Regulation No. 105/2001, Annex), as amended (04 2024) Dust, inorganic, fine dust |
| Silicon - Respirable fraction. | TWA | 10 mg/m3 | Estonia. OELs. Occupational Exposure Limits of Hazardous Substances (Regulation No. 105/2001, Annex), as amended (10 2019) Silicon |
| Silicon - Fine dust, respiratory fraction | TWA | 5 mg/m3 | Estonia. OELs. Occupational Exposure Limits of Hazardous Substances (Regulation No. 105/2001, Annex), as amended (04 2024) Silicon, fine dust |

**Occupational Exposure Limits: Finland**

| Chemical Identity | Type | Exposure Limit Values | Source |
|---|---|---|---|
| Quartz - Respirable dust. | HTP 8H | 0,1 mg/m3 | Finland. Regulation on Carcinogenic, Mutagenic and Toxic to Reproduction Substances at Work (113/2024) (03 2024) |
| Quartz - Alveolar fraction | HTP 8H | 0,1 mg/m3 | Finland. Regulation on Carcinogenic, Mutagenic and Toxic to Reproduction Substances at Work (113/2024) (03 2024) |
| Zircon - as Zr | HTP 8H | 1 mg/m3 | Finland. Workplace Exposure Limits, as amended (05 2012) Zirconium and its compounds (as Zr) |
| Limestone - Dust. | HTP 8H | 10 mg/m3 | Finland. Workplace Exposure Limits, as amended (05 2014) Limestone dust |
| Magnesite - Dust. | HTP 8H | 10 mg/m3 | Finland. Workplace Exposure Limits, as amended (05 2014) Magnesium dust |
| Silicon dioxide (amorphous) | HTP 8H | 5 mg/m3 | Finland. Workplace Exposure Limits, as amended (10 2021) Silica, amorphous |
| Iron oxide - Fume. - as Fe | HTP 8H | 5 mg/m3 | Finland. Workplace Exposure Limits, as amended (05 2012) Iron oxide, fumes (as Fe) |
| Zirconium oxide - as Zr | HTP 8H | 1 mg/m3 | Finland. Workplace Exposure Limits, as amended (05 2012) Zirconium and its compounds (as Zr) |

### Occupational Exposure Limits: France

| Chemical Identity | Type | Exposure Limit Values | Source |
|---|---|---|---|
| Titanium dioxide (naturally occurring) - as Ti | VME | 10 mg/m3 | France. Threshold Limit Values (VLEP) for Occupational Exposure to Chemicals in France, INRS ED 984, as amended (01 2008) Indicative limit (VL) |
| | VME | 10 mg/m3 | France. OELs. Threshold Limit Values (VLEP) for Occupational Exposure to Chemicals in France according to INRS, ED 984, as amended (04 2024) Titanium dioxide, as Ti |
| Quartz - Respirable fraction. | VME | 0,1 mg/m3 | France. Threshold Limit Values (VLEP) for Occupational Exposure to Chemicals in France, INRS ED 984, as amended (01 2008) Regulatory binding (VRC) |
| Quartz - Respirable. | VME | 0,1 mg/m3 | France. OELs. Occupational Exposure Limits as Prescribed by Art. R.4412-149 of Labor Code, as amended (04 2024) Crystalline silica (respirable fraction including quartz with the exception of respirable fractions of cristobalite and tridymite) |
| Quartz - Respirable fraction. | VME | 0,1 mg/m3 | France. OELs. Threshold Limit Values (VLEP) for Occupational Exposure to Chemicals in France according to INRS, ED 984, as amended (04 2024) Binding regulatory limit values (article R. 4412-149 of the Labor Code) Binding regulatory limit values (article R. 4412-149 of the Labor Code) Quartz |
| Manganese - Inhalable fraction. - as Mn | VME | 0,20 mg/m3 | France. Threshold Limit Values (VLEP) for Occupational Exposure to Chemicals in France, INRS ED 984, as amended (01 2022) Regulatory indicative (VRI) |
| Manganese - Respirable fraction. - as Mn | VME | 0,05 mg/m3 | France. Threshold Limit Values (VLEP) for Occupational Exposure to Chemicals in France, INRS ED 984, as amended (01 2022) Regulatory indicative (VRI) |
| Limestone - Total dust. | TWA | 4 mg/m3 | France. Dust OELs in premises with specific pollution, Art. R. 4222-10 of Labor Code, as amended (12 2021) Effective Date: 01 July 2023 Effective Date: 01 July 2023 Dust known to have no specific effect |
| Limestone - Alveolar dust. | TWA | 0,9 mg/m3 | France. Dust OELs in premises with specific pollution, Art. R. 4222-10 of Labor Code, as amended (12 2021) Effective Date: 01 July 2023 Effective Date: 01 July 2023 Dust known to have no specific effect |
| | TWA | 5 mg/m3 | France. Dust OELs in premises with specific pollution, Art. R. 4222-10 of Labor Code, as amended (12 2021) Effective date: 01 May 2008 Effective date: 01 May 2008 Dust known to have no specific effect |
| Limestone - Total dust. | TWA | 7 mg/m3 | France. Dust OELs in premises with specific pollution, Art. R. 4222-10 of Labor Code, as amended (12 2021) Effective date: 01 Jan 2022 Effective date: 01 Jan 2022 Dust known to have no specific effect |
| Limestone - Alveolar dust. | TWA | 3,5 mg/m3 | France. Dust OELs in premises with specific pollution, Art. R. 4222-10 of Labor Code, as amended (12 2021) Effective date: 01 Jan 2022 Effective date: 01 Jan 2022 Dust known to have no specific effect |
| Limestone - Total dust. | TWA | 10 mg/m3 | France. Dust OELs in premises with specific pollution, Art. R. 4222-10 of Labor Code, as amended (12 2021) Effective date: 01 May 2008 Effective date: 01 May 2008 Dust known to have no specific effect |
| Magnesite - Total dust. | TWA | 4 mg/m3 | France. Dust OELs in premises with specific pollution, Art. R. 4222-10 of Labor Code, as amended (12 2021) Effective Date: 01 July 2023 Effective Date: 01 July 2023 Dust known to have no specific effect |
| Magnesite - Alveolar dust. | TWA | 0,9 mg/m3 | France. Dust OELs in premises with specific pollution, Art. R. 4222-10 of Labor Code, as amended (12 2021) Effective Date: 01 July 2023 Effective Date: 01 July 2023 Dust known to have no specific effect |
| Magnesite - Total dust. | TWA | 10 mg/m3 | France. Dust OELs in premises with specific pollution, Art. R. 4222-10 of Labor Code, as amended (12 2021) Effective date: 01 May 2008 Effective date: 01 May 2008 Dust known to have no specific effect |
| Magnesite - Alveolar dust. | TWA | 3,5 mg/m3 | France. Dust OELs in premises with specific pollution, Art. R. 4222-10 of Labor Code, as amended (12 2021) Effective date: 01 Jan 2022 Effective date: 01 Jan 2022 Dust known to have no specific effect |

| | | | |
|---|---|---|---|
| | TWA | 5 mg/m3 | France. Dust OELs in premises with specific pollution, Art. R. 4222-10 of Labor Code, as amended (12 2021) Effective date: 01 May 2008 Effective date: 01 May 2008 Dust known to have no specific effect |
| Magnesite - Total dust. | TWA | 7 mg/m3 | France. Dust OELs in premises with specific pollution, Art. R. 4222-10 of Labor Code, as amended (12 2021) Effective date: 01 Jan 2022 Effective date: 01 Jan 2022 Dust known to have no specific effect |
| Magnesite | VME | 10 mg/m3 | France. OELs. Threshold Limit Values (VLEP) for Occupational Exposure to Chemicals in France according to INRS, ED 984, as amended (04 2024) Magnesium carbonate |
| Mica - Respirable dust. | VME | 3,5 mg/m3 | France. Threshold Limit Values (VLEP) for Occupational Exposure to Chemicals in France, INRS ED 984, as amended (01 2022) Regulatory binding (VRC) |
| Mica - Total dust. | VME | 4 mg/m3 | France. Threshold Limit Values (VLEP) for Occupational Exposure to Chemicals in France, INRS ED 984, as amended (01 2022) Regulatory binding (VRC) |
| Mica - Respirable dust. | VME | 0,9 mg/m3 | France. Threshold Limit Values (VLEP) for Occupational Exposure to Chemicals in France, INRS ED 984, as amended (01 2022) Regulatory binding (VRC) |
| Mica - Total dust. | VME | 7 mg/m3 | France. Threshold Limit Values (VLEP) for Occupational Exposure to Chemicals in France, INRS ED 984, as amended (01 2022) Regulatory binding (VRC) |
| Silicon dioxide (amorphous) - Total dust. | TWA | 7 mg/m3 | France. Dust OELs in premises with specific pollution, Art. R. 4222-10 of Labor Code, as amended (12 2021) Effective date: 01 Jan 2022 Effective date: 01 Jan 2022 Dust known to have no specific effect |
| | TWA | 10 mg/m3 | France. Dust OELs in premises with specific pollution, Art. R. 4222-10 of Labor Code, as amended (12 2021) Effective date: 01 May 2008 Effective date: 01 May 2008 Dust known to have no specific effect |
| Silicon dioxide (amorphous) - Alveolar dust. | TWA | 3,5 mg/m3 | France. Dust OELs in premises with specific pollution, Art. R. 4222-10 of Labor Code, as amended (12 2021) Effective date: 01 Jan 2022 Effective date: 01 Jan 2022 Dust known to have no specific effect |
| | TWA | 0,9 mg/m3 | France. Dust OELs in premises with specific pollution, Art. R. 4222-10 of Labor Code, as amended (12 2021) Effective Date: 01 July 2023 Effective Date: 01 July 2023 Dust known to have no specific effect |
| | TWA | 5 mg/m3 | France. Dust OELs in premises with specific pollution, Art. R. 4222-10 of Labor Code, as amended (12 2021) Effective date: 01 May 2008 Effective date: 01 May 2008 Dust known to have no specific effect |
| Silicon dioxide (amorphous) - Total dust. | TWA | 4 mg/m3 | France. Dust OELs in premises with specific pollution, Art. R. 4222-10 of Labor Code, as amended (12 2021) Effective Date: 01 July 2023 Effective Date: 01 July 2023 Dust known to have no specific effect |
| Aluminum oxide | VME | 10 mg/m3 | France. Threshold Limit Values (VLEP) for Occupational Exposure to Chemicals in France, INRS ED 984, as amended (01 2008) Indicative limit (VL) |
| | VME | 10 mg/m3 | France. OELs. Threshold Limit Values (VLEP) for Occupational Exposure to Chemicals in France according to INRS, ED 984, as amended (04 2024) Aluminum (di-trioxide) |
| Iron oxide - Total dust. | TWA | 4 mg/m3 | France. Dust OELs in premises with specific pollution, Art. R. 4222-10 of Labor Code, as amended (12 2021) Effective Date: 01 July 2023 Effective Date: 01 July 2023 Dust known to have no specific effect |
| | TWA | 7 mg/m3 | France. Dust OELs in premises with specific pollution, Art. R. 4222-10 of Labor Code, as amended (12 2021) Effective date: 01 Jan 2022 Effective date: 01 Jan 2022 Dust known to have no specific effect |
| Iron oxide - Alveolar dust. | TWA | 3,5 mg/m3 | France. Dust OELs in premises with specific pollution, Art. R. 4222-10 of Labor Code, as amended (12 2021) Effective date: 01 Jan 2022 Effective date: 01 Jan 2022 Dust known to have no specific effect |
| Iron oxide - Total dust. | TWA | 10 mg/m3 | France. Dust OELs in premises with specific pollution, Art. R. 4222-10 of Labor Code, as amended (12 2021) Effective date: 01 May 2008 Effective date: 01 May 2008 Dust known to have no specific effect |
| Iron oxide - Alveolar dust. | TWA | 0,9 mg/m3 | France. Dust OELs in premises with specific pollution, Art. R. 4222-10 of Labor Code, as amended (12 2021) Effective Date: |

| | | | |
|---|---|---|---|
| | | | 01 July 2023 Effective Date: 01 July 2023 Dust known to have no specific effect |
| | TWA | 5 mg/m3 | France. Dust OELs in premises with specific pollution, Art. R. 4222-10 of Labor Code, as amended (12 2021) Effective date: 01 May 2008 Effective date: 01 May 2008 Dust known to have no specific effect |
| Iron oxide - Fume. - as Fe | VME | 5 mg/m3 | France. OELs. Threshold Limit Values (VLEP) for Occupational Exposure to Chemicals in France according to INRS, ED 984, as amended (04 2024) Iron (di-, fume trioxide), as Fe |
| Zirconium oxide - Total dust. | TWA | 7 mg/m3 | France. Dust OELs in premises with specific pollution, Art. R. 4222-10 of Labor Code, as amended (12 2021) Effective date: 01 Jan 2022 Effective date: 01 Jan 2022 Dust known to have no specific effect |
| | TWA | 4 mg/m3 | France. Dust OELs in premises with specific pollution, Art. R. 4222-10 of Labor Code, as amended (12 2021) Effective Date: 01 July 2023 Effective Date: 01 July 2023 Dust known to have no specific effect |
| Zirconium oxide - Alveolar dust. | TWA | 3,5 mg/m3 | France. Dust OELs in premises with specific pollution, Art. R. 4222-10 of Labor Code, as amended (12 2021) Effective date: 01 Jan 2022 Effective date: 01 Jan 2022 Dust known to have no specific effect |
| | TWA | 5 mg/m3 | France. Dust OELs in premises with specific pollution, Art. R. 4222-10 of Labor Code, as amended (12 2021) Effective date: 01 May 2008 Effective date: 01 May 2008 Dust known to have no specific effect |
| Zirconium oxide - Total dust. | TWA | 10 mg/m3 | France. Dust OELs in premises with specific pollution, Art. R. 4222-10 of Labor Code, as amended (12 2021) Effective date: 01 May 2008 Effective date: 01 May 2008 Dust known to have no specific effect |
| Zirconium oxide - Alveolar dust. | TWA | 0,9 mg/m3 | France. Dust OELs in premises with specific pollution, Art. R. 4222-10 of Labor Code, as amended (12 2021) Effective Date: 01 July 2023 Effective Date: 01 July 2023 Dust known to have no specific effect |
| Titanium dioxide (synthetic) - as Ti | VME | 10 mg/m3 | France. Threshold Limit Values (VLEP) for Occupational Exposure to Chemicals in France, INRS ED 984, as amended (01 2008) Indicative limit (VL) |
| | VME | 10 mg/m3 | France. OELs. Threshold Limit Values (VLEP) for Occupational Exposure to Chemicals in France according to INRS, ED 984, as amended (04 2024) Titanium dioxide, as Ti |
| Silicon - Total dust. | TWA | 4 mg/m3 | France. Dust OELs in premises with specific pollution, Art. R. 4222-10 of Labor Code, as amended (12 2021) Effective Date: 01 July 2023 Effective Date: 01 July 2023 Dust known to have no specific effect |
| Silicon - Alveolar dust. | TWA | 0,9 mg/m3 | France. Dust OELs in premises with specific pollution, Art. R. 4222-10 of Labor Code, as amended (12 2021) Effective Date: 01 July 2023 Effective Date: 01 July 2023 Dust known to have no specific effect |
| | TWA | 5 mg/m3 | France. Dust OELs in premises with specific pollution, Art. R. 4222-10 of Labor Code, as amended (12 2021) Effective date: 01 May 2008 Effective date: 01 May 2008 Dust known to have no specific effect |
| Silicon - Total dust. | TWA | 7 mg/m3 | France. Dust OELs in premises with specific pollution, Art. R. 4222-10 of Labor Code, as amended (12 2021) Effective date: 01 Jan 2022 Effective date: 01 Jan 2022 Dust known to have no specific effect |
| Silicon - Alveolar dust. | TWA | 3,5 mg/m3 | France. Dust OELs in premises with specific pollution, Art. R. 4222-10 of Labor Code, as amended (12 2021) Effective date: 01 Jan 2022 Effective date: 01 Jan 2022 Dust known to have no specific effect |
| Silicon - Total dust. | TWA | 10 mg/m3 | France. Dust OELs in premises with specific pollution, Art. R. 4222-10 of Labor Code, as amended (12 2021) Effective date: 01 May 2008 Effective date: 01 May 2008 Dust known to have no specific effect |
| Silicon | VME | 10 mg/m3 | France. OELs. Threshold Limit Values (VLEP) for Occupational Exposure to Chemicals in France according to INRS, ED 984, as amended (04 2024) Silicon |

**Occupational Exposure Limits: Germany**

| Chemical Identity | Type | Exposure Limit Values | Source |
|---|---|---|---|
| Titanium dioxide (naturally occurring) - Respirable fraction. | MAK | 0,3 mg/m3 | Germany. DFG MAK List (advisory OELs). Commission for the Investigation of Health Hazards of Chemical Compounds in the Work Area (DFG), as amended (2018) Listed Listed Titanium dioxide (respirable fraction, except for ultrafine particles) |
| | AGW | 1,25 mg/m3 | Germany. TRGS 900, Occupational Exposure Limits (AGW), as amended (06 2016) |
| Titanium dioxide (naturally occurring) - Inhalable fraction. | AGW | 10 mg/m3 | Germany. TRGS 900, Occupational Exposure Limits (AGW), as amended (06 2016) |
| Manganese - Inhalable fraction. | MAK | 0,2 mg/m3 | Germany. DFG MAK List (advisory OELs). Commission for the Investigation of Health Hazards of Chemical Compounds in the Work Area (DFG), as amended (2013) Listed Listed MANGANESE AND ITS INORGANIC COMPOUNDS (INHALABLE FRACTION) |
| Manganese - Respirable fraction. | MAK | 0,02 mg/m3 | Germany. DFG MAK List (advisory OELs). Commission for the Investigation of Health Hazards of Chemical Compounds in the Work Area (DFG), as amended (2013) Listed Listed MANGANESE AND ITS INORGANIC COMPOUNDS (RESPIRABLE FRACTION) |
| Manganese - Inhalable fraction. - as Mn | AGW | 0,2 mg/m3 | Germany. TRGS 900, Occupational Exposure Limits (AGW), as amended (11 2015) If the AGW and BGW values are complied with, there should be no risk of reproductive damage (see Number 2.7). |
| Manganese - Respirable fraction. - as Mn | AGW | 0,02 mg/m3 | Germany. TRGS 900, Occupational Exposure Limits (AGW), as amended (11 2015) If the AGW and BGW values are complied with, there should be no risk of reproductive damage (see Number 2.7). |
| Limestone - Inhalable dust. | MAK | 4 mg/m3 | Germany. DFG MAK List (advisory OELs). Commission for the Investigation of Health Hazards of Chemical Compounds in the Work Area (DFG), as amended (2020) Listed Listed Dust, general threshold limit value (inhalable fraction) |
| Limestone - Respirable dust. | AGW | 1,25 mg/m3 | Germany. TRGS 900, Occupational Exposure Limits (AGW), as amended (06 2023) If the AGW and BGW values are complied with, there should be no risk of reproductive damage (see Number 2.7). |
| Limestone - Inhalable dust. | AGW | 10 mg/m3 | Germany. TRGS 900, Occupational Exposure Limits (AGW), as amended (06 2023) If the AGW and BGW values are complied with, there should be no risk of reproductive damage (see Number 2.7). |
| Magnesite - Inhalable dust. | MAK | 4 mg/m3 | Germany. DFG MAK List (advisory OELs). Commission for the Investigation of Health Hazards of Chemical Compounds in the Work Area (DFG), as amended (2020) Listed Listed Dust, general threshold limit value (inhalable fraction) |
| Magnesite - Respirable dust. | AGW | 1,25 mg/m3 | Germany. TRGS 900, Occupational Exposure Limits (AGW), as amended (06 2023) If the AGW and BGW values are complied with, there should be no risk of reproductive damage (see Number 2.7). |
| Magnesite - Inhalable dust. | AGW | 10 mg/m3 | Germany. TRGS 900, Occupational Exposure Limits (AGW), as amended (06 2023) If the AGW and BGW values are complied with, there should be no risk of reproductive damage (see Number 2.7). |
| Silicon dioxide (amorphous) - Respirable fraction. | MAK | 0,02 mg/m3 | Germany. DFG MAK List (advisory OELs). Commission for the Investigation of Health Hazards of Chemical Compounds in the Work Area (DFG), as amended (07 2022) Listed Listed Silica, amorphous: synthetic colloidal amorphous silica including pyrogenic and wet process silica and diatomaceous earth (uncalcine |
| Silicon dioxide (amorphous) - Inhalable fraction. | AGW | 1 mg/m3 | Germany. TRGS 900, Occupational Exposure Limits (AGW), as amended (06 2024) If the AGW and BGW values are complied with, there should be no risk of reproductive damage (see Number 2.7). |
| Aluminum oxide - Respirable dust. | MAK | 1,5 mg/m3 | Germany. DFG MAK List (advisory OELs). Commission for the Investigation of Health Hazards of Chemical Compounds in the Work Area (DFG), as amended (2018) Listed Listed ALUMINUM OXIDE, CONTAINING DUSTS (RESPIRABLE FRACTION) |

| | | | |
|---|---|---|---|
| Aluminum oxide - Inhalable dust. | MAK | 4 mg/m3 | Germany. DFG MAK List (advisory OELs). Commission for the Investigation of Health Hazards of Chemical Compounds in the Work Area (DFG), as amended (2018) Listed Listed ALUMINUM OXIDE, CONTAINING DUSTS (INHALABLE FRACTION) |
| Aluminum oxide - Inhalable fraction. | AGW | 10 mg/m3 | Germany. TRGS 900, Occupational Exposure Limits (AGW), as amended (06 2016) |
| Aluminum oxide - Respirable fraction. | AGW | 1,25 mg/m3 | Germany. TRGS 900, Occupational Exposure Limits (AGW), as amended (06 2016) |
| Iron oxide - Inhalable dust. | AGW | 10 mg/m3 | Germany. TRGS 900, Occupational Exposure Limits (AGW), as amended (06 2023) If the AGW and BGW values are complied with, there should be no risk of reproductive damage (see Number 2.7). |
| Iron oxide - Respirable dust. | AGW | 1,25 mg/m3 | Germany. TRGS 900, Occupational Exposure Limits (AGW), as amended (06 2023) If the AGW and BGW values are complied with, there should be no risk of reproductive damage (see Number 2.7). |
| Zirconium oxide - Respirable fraction. | MAK | 0,3 mg/m3 | Germany. DFG MAK List (advisory OELs). Commission for the Investigation of Health Hazards of Chemical Compounds in the Work Area (DFG), as amended (2018) Listed Listed Zirconium dioxide (respirable fraction) |
| Zirconium oxide - Respirable dust. | AGW | 1,25 mg/m3 | Germany. TRGS 900, Occupational Exposure Limits (AGW), as amended (06 2023) If the AGW and BGW values are complied with, there should be no risk of reproductive damage (see Number 2.7). |
| Zirconium oxide - Inhalable dust. | AGW | 10 mg/m3 | Germany. TRGS 900, Occupational Exposure Limits (AGW), as amended (06 2023) If the AGW and BGW values are complied with, there should be no risk of reproductive damage (see Number 2.7). |
| Titanium dioxide (synthetic) - Respirable fraction. | MAK | 0,3 mg/m3 | Germany. DFG MAK List (advisory OELs). Commission for the Investigation of Health Hazards of Chemical Compounds in the Work Area (DFG), as amended (2018) Listed Listed TITANIUM DIOXIDE (RESPIRABLE FRACTION, EXCEPT FOR ULTRAFINE PARTICLES) |
| | AGW | 1,25 mg/m3 | Germany. TRGS 900, Occupational Exposure Limits (AGW), as amended (06 2016) |
| Titanium dioxide (synthetic) - Inhalable fraction. | AGW | 10 mg/m3 | Germany. TRGS 900, Occupational Exposure Limits (AGW), as amended (06 2016) |
| Silicon - Inhalable dust. | MAK | 4 mg/m3 | Germany. DFG MAK List (advisory OELs). Commission for the Investigation of Health Hazards of Chemical Compounds in the Work Area (DFG), as amended (2020) Listed Listed Dust, general threshold limit value (inhalable fraction) |
| Silicon - Respirable dust. | AGW | 1,25 mg/m3 | Germany. TRGS 900, Occupational Exposure Limits (AGW), as amended (06 2023) If the AGW and BGW values are complied with, there should be no risk of reproductive damage (see Number 2.7). |
| Silicon - Inhalable dust. | AGW | 10 mg/m3 | Germany. TRGS 900, Occupational Exposure Limits (AGW), as amended (06 2023) If the AGW and BGW values are complied with, there should be no risk of reproductive damage (see Number 2.7). |

### Occupational Exposure Limits: Greece

| Chemical Identity | Type | Exposure Limit Values | Source |
|---|---|---|---|
| Zircon | TWA | 5 mg/m3 | Greece. OELs, Presidential Decree No. 307/1986, as amended (09 2021) Zirconium and its compounds |
| | STEL | 10 mg/m3 | Greece. OELs, Presidential Decree No. 307/1986, as amended (09 2021) Zirconium and its compounds |
| Limestone - Inhalable | TWA | 10 mg/m3 | Greece. OELs, Presidential Decree No. 307/1986, as amended (09 2001) |
| Limestone - Respirable. | TWA | 5 mg/m3 | Greece. OELs, Presidential Decree No. 307/1986, as amended (09 2001) |
| Iron oxide - as Fe | TWA | 10 mg/m3 | Greece. OELs, Presidential Decree No. 307/1986, as amended (09 2001) Iron (III) oxide, as Fe |
| | STEL | 10 mg/m3 | Greece. OELs, Presidential Decree No. 307/1986, as amended (08 2018) Iron (III) oxide, as Fe |
| Zirconium oxide | STEL | 10 mg/m3 | Greece. OELs, Presidential Decree No. 307/1986, as amended (09 2021) Zirconium and its compounds |

| | | | |
|---|---|---|---|
| | TWA | 5 mg/m3 | Greece. OELs, Presidential Decree No. 307/1986, as amended (09 2021) Zirconium and its compounds |
| Silicon - Inhalable | TWA | 10 mg/m3 | Greece. OELs, Presidential Decree No. 307/1986, as amended (09 2001) Silicon (inhalable) |
| Silicon - Respirable. | TWA | 5 mg/m3 | Greece. OELs, Presidential Decree No. 307/1986, as amended (09 2001) Silicon (respirable) |

### Occupational Exposure Limits: Hungary

| Chemical Identity | Type | Exposure Limit Values | Source |
|---|---|---|---|
| Zircon - as Zr | ÁK | 5 mg/m3 | Hungary. OELs. Occupational Exposure Limits of Dangerous Substances at work (Decree on protection of workers exposed to chemical agents (5/2020. (II.6)), Annex 1&2), as amended (02 2020) Zircunium compounds |
| | CK | 20 mg/m3 | Hungary. OELs. Occupational Exposure Limits of Dangerous Substances at work (Decree on protection of workers exposed to chemical agents (5/2020. (II.6)), Annex 1&2), as amended (02 2020) Zircunium compounds |
| Limestone | ÁK | 10 mg/m3 | Hungary. OELs. Occupational Exposure Limits of Dangerous Substances at work (Decree on protection of workers exposed to chemical agents (5/2020. (II.6)), Annex 1&2), as amended (2002) Calcium carbonate |
| Iron oxide - Respirable. - as Fe | ÁK | 4 mg/m3 | Hungary. OELs. Occupational Exposure Limits of Dangerous Substances at work (Decree on protection of workers exposed to chemical agents (5/2020. (II.6)), Annex 1&2), as amended (12 2023) Iron(III) oxide |
| Zirconium oxide - as Zr | CK | 20 mg/m3 | Hungary. OELs. Occupational Exposure Limits of Dangerous Substances at work (Decree on protection of workers exposed to chemical agents (5/2020. (II.6)), Annex 1&2), as amended (02 2020) Zircunium compounds |
| | ÁK | 5 mg/m3 | Hungary. OELs. Occupational Exposure Limits of Dangerous Substances at work (Decree on protection of workers exposed to chemical agents (5/2020. (II.6)), Annex 1&2), as amended (02 2020) Zircunium compounds |

### Occupational Exposure Limits: Italy

| Chemical Identity | Type | Exposure Limit Values | Source |
|---|---|---|---|
| Zircon - as Zr | STEL | 10 mg/m3 | Italy. Occupational Exposure Limits, (OELs), Legislative Decree n.81, as amended (05 2020) Source of Limit value: ACGIH Source of Limit value: ACGIH Zirconium and compounds, as Zr |
| | TWA | 5 mg/m3 | Italy. Occupational Exposure Limits, (OELs), Legislative Decree n.81, as amended (05 2020) Source of Limit value: ACGIH Source of Limit value: ACGIH Zirconium and compounds, as Zr |
| Limestone - Inhalable particles. | TWA | 10 mg/m3 | Italy. Occupational Exposure Limits, (OELs), Legislative Decree n.81, as amended (05 2020) Source of Limit value: ACGIH Source of Limit value: ACGIH Particles (insoluble or poorly soluble) not otherwise specified, inhalable particles |
| Limestone - Respirable particles. | TWA | 3 mg/m3 | Italy. Occupational Exposure Limits, (OELs), Legislative Decree n.81, as amended (05 2020) Source of Limit value: ACGIH Source of Limit value: ACGIH Particles (insoluble or poorly soluble) not otherwise specified, respirable particles |
| Magnesite - Inhalable particles. | TWA | 10 mg/m3 | Italy. Occupational Exposure Limits, (OELs), Legislative Decree n.81, as amended (05 2020) Source of Limit value: ACGIH Source of Limit value: ACGIH Particles (insoluble or poorly soluble) not otherwise specified, inhalable particles |
| Magnesite - Respirable particles. | TWA | 3 mg/m3 | Italy. Occupational Exposure Limits, (OELs), Legislative Decree n.81, as amended (05 2020) Source of Limit value: ACGIH Source of Limit value: ACGIH Particles (insoluble or poorly soluble) not otherwise specified, respirable particles |
| Silicon dioxide (amorphous) - Respirable particles. | TWA | 3 mg/m3 | Italy. Occupational Exposure Limits, (OELs), Legislative Decree n.81, as amended (05 2020) Source of Limit value: ACGIH Source of Limit value: ACGIH Particles (insoluble or poorly soluble) not otherwise specified, respirable particles |

| | | | |
|---|---|---|---|
| Silicon dioxide (amorphous) - Inhalable particles. | TWA | 10 mg/m3 | Italy. Occupational Exposure Limits, (OELs), Legislative Decree n.81, as amended (05 2020) Source of Limit value: ACGIH Source of Limit value: ACGIH Particles (insoluble or poorly soluble) not otherwise specified, inhalable particles |
| Iron oxide - Respirable fraction. | TWA | 5 mg/m3 | Italy. Occupational Exposure Limits, (OELs), Legislative Decree n.81, as amended (2009) Source of Limit value: ACGIH Source of Limit value: ACGIH Iron oxide (Fe2O3), respirable fraction |
| Zirconium oxide - as Zr | STEL | 10 mg/m3 | Italy. Occupational Exposure Limits, (OELs), Legislative Decree n.81, as amended (05 2020) Source of Limit value: ACGIH Source of Limit value: ACGIH Zirconium and compounds, as Zr |
| | TWA | 5 mg/m3 | Italy. Occupational Exposure Limits, (OELs), Legislative Decree n.81, as amended (05 2020) Source of Limit value: ACGIH Source of Limit value: ACGIH Zirconium and compounds, as Zr |
| Zirconium oxide - Respirable particles. | TWA | 3 mg/m3 | Italy. Occupational Exposure Limits, (OELs), Legislative Decree n.81, as amended (05 2020) Source of Limit value: ACGIH Source of Limit value: ACGIH Particles (insoluble or poorly soluble) not otherwise specified, respirable particles |
| Zirconium oxide - Inhalable particles. | TWA | 10 mg/m3 | Italy. Occupational Exposure Limits, (OELs), Legislative Decree n.81, as amended (05 2020) Source of Limit value: ACGIH Source of Limit value: ACGIH Particles (insoluble or poorly soluble) not otherwise specified, inhalable particles |
| Silicon - Respirable particles. | TWA | 3 mg/m3 | Italy. Occupational Exposure Limits, (OELs), Legislative Decree n.81, as amended (05 2020) Source of Limit value: ACGIH Source of Limit value: ACGIH Particles (insoluble or poorly soluble) not otherwise specified, respirable particles |
| Silicon - Inhalable particles. | TWA | 10 mg/m3 | Italy. Occupational Exposure Limits, (OELs), Legislative Decree n.81, as amended (05 2020) Source of Limit value: ACGIH Source of Limit value: ACGIH Particles (insoluble or poorly soluble) not otherwise specified, inhalable particles |

### Occupational Exposure Limits: Latvia

| Chemical Identity | Type | Exposure Limit Values | Source |
|---|---|---|---|
| Manganese - Respirable fraction. - Manganese | TWA | 0,05 mg/m3 | Latvia. OELs. Occupational exposure limit values of chemical substances in work environment, as amended (04 2024) Manganese and its inorganic compounds, respirable fraction (as Mn) |
| Manganese - Inhalable fraction. - Manganese | TWA | 0,2 mg/m3 | Latvia. OELs. Occupational exposure limit values of chemical substances in work environment, as amended (04 2024) Manganese and its inorganic compounds, Inhalable fraction (as Mn) |
| Manganese - Condensation aerosol | TWA | 0,1 mg/m3 | Latvia. OELs. Occupational exposure limit values of chemical substances in work environment, as amended (04 2024) Manganese and its inorganic compounds, condensation aerosol (as Mn) |
| Silicon dioxide (amorphous) | TWA | 1 mg/m3 | Latvia. OELs. Occupational exposure limit values of chemical substances in work environment, as amended (02 2011) Silicon dioxide |
| Aluminum oxide | TWA | 4 mg/m3 | Latvia. OELs. Occupational exposure limit values of chemical substances in work environment, as amended (04 2024) Aluminum oxide: in mixtures with nickel (up to 15%), (fused corundum) |
| Aluminum oxide - Disintegration aerosol | TWA | 6 mg/m3 | Latvia. OELs. Occupational exposure limit values of chemical substances in work environment, as amended (04 2024) Aluminum oxide: as decomposition aerosol |

### Occupational Exposure Limits: Lithuania

| Chemical Identity | Type | Exposure Limit Values | Source |
|---|---|---|---|
| Zircon | IPRV | 6 mg/m3 | Lithuania. OELs. Occupational Exposure Limit Values for Chemical Substances (Hygiene Norm HN 23:2011; Order No. V-824/A1-389, Annex 1, tbl. 1), as amended (12 2001) Zircon |

| | | | |
|---|---|---|---|
| Limestone - Respirable fraction. | IPRV | 5 mg/m3 | Lithuania. OELs. Occupational Exposure Limit Values for Chemical Substances (Hygiene Norm HN 23:2011; Order No. V-824/A1-389, Annex 1, tbl. 1), as amended (10 2019) Dust: respirable fraction |
| Limestone - Inhalable fraction. | IPRV | 10 mg/m3 | Lithuania. OELs. Occupational Exposure Limit Values for Chemical Substances (Hygiene Norm HN 23:2011; Order No. V-824/A1-389, Annex 1, tbl. 1), as amended (10 2019) Dust: inhalable fraction |
| Magnesite | IPRV | 10 mg/m3 | Lithuania. OELs. Occupational Exposure Limit Values for Chemical Substances (Hygiene Norm HN 23:2011; Order No. V-824/A1-389, Annex 1, tbl. 1), as amended (12 2001) Magnesite |
| Silicon dioxide (amorphous) - Respirable fraction. | IPRV | 5 mg/m3 | Lithuania. OELs. Occupational Exposure Limit Values for Chemical Substances (Hygiene Norm HN 23:2011; Order No. V-824/A1-389, Annex 1, tbl. 1), as amended (10 2019) Dust: respirable fraction |
| Silicon dioxide (amorphous) - Inhalable fraction. | IPRV | 10 mg/m3 | Lithuania. OELs. Occupational Exposure Limit Values for Chemical Substances (Hygiene Norm HN 23:2011; Order No. V-824/A1-389, Annex 1, tbl. 1), as amended (10 2019) Dust: inhalable fraction |
| Iron oxide - Respirable fraction. - as Fe | IPRV | 3,5 mg/m3 | Lithuania. OELs. Occupational Exposure Limit Values for Chemical Substances (Hygiene Norm HN 23:2011; Order No. V-824/A1-389, Annex 1, tbl. 1), as amended (10 2007) Iron oxide (as Fe), respirable fraction |
| Zirconium oxide | IPRV | 6 mg/m3 | Lithuania. OELs. Occupational Exposure Limit Values for Chemical Substances (Hygiene Norm HN 23:2011; Order No. V-824/A1-389, Annex 1, tbl. 1), as amended (12 2001) Zirconium (IV) oxide |
| Silicon - Respirable fraction. | IPRV | 5 mg/m3 | Lithuania. OELs. Occupational Exposure Limit Values for Chemical Substances (Hygiene Norm HN 23:2011; Order No. V-824/A1-389, Annex 1, tbl. 1), as amended (10 2019) Dust: respirable fraction |
| Silicon - Inhalable fraction. | IPRV | 10 mg/m3 | Lithuania. OELs. Occupational Exposure Limit Values for Chemical Substances (Hygiene Norm HN 23:2011; Order No. V-824/A1-389, Annex 1, tbl. 1), as amended (10 2019) Dust: inhalable fraction |

### Occupational Exposure Limits: The Netherlands

| Chemical Identity | Type | Exposure Limit Values | Source |
|---|---|---|---|
| Quartz - Respirable dust. | TGG | 0,075 mg/m3 | Netherlands. OELs (binding) per Annex XIII of Working Conditions Regulation, as amended (12 2019) CRISTALLINE SILICA, QUARTZ |
| Manganese - Respirable fraction. - as Mn | TGG 15 | 0,05 mg/m3 | Netherlands. OELs (binding) per Annex XIII of Working Conditions Regulation, as amended (06 2020) MANGANESE AND INORGANIC MANGANESE COMPOUNDS (AS MANGANESE) (RESPIRABLE) |
| Manganese - Inhalable fraction. - as Mn | TGG | 0,2 mg/m3 | Netherlands. OELs (binding) per Annex XIII of Working Conditions Regulation, as amended (06 2020) Manganese and inorganic manganese compounds |
| Manganese - Inhalable - as Mn | TGG | 0,2 mg/m3 | Netherlands. OELs (binding) per Annex XIII of Working Conditions Regulation, as amended (05 2024) Manganese and inorganic manganese compounds |
| Manganese - Respirable. - as Mn | TGG | 0,05 mg/m3 | Netherlands. OELs (binding) per Annex XIII of Working Conditions Regulation, as amended (05 2024) Manganese and inorganic manganese compounds |

### Occupational Exposure Limits: Norway

| Chemical Identity | Type | Exposure Limit Values | Source |
|---|---|---|---|
| Quartz - Respirable dust. | NORMEN | 0,1 mg/m3 | Norway. Occupational Limit Values: Annex 1, Regulation No. 1358 (Forskrift om tiltaks- og grenseverdier), as amended (04 2024)Industries 08 Mining and other mining operations and 42 Civil engineering The EU has set a binding limit for the substance. The EU has set a binding limit for the substance. Crystalline silica (SiO2), α-quartz, respirable dust |
| Zircon - as Zr | NORMEN | 5 mg/m3 | Norway. Occupational Limit Values: Annex 1, Regulation No. |

| | | | |
|---|---|---|---|
| | | | 1358 (Forskrift om tiltaks- og grenseverdier), as amended (12 2022) Zirconium and its compounds |
| Silicon dioxide (amorphous) - Respirable dust. | NORMEN | 1,5 mg/m3 | Norway. Occupational Limit Values: Annex 1, Regulation No. 1358 (Forskrift om tiltaks- og grenseverdier), as amended (12 2022) Amorphous silicon dioxide |
| Iron oxide - as Fe | NORMEN | 3 mg/m3 | Norway. Occupational Limit Values: Annex 1, Regulation No. 1358 (Forskrift om tiltaks- og grenseverdier), as amended (12 2022) Iron oxide; Iron(III) oxide |
| Zirconium oxide - as Zr | NORMEN | 5 mg/m3 | Norway. Occupational Limit Values: Annex 1, Regulation No. 1358 (Forskrift om tiltaks- og grenseverdier), as amended (12 2022) Zirconium and its compounds |
| Silicon | NORMEN | 10 mg/m3 | Norway. Occupational Limit Values: Annex 1, Regulation No. 1358 (Forskrift om tiltaks- og grenseverdier), as amended (12 2022) Silicon |

**Occupational Exposure Limits: Poland**

| Chemical Identity | Type | Exposure Limit Values | Source |
|---|---|---|---|
| Titanium dioxide (naturally occurring) - Inhalable fraction. | NDS | 10 mg/m3 | Poland. Maximum permissible concentrations and intensities of harmful factors in the work environment (Dz.U.Poz. 1286/2018, Annex 1), as amended (07 2018) Titanium dioxide, inhalable fraction |
| Quartz - Total dust. | NDS | 2 mg/m3 | Poland. Maximum permissible concentrations and intensities of harmful factors in the work environment (Dz.U.Poz. 1286/2018, Annex 1), as amended (07 2010) Dusts containing more than 50% free (crystalline) silica, total dust |
| | NDS | 4 mg/m3 | Poland. Maximum permissible concentrations and intensities of harmful factors in the work environment (Dz.U.Poz. 1286/2018, Annex 1), as amended (07 2010) Dusts containing from 2% to 50% free (crystalline) silica, total dust |
| Quartz - Respirable dust. | NDS | 0,3 mg/m3 | Poland. Maximum permissible concentrations and intensities of harmful factors in the work environment (Dz.U.Poz. 1286/2018, Annex 1), as amended (07 2010) Dusts containing more than 50% free (crystalline) silica, respirable dust |
| | NDS | 1 mg/m3 | Poland. Maximum permissible concentrations and intensities of harmful factors in the work environment (Dz.U.Poz. 1286/2018, Annex 1), as amended (07 2010) Dusts containing from 2% to 50% free (crystalline) silica, respirable dust |
| Quartz - Respirable fraction. | NDS | 0,1 mg/m3 | Poland. Maximum permissible concentrations and intensities of harmful factors in the work environment (Dz.U.Poz. 1286/2018, Annex 1), as amended (07 2018) Silica, crystalline; quartz, respirable fraction |
| Manganese - as Mn | NDS | 0,3 mg/m3 | Poland. Maximum permissible concentrations and intensities of harmful factors in the work environment (Dz.U.Poz. 1286/2018, Annex 1), as amended (07 2010) Manganese and inorganic compounds, as Mn |
| Zircon - as Zr | NDS | 5 mg/m3 | Poland. Maximum permissible concentrations and intensities of harmful factors in the work environment (Dz.U.Poz. 1286/2018, Annex 1), as amended (09 2007) Zirconium and compounds, as Zr |
| | NDSCh | 10 mg/m3 | Poland. Maximum permissible concentrations and intensities of harmful factors in the work environment (Dz.U.Poz. 1286/2018, Annex 1), as amended (09 2007) Zirconium and compounds, as Zr |
| Aluminum oxide - Respirable fraction. - as Al | NDS | 1,2 mg/m3 | Poland. Maximum permissible concentrations and intensities of harmful factors in the work environment (Dz.U.Poz. 1286/2018, Annex 1), as amended (06 2014) Aluminum oxide, respirable fraction, as Al |
| Aluminum oxide - Inhalable fraction. - as Al | NDS | 2,5 mg/m3 | Poland. Maximum permissible concentrations and intensities of harmful factors in the work environment (Dz.U.Poz. 1286/2018, Annex 1), as amended (06 2014) Aluminum oxide, inhalable fraction, as Al |
| Iron oxide - Inhalable fraction. - as Fe | NDSCh | 10 mg/m3 | Poland. Maximum permissible concentrations and intensities of harmful factors in the work environment (Dz.U.Poz. 1286/2018, Annex 1), as amended (07 2018) Iron(III) oxide, inhalable fraction, as Fe |
| Iron oxide - Respirable | NDSCh | 5 mg/m3 | Poland. Maximum permissible concentrations and intensities |

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|---|---|---|---|
| fraction. - as Fe | | | of harmful factors in the work environment (Dz.U.Poz. 1286/2018, Annex 1), as amended (07 2018) Iron(III) oxide, respirable fraction, as Fe |
| | NDS | 2,5 mg/m3 | Poland. Maximum permissible concentrations and intensities of harmful factors in the work environment (Dz.U.Poz. 1286/2018, Annex 1), as amended (07 2018) Iron(III) oxide, respirable fraction, as Fe |
| Iron oxide - Inhalable fraction. - as Fe | NDS | 5 mg/m3 | Poland. Maximum permissible concentrations and intensities of harmful factors in the work environment (Dz.U.Poz. 1286/2018, Annex 1), as amended (07 2018) Iron(III) oxide, inhalable fraction, as Fe |
| Zirconium oxide - as Zr | NDS | 5 mg/m3 | Poland. Maximum permissible concentrations and intensities of harmful factors in the work environment (Dz.U.Poz. 1286/2018, Annex 1), as amended (09 2007) Zirconium and compounds, as Zr |
| | NDSCh | 10 mg/m3 | Poland. Maximum permissible concentrations and intensities of harmful factors in the work environment (Dz.U.Poz. 1286/2018, Annex 1), as amended (09 2007) Zirconium and compounds, as Zr |
| Titanium dioxide (synthetic) - Inhalable fraction. | NDS | 10 mg/m3 | Poland. Maximum permissible concentrations and intensities of harmful factors in the work environment (Dz.U.Poz. 1286/2018, Annex 1), as amended (07 2018) Titanium dioxide, inhalable fraction |

### Occupational Exposure Limits: Portugal

| Chemical Identity | Type | Exposure Limit Values | Source |
|---|---|---|---|
| Titanium dioxide (naturally occurring) | TWA | 10 mg/m3 | Portugal. VLEs. Norm on occupational exposure to chemical agents (NP 1796), as amended (2004) |
| Quartz - Respirable fraction. | TWA | 0,05 mg/m3 | Portugal. VLEs. Norm on occupational exposure to chemical agents (NP 1796), as amended (2004) |
| Manganese - Respirable fraction. - as Mn | TWA | 0,02 mg/m3 | Portugal. VLEs. Norm on occupational exposure to chemical agents (NP 1796), as amended (11 2014) |
| Manganese - Inhalable fraction. - as Mn | TWA | 0,1 mg/m3 | Portugal. VLEs. Norm on occupational exposure to chemical agents (NP 1796), as amended (11 2014) |
| Manganese - Inhalable fraction. - Manganese | TWA | 0,2 mg/m3 | Portugal. OELs. Decree-Law No. 24/2012, as amended (06 2018) |
| Manganese - Respirable fraction. - Manganese | TWA | 0,05 mg/m3 | Portugal. OELs. Decree-Law No. 24/2012, as amended (01 2021) Manganese and inorganic manganese compounds |
| Manganese - Inhalable fraction. - Manganese | TWA | 0,2 mg/m3 | Portugal. OELs. Decree-Law No. 24/2012, as amended (01 2021) Manganese and inorganic manganese compounds |
| Zircon - as Zr | STEL | 10 mg/m3 | Portugal. VLEs. Norm on occupational exposure to chemical agents (NP 1796), as amended (2004) |
| | TWA | 5 mg/m3 | Portugal. VLEs. Norm on occupational exposure to chemical agents (NP 1796), as amended (2004) |
| Mica - Respirable fraction. | TWA | 3 mg/m3 | Portugal. VLEs. Norm on occupational exposure to chemical agents (NP 1796), as amended (2004) |
| Aluminum oxide - Respirable fraction. - as Al | TWA | 1 mg/m3 | Portugal. VLEs. Norm on occupational exposure to chemical agents (NP 1796), as amended (11 2014) |
| Iron oxide - Respirable fraction. | TWA | 5 mg/m3 | Portugal. VLEs. Norm on occupational exposure to chemical agents (NP 1796), as amended (2007) |
| Zirconium oxide - as Zr | STEL | 10 mg/m3 | Portugal. VLEs. Norm on occupational exposure to chemical agents (NP 1796), as amended (2004) |
| | TWA | 5 mg/m3 | Portugal. VLEs. Norm on occupational exposure to chemical agents (NP 1796), as amended (2004) |
| Titanium dioxide (synthetic) | TWA | 10 mg/m3 | Portugal. VLEs. Norm on occupational exposure to chemical agents (NP 1796), as amended (2004) |

### Occupational Exposure Limits: Romania

| Chemical Identity | Type | Exposure Limit Values | Source |
|---|---|---|---|
| Zircon - as Zr | TWA | 5 mg/m3 | Romania. OELs. Limit Values of Chemical Agents at Workplace (Regulation 1.218/2006, M.O 845, Annex 1, 3&4) as amended (03 2020) Zirconium and its compounds |
| | STEL | 10 mg/m3 | Romania. OELs. Limit Values of Chemical Agents at |

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| | | | Workplace (Regulation 1.218/2006, M.O 845, Annex 1, 3&4) as amended (03 2020) Zirconium and its compounds |
| Limestone - Inhalable fraction. | TWA | 10 mg/m3 | Romania. OELs. Limit Values of Chemical Agents at Workplace (Regulation 1.218/2006, M.O 845, Annex 1, 3&4) as amended (03 2024) Marble, chalk (calcium carbonate) (quartz ≤ 1%) (Inhalable fraction) |
| Mica - Respirable fraction. | TWA | 3 mg/m3 | Romania. OELs. Limit Values of Chemical Agents at Workplace (Regulation 1.218/2006, M.O 845, Annex 1, 3&4) as amended (03 2024) Marble, chalk (calcium carbonate) (quartz ≥ 1%) |
| Iron oxide - Dust and fume. | STEL | 10 mg/m3 | Romania. OELs. Limit Values of Chemical Agents at Workplace (Regulation 1.218/2006, M.O 845, Annex 1, 3&4) as amended (03 2020) Ferric oxide |
| | TWA | 5 mg/m3 | Romania. OELs. Limit Values of Chemical Agents at Workplace (Regulation 1.218/2006, M.O 845, Annex 1, 3&4) as amended (03 2020) Ferric oxide |
| Zirconium oxide - as Zr | TWA | 5 mg/m3 | Romania. OELs. Limit Values of Chemical Agents at Workplace (Regulation 1.218/2006, M.O 845, Annex 1, 3&4) as amended (03 2020) Zirconium and its compounds |
| | STEL | 10 mg/m3 | Romania. OELs. Limit Values of Chemical Agents at Workplace (Regulation 1.218/2006, M.O 845, Annex 1, 3&4) as amended (03 2020) Zirconium and its compounds |
| Sodium carbonate | TWA | 1 mg/m3 | Romania. OELs. Limit Values of Chemical Agents at Workplace (Regulation 1.218/2006, M.O 845, Annex 1, 3&4) as amended (10 2006) Sodium carbonate |
| | STEL | 3 mg/m3 | Romania. OELs. Limit Values of Chemical Agents at Workplace (Regulation 1.218/2006, M.O 845, Annex 1, 3&4) as amended (08 2018) Sodium carbonate |

**Occupational Exposure Limits: Slovakia**

| Chemical Identity | Type | Exposure Limit Values | Source |
|---|---|---|---|
| Iron | TWA | 6 mg/m3 | Slovakia. OELs. Maximum permissible exposure limits for chemical factors in workplace air (Regulation No 355/2006, Annex 1, Tables 1-7), as amended (09 2020) Maximum exposure limits for stable aerosols; Table 5. Stable aerosols with mostly irritant effects. Maximum exposure limits for stable aerosols; Table 5. Stable aerosols with mostly irritant effects. Iron and iron alloys |
| Zircon - as Zr | TWA | 1 mg/m3 | Slovakia. OELs. Maximum permissible exposure limits for chemical factors in workplace air (Regulation No 355/2006, Annex 1, Tables 1-7), as amended (12 2011) Maximum exposure limits for gases, vapors and aerosols in workplace air (NPEL);Table 1. Maximum exposure limits for gases, vapors and aerosols in workplace air (NPEL);Table 1. Zirconium and its compounds (as Zr) |
| Limestone | TWA | 10 mg/m3 | Slovakia. OELs. Maximum permissible exposure limits for chemical factors in workplace air (Regulation No 355/2006, Annex 1, Tables 1-7), as amended (09 2020) Maximum exposure limits for stable aerosols; Table 5. Stable aerosols with mostly irritant effects. Maximum exposure limits for stable aerosols; Table 5. Stable aerosols with mostly irritant effects. Limestone and marble |
| Magnesite | TWA | 10 mg/m3 | Slovakia. OELs. Maximum permissible exposure limits for chemical factors in workplace air (Regulation No 355/2006, Annex 1, Tables 1-7), as amended (09 2020) Maximum exposure limits for stable aerosols; Table 5. Stable aerosols with mostly irritant effects. Maximum exposure limits for stable aerosols; Table 5. Stable aerosols with mostly irritant effects. Magnesite |
| Silicon dioxide (amorphous) - Dust. | TWA | 10 mg/m3 | Slovakia. OELs. Maximum permissible exposure limits for chemical factors in workplace air (Regulation No 355/2006, Annex 1, Tables 1-7), as amended (09 2020) Maximum exposure limits for stable aerosols; Table 5. Stable aerosols with mostly irritant effects. Maximum exposure limits for stable aerosols; Table 5. Stable aerosols with mostly irritant effects. inert dust (particles insoluble in water, not elsewhere classified) |
| Silicon dioxide (amorphous) | TWA | 0,3 mg/m3 | Slovakia. OELs. Maximum permissible exposure limits for |

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| | | | chemical factors in workplace air (Regulation No 355/2006, Annex 1, Tables 1-7), as amended (09 2020) Maximum exposure limits for stable aerosols; Table 4. Stable aerosols with mostly nonspecific effects. Maximum exposure limits for stable aerosols; Table 4. Stable aerosols with mostly nonspecific effects. Silica, amorphous (fused silica, fused silica, fumes, burnt diatomaceous earth) |
| | TWA | 4 mg/m3 | Slovakia. OELs. Maximum permissible exposure limits for chemical factors in workplace air (Regulation No 355/2006, Annex 1, Tables 1-7), as amended (09 2020) Maximum exposure limits for stable aerosols; Table 4. Stable aerosols with mostly nonspecific effects. Maximum exposure limits for stable aerosols; Table 4. Stable aerosols with mostly nonspecific effects. Silica, amorphous (heat and wet processes, unfired diatomaceous earth, diatomite) |
| Iron oxide - Respirable fume. - as Fe | TWA | 1,5 mg/m3 | Slovakia. OELs. Maximum permissible exposure limits for chemical factors in workplace air (Regulation No 355/2006, Annex 1, Tables 1-7), as amended (12 2011) Maximum exposure limits for gases, vapors and aerosols in workplace air (NPEL);Table 1. Maximum exposure limits for gases, vapors and aerosols in workplace air (NPEL);Table 1. Iron oxide, fumes (as Fe), respirable fraction |
| Iron oxide - Inhalable fume. - as Fe | TWA | 4 mg/m3 | Slovakia. OELs. Maximum permissible exposure limits for chemical factors in workplace air (Regulation No 355/2006, Annex 1, Tables 1-7), as amended (12 2011) Maximum exposure limits for gases, vapors and aerosols in workplace air (NPEL);Table 1. Maximum exposure limits for gases, vapors and aerosols in workplace air (NPEL);Table 1. Iron oxide, fumes (as Fe), inhalable fraction |
| Zirconium oxide - as Zr | TWA | 1 mg/m3 | Slovakia. OELs. Maximum permissible exposure limits for chemical factors in workplace air (Regulation No 355/2006, Annex 1, Tables 1-7), as amended (12 2011) Maximum exposure limits for gases, vapors and aerosols in workplace air (NPEL);Table 1. Maximum exposure limits for gases, vapors and aerosols in workplace air (NPEL);Table 1. Zirconium and its compounds (as Zr) |
| Zirconium oxide - Dust. | TWA | 10 mg/m3 | Slovakia. OELs. Maximum permissible exposure limits for chemical factors in workplace air (Regulation No 355/2006, Annex 1, Tables 1-7), as amended (09 2020) Maximum exposure limits for stable aerosols; Table 5. Stable aerosols with mostly irritant effects. Maximum exposure limits for stable aerosols; Table 5. Stable aerosols with mostly irritant effects. inert dust (particles insoluble in water, not elsewhere classified) |
| Silicon - Respirable fraction. | TWA | 4 mg/m3 | Slovakia. OELs. Maximum permissible exposure limits for chemical factors in workplace air (Regulation No 355/2006, Annex 1, Tables 1-7), as amended (12 2011) Maximum exposure limits for gases, vapors and aerosols in workplace air (NPEL);Table 1. Maximum exposure limits for gases, vapors and aerosols in workplace air (NPEL);Table 1. Silicon, respirable fraction |
| Silicon - Inhalable fraction. | TWA | 10 mg/m3 | Slovakia. OELs. Maximum permissible exposure limits for chemical factors in workplace air (Regulation No 355/2006, Annex 1, Tables 1-7), as amended (12 2011) Maximum exposure limits for gases, vapors and aerosols in workplace air (NPEL);Table 1. Maximum exposure limits for gases, vapors and aerosols in workplace air (NPEL);Table 1. Silicon, inhalable fraction |

**Occupational Exposure Limits: Slovenia**

| Chemical Identity | Type | Exposure Limit Values | Source |
|---|---|---|---|
| Quartz - Alveolar fraction | MV | 0,05 mg/m3 | Slovenia. Occupational Exposure Limit Values for Carcinogens, Mutagens and Reprotoxic Substances (Reg. on Protection from Exposure to CMR Substances, 29/2024, Annex III, Table 3.1), as amended (04 2024) Silica, crystalline-quartz |
| Manganese - Inhalable fraction. - as Mg | KTV | 1,6 mg/m3 | Slovenia. OELs. Occupational Exposure Limits of Chemicals at Work (Reg. on Protection of Workers from Risks due to Exp. |

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| | | | to Chemicals at Work, Annex 1, 72/2021), as amended (04 2024) Manganese and inorganic compounds (calculated as Mg) [inhalable fraction] |
| Manganese - Respirable fraction. - as Mg | TWA | 0,05 mg/m3 | Slovenia. OELs. Occupational Exposure Limits of Chemicals at Work (Reg. on Protection of Workers from Risks due to Exp. to Chemicals at Work, Annex 1, 72/2021), as amended (04 2024) If in compliance with the OEL and BEL values, then there should be no risk of reproductive damage. If in compliance with the OEL and BEL values, then there should be no risk of reproductive damage. Manganese and inorganic compounds (calculated as Mg) [respirable fraction] |
| | KTV | 0,4 mg/m3 | Slovenia. OELs. Occupational Exposure Limits of Chemicals at Work (Reg. on Protection of Workers from Risks due to Exp. to Chemicals at Work, Annex 1, 72/2021), as amended (04 2024) Manganese and inorganic compounds (calculated as Mg) [respirable fraction] |
| Manganese - Inhalable fraction. - as Mg | TWA | 0,2 mg/m3 | Slovenia. OELs. Occupational Exposure Limits of Chemicals at Work (Reg. on Protection of Workers from Risks due to Exp. to Chemicals at Work, Annex 1, 72/2021), as amended (04 2024) If in compliance with the OEL and BEL values, then there should be no risk of reproductive damage. If in compliance with the OEL and BEL values, then there should be no risk of reproductive damage. Manganese and inorganic compounds (calculated as Mg) [inhalable fraction] |
| Zircon - Inhalable fraction. | KTV | 1 mg/m3 | Slovenia. OELs. Occupational Exposure Limits of Chemicals at Work (Reg. on Protection of Workers from Risks due to Exp. to Chemicals at Work, Annex 1, 72/2021), as amended (12 2018) Zirconium-dust, and water insoluble zirconium compounds [inhalable fraction] |
| | TWA | 1 mg/m3 | Slovenia. OELs. Occupational Exposure Limits of Chemicals at Work (Reg. on Protection of Workers from Risks due to Exp. to Chemicals at Work, Annex 1, 72/2021), as amended (12 2018) Zirconium-dust, and water insoluble zirconium compounds [inhalable fraction] |
| Limestone - Respirable fraction. | TWA | 1,25 mg/m3 | Slovenia. OELs. Occupational Exposure Limits of Chemicals at Work (Reg. on Protection of Workers from Risks due to Exp. to Chemicals at Work, Annex 1, 72/2021), as amended (12 2019) Dust [respirable fraction] |
| Limestone - Inhalable fraction. | KTV | 20 mg/m3 | Slovenia. OELs. Occupational Exposure Limits of Chemicals at Work (Reg. on Protection of Workers from Risks due to Exp. to Chemicals at Work, Annex 1, 72/2021), as amended (12 2019) Dust [inhalable fraction] |
| Limestone - Respirable fraction. | KTV | 2,5 mg/m3 | Slovenia. OELs. Occupational Exposure Limits of Chemicals at Work (Reg. on Protection of Workers from Risks due to Exp. to Chemicals at Work, Annex 1, 72/2021), as amended (12 2019) Dust [respirable fraction] |
| Limestone - Inhalable fraction. | TWA | 10 mg/m3 | Slovenia. OELs. Occupational Exposure Limits of Chemicals at Work (Reg. on Protection of Workers from Risks due to Exp. to Chemicals at Work, Annex 1, 72/2021), as amended (12 2019) Dust [inhalable fraction] |
| Magnesite - Respirable fraction. | TWA | 1,25 mg/m3 | Slovenia. OELs. Occupational Exposure Limits of Chemicals at Work (Reg. on Protection of Workers from Risks due to Exp. to Chemicals at Work, Annex 1, 72/2021), as amended (12 2019) Dust [respirable fraction] |
| Magnesite - Inhalable fraction. | KTV | 20 mg/m3 | Slovenia. OELs. Occupational Exposure Limits of Chemicals at Work (Reg. on Protection of Workers from Risks due to Exp. to Chemicals at Work, Annex 1, 72/2021), as amended (12 2019) Dust [inhalable fraction] |
| | TWA | 10 mg/m3 | Slovenia. OELs. Occupational Exposure Limits of Chemicals at Work (Reg. on Protection of Workers from Risks due to Exp. to Chemicals at Work, Annex 1, 72/2021), as amended (12 2019) Dust [inhalable fraction] |
| Magnesite - Respirable fraction. | KTV | 2,5 mg/m3 | Slovenia. OELs. Occupational Exposure Limits of Chemicals at Work (Reg. on Protection of Workers from Risks due to Exp. to Chemicals at Work, Annex 1, 72/2021), as amended (12 2019) Dust [respirable fraction] |
| Silicon dioxide (amorphous) - Inhalable fraction. | TWA | 4 mg/m3 | Slovenia. OELs. Occupational Exposure Limits of Chemicals at Work (Reg. on Protection of Workers from Risks due to Exp. to Chemicals at Work, Annex 1, 72/2021), as amended (06 2007) If in compliance with the OEL and BEL values, then there should be no risk of reproductive damage. If in |

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|---|---|---|---|
| | | | compliance with the OEL and BEL values, then there should be no risk of reproductive damage. Silica [inhalable fraction] |
| Iron oxide - Inhalable fraction. | TWA | 10 mg/m3 | Slovenia. OELs. Occupational Exposure Limits of Chemicals at Work (Reg. on Protection of Workers from Risks due to Exp. to Chemicals at Work, Annex 1, 72/2021), as amended (12 2018) Dust [inhalable fraction] |
| Iron oxide - Respirable fraction. | KTV | 2,5 mg/m3 | Slovenia. OELs. Occupational Exposure Limits of Chemicals at Work (Reg. on Protection of Workers from Risks due to Exp. to Chemicals at Work, Annex 1, 72/2021), as amended (12 2018) Dust [respirable fraction] |
| | TWA | 1,25 mg/m3 | Slovenia. OELs. Occupational Exposure Limits of Chemicals at Work (Reg. on Protection of Workers from Risks due to Exp. to Chemicals at Work, Annex 1, 72/2021), as amended (12 2018) Dust [respirable fraction] |
| Iron oxide - Inhalable fraction. | KTV | 20 mg/m3 | Slovenia. OELs. Occupational Exposure Limits of Chemicals at Work (Reg. on Protection of Workers from Risks due to Exp. to Chemicals at Work, Annex 1, 72/2021), as amended (12 2018) Dust [inhalable fraction] |
| Zirconium oxide - Inhalable fraction. | KTV | 1 mg/m3 | Slovenia. OELs. Occupational Exposure Limits of Chemicals at Work (Reg. on Protection of Workers from Risks due to Exp. to Chemicals at Work, Annex 1, 72/2021), as amended (12 2018) Zirconium-dust, and water insoluble zirconium compounds [inhalable fraction] |
| | TWA | 1 mg/m3 | Slovenia. OELs. Occupational Exposure Limits of Chemicals at Work (Reg. on Protection of Workers from Risks due to Exp. to Chemicals at Work, Annex 1, 72/2021), as amended (12 2018) Zirconium-dust, and water insoluble zirconium compounds [inhalable fraction] |
| | TWA | 10 mg/m3 | Slovenia. OELs. Occupational Exposure Limits of Chemicals at Work (Reg. on Protection of Workers from Risks due to Exp. to Chemicals at Work, Annex 1, 72/2021), as amended (12 2019) Dust [inhalable fraction] |
| | KTV | 20 mg/m3 | Slovenia. OELs. Occupational Exposure Limits of Chemicals at Work (Reg. on Protection of Workers from Risks due to Exp. to Chemicals at Work, Annex 1, 72/2021), as amended (12 2019) Dust [inhalable fraction] |
| Zirconium oxide - Respirable fraction. | KTV | 2,5 mg/m3 | Slovenia. OELs. Occupational Exposure Limits of Chemicals at Work (Reg. on Protection of Workers from Risks due to Exp. to Chemicals at Work, Annex 1, 72/2021), as amended (12 2019) Dust [respirable fraction] |
| | TWA | 1,25 mg/m3 | Slovenia. OELs. Occupational Exposure Limits of Chemicals at Work (Reg. on Protection of Workers from Risks due to Exp. to Chemicals at Work, Annex 1, 72/2021), as amended (12 2019) Dust [respirable fraction] |
| Silicon - Respirable fraction. | KTV | 2,5 mg/m3 | Slovenia. OELs. Occupational Exposure Limits of Chemicals at Work (Reg. on Protection of Workers from Risks due to Exp. to Chemicals at Work, Annex 1, 72/2021), as amended (12 2019) Dust [respirable fraction] |
| Silicon - Inhalable fraction. | TWA | 10 mg/m3 | Slovenia. OELs. Occupational Exposure Limits of Chemicals at Work (Reg. on Protection of Workers from Risks due to Exp. to Chemicals at Work, Annex 1, 72/2021), as amended (12 2019) Dust [inhalable fraction] |
| Silicon - Respirable fraction. | TWA | 1,25 mg/m3 | Slovenia. OELs. Occupational Exposure Limits of Chemicals at Work (Reg. on Protection of Workers from Risks due to Exp. to Chemicals at Work, Annex 1, 72/2021), as amended (12 2019) Dust [respirable fraction] |
| Silicon - Inhalable fraction. | KTV | 20 mg/m3 | Slovenia. OELs. Occupational Exposure Limits of Chemicals at Work (Reg. on Protection of Workers from Risks due to Exp. to Chemicals at Work, Annex 1, 72/2021), as amended (12 2019) Dust [inhalable fraction] |

### Occupational Exposure Limits: Spain

| Chemical Identity | Type | Exposure Limit Values | Source |
|---|---|---|---|
| Zircon - as Zr | VLA-EC | 10 mg/m3 | Spain. Occupational Exposure Limits, as amended (2013) |
| | VLA-ED | 5 mg/m3 | Spain. Occupational Exposure Limits, as amended (2013) |
| Limestone - Inhalable fraction. | VLA-ED | 10 mg/m3 | Spain. Occupational Exposure Limits, as amended (2023) This value is for the particulated matter that is free from asbestos and crystalline silica. This value is for the particulated matter |

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|---|---|---|---|
| | | | that is free from asbestos and crystalline silica. Particles (insoluble or poorly soluble) not otherwise specified, inhalable fraction |
| Limestone - Respirable fraction. | VLA-ED | 3 mg/m3 | Spain. Occupational Exposure Limits, as amended (2023) This value is for the particulated matter that is free from asbestos and crystalline silica. This value is for the particulated matter that is free from asbestos and crystalline silica. Particles (insoluble or poorly soluble) not otherwise specified, respirable fraction |
| Magnesite - Inhalable fraction. | VLA-ED | 10 mg/m3 | Spain. Occupational Exposure Limits, as amended (2023) This value is for the particulated matter that is free from asbestos and crystalline silica. This value is for the particulated matter that is free from asbestos and crystalline silica. Particles (insoluble or poorly soluble) not otherwise specified, inhalable fraction |
| Magnesite - Respirable fraction. | VLA-ED | 3 mg/m3 | Spain. Occupational Exposure Limits, as amended (2023) This value is for the particulated matter that is free from asbestos and crystalline silica. This value is for the particulated matter that is free from asbestos and crystalline silica. Particles (insoluble or poorly soluble) not otherwise specified, respirable fraction |
| Silicon dioxide (amorphous) - Inhalable fraction. | VLA-ED | 10 mg/m3 | Spain. Occupational Exposure Limits, as amended (2023) This value is for the particulated matter that is free from asbestos and crystalline silica. This value is for the particulated matter that is free from asbestos and crystalline silica. Particles (insoluble or poorly soluble) not otherwise specified, inhalable fraction |
| Silicon dioxide (amorphous) - Respirable fraction. | VLA-ED | 3 mg/m3 | Spain. Occupational Exposure Limits, as amended (2023) This value is for the particulated matter that is free from asbestos and crystalline silica. This value is for the particulated matter that is free from asbestos and crystalline silica. Particles (insoluble or poorly soluble) not otherwise specified, respirable fraction |
| Iron oxide - Dust and fume. - as Fe | VLA-ED | 5 mg/m3 | Spain. Occupational Exposure Limits, as amended (2008) Iron (III) oxide, as Fe, dust and fume |
| Zirconium oxide - as Zr | VLA-ED | 5 mg/m3 | Spain. Occupational Exposure Limits, as amended (2013) |
| | VLA-EC | 10 mg/m3 | Spain. Occupational Exposure Limits, as amended (2013) |
| Zirconium oxide - Respirable fraction. | VLA-ED | 3 mg/m3 | Spain. Occupational Exposure Limits, as amended (2023) This value is for the particulated matter that is free from asbestos and crystalline silica. This value is for the particulated matter that is free from asbestos and crystalline silica. Particles (insoluble or poorly soluble) not otherwise specified, respirable fraction |
| Zirconium oxide - Inhalable fraction. | VLA-ED | 10 mg/m3 | Spain. Occupational Exposure Limits, as amended (2023) This value is for the particulated matter that is free from asbestos and crystalline silica. This value is for the particulated matter that is free from asbestos and crystalline silica. Particles (insoluble or poorly soluble) not otherwise specified, inhalable fraction |
| Silicon - Respirable fraction. | VLA-ED | 3 mg/m3 | Spain. Occupational Exposure Limits, as amended (2023) This value is for the particulated matter that is free from asbestos and crystalline silica. This value is for the particulated matter that is free from asbestos and crystalline silica. Particles (insoluble or poorly soluble) not otherwise specified, respirable fraction |
| Silicon - Inhalable fraction. | VLA-ED | 10 mg/m3 | Spain. Occupational Exposure Limits, as amended (2023) This value is for the particulated matter that is free from asbestos and crystalline silica. This value is for the particulated matter that is free from asbestos and crystalline silica. Particles (insoluble or poorly soluble) not otherwise specified, inhalable fraction |

### Occupational Exposure Limits: Sweden

| Chemical Identity | Type | Exposure Limit Values | Source |
|---|---|---|---|
| Limestone - Inhalable dust. | NGV | 5 mg/m3 | Sweden. Occupational Exposure Limit Values, as amended (11 2022) Dust, inorganic, inhalable dust |
| Limestone - Respirable dust. | NGV | 2,5 mg/m3 | Sweden. Occupational Exposure Limit Values, as amended (11 2022) Dust, inorganic, respirable dust |

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|---|---|---|---|
| Magnesite - Inhalable dust. | NGV | 5 mg/m3 | Sweden. Occupational Exposure Limit Values, as amended (11 2022) Dust, inorganic, inhalable dust |
| Magnesite - Respirable dust. | NGV | 2,5 mg/m3 | Sweden. Occupational Exposure Limit Values, as amended (11 2022) Dust, inorganic, respirable dust |
| Silicon dioxide (amorphous) - Inhalable dust. | NGV | 5 mg/m3 | Sweden. Occupational Exposure Limit Values, as amended (11 2022) Dust, inorganic, inhalable dust |
| Silicon dioxide (amorphous) - Respirable dust. | NGV | 2,5 mg/m3 | Sweden. Occupational Exposure Limit Values, as amended (11 2022) Dust, inorganic, respirable dust |
| Iron oxide - Respirable dust. - as Fe | NGV | 3,5 mg/m3 | Sweden. Occupational Exposure Limit Values, as amended (11 2022) Iron oxide, as Fe, respirable dust |
| Zirconium oxide - Respirable dust. | NGV | 2,5 mg/m3 | Sweden. Occupational Exposure Limit Values, as amended (11 2022) Dust, inorganic, respirable dust |
| Zirconium oxide - Inhalable dust. | NGV | 5 mg/m3 | Sweden. Occupational Exposure Limit Values, as amended (11 2022) Dust, inorganic, inhalable dust |
| Silicon - Inhalable dust. | NGV | 5 mg/m3 | Sweden. Occupational Exposure Limit Values, as amended (11 2022) Dust, inorganic, inhalable dust |
| Silicon - Respirable dust. | NGV | 2,5 mg/m3 | Sweden. Occupational Exposure Limit Values, as amended (11 2022) Dust, inorganic, respirable dust |

## Occupational Exposure Limits: Switzerland

| Chemical Identity | Type | Exposure Limit Values | Source |
|---|---|---|---|
| Titanium dioxide (naturally occurring) - Respirable dust. | TWA | 3 mg/m3 | Switzerland. SUVA Grenzwerte am Arbeitsplatz, as amended (01 2018) TITANIUM DIOXIDE, RESPIRABLE DUST |
| Quartz - Respirable fraction. | TWA | 0,15 mg/m3 | Switzerland. SUVA Grenzwerte am Arbeitsplatz, as amended (01 2018) Provisional value. Provisional value. SILICON DIOXIDE, CRYSTALLINE: QUARTZ, RESPIRABLE FRACTION |
| Manganese - Inhalable fraction. | TWA | 0,5 mg/m3 | Switzerland. SUVA Grenzwerte am Arbeitsplatz, as amended (01 2018) Provisional value. Provisional value. MANGANESE AND ITS INORGANIC COMPOUNDS, INHALABLE FRACTION |
| Zircon - Inhalable fraction. | TWA | 5 mg/m3 | Switzerland. SUVA Grenzwerte am Arbeitsplatz, as amended (01 2018) ZIRCONIUM COMPOUNDS, INHALABLE FRACTION |
| Zircon - Inhalable fraction. - as Zr | TWA | 5 mg/m3 | Switzerland. SUVA Grenzwerte am Arbeitsplatz, as amended (08 2023) Zirconium and its compounds, except Zirconium tetrachloride and Zirconium dioxide, as Zr, inhalable fraction |
| | STEL | 10 mg/m3 | Switzerland. SUVA Grenzwerte am Arbeitsplatz, as amended (08 2023) Zirconium and its compounds, except Zirconium tetrachloride and Zirconium dioxide, as Zr, inhalable fraction |
| Limestone - Inhalable dust. | TWA | 10 mg/m3 | Switzerland. SUVA Grenzwerte am Arbeitsplatz, as amended (08 2023) Dust, inhalable fraction |
| Limestone - Respirable dust. | TWA | 3 mg/m3 | Switzerland. SUVA Grenzwerte am Arbeitsplatz, as amended (08 2023) Dust, granular, bio-reistant, respirable fraction |
| Magnesite - Respirable dust. | TWA | 3 mg/m3 | Switzerland. SUVA Grenzwerte am Arbeitsplatz, as amended (08 2023) Magnesium carbonate, respirable dust |
| Mica - Respirable fraction. | TWA | 3 mg/m3 | Switzerland. SUVA Grenzwerte am Arbeitsplatz, as amended (01 2018) MICA, RESPIRABLE FRACTION |
| Silicon dioxide (amorphous) | TWA | 4 mg/m3 | Switzerland. SUVA Grenzwerte am Arbeitsplatz, as amended (08 2023) Amorphous silica |
| Aluminum oxide - Respirable dust. - as Al | TWA | 3 mg/m3 | Switzerland. SUVA Grenzwerte am Arbeitsplatz, as amended (01 2018) ALUMINUM OXIDE, AS AL, RESPIRABLE DUST |
| Aluminum oxide - Respirable dust and/or fume. | TWA | 3 mg/m3 | Switzerland. SUVA Grenzwerte am Arbeitsplatz, as amended (01 2018) ALUMINUM OXIDE-FUME, RESPIRABLE DUST |
| | STEL | 24 mg/m3 | Switzerland. SUVA Grenzwerte am Arbeitsplatz, as amended (01 2018) ALUMINUM OXIDE-FUME, RESPIRABLE DUST |
| Iron oxide - Respirable fraction. | TWA | 3 mg/m3 | Switzerland. SUVA Grenzwerte am Arbeitsplatz, as amended (08 2023) Iron oxide, respirable fraction |
| Zirconium oxide - Inhalable fraction. | TWA | 5 mg/m3 | Switzerland. SUVA Grenzwerte am Arbeitsplatz, as amended (01 2018) ZIRCONIUM COMPOUNDS, INHALABLE FRACTION |
| Zirconium oxide - Respirable fraction. | TWA | 3 mg/m3 | Switzerland. SUVA Grenzwerte am Arbeitsplatz, as amended (08 2023) Zirconium dioxide, respirable fraction |
| Titanium dioxide (synthetic) - Respirable dust. | TWA | 3 mg/m3 | Switzerland. SUVA Grenzwerte am Arbeitsplatz, as amended (01 2018) TITANIUM DIOXIDE, RESPIRABLE DUST |
| Silicon - Respirable fraction. | TWA | 3 mg/m3 | Switzerland. SUVA Grenzwerte am Arbeitsplatz, as amended (08 2023) Silicon, respirable fraction |

**Occupational Exposure Limits: Türkiye**

| Chemical Identity | Type | Exposure Limit Values | Source |
|---|---|---|---|
| Limestone - Respirable dust. | TWA | 5 mg/m3 | Turkiye. Workplace Dust Exposure Limit Values (Annex 1), Regulation on Dust Control, No. 28812, as amended (11 2013) |
| Limestone - Total dust. | TWA | 15 mg/m3 | Turkiye. Workplace Dust Exposure Limit Values (Annex 1), Regulation on Dust Control, No. 28812, as amended (11 2013) |
| Magnesite - Total dust. | TWA | 15 mg/m3 | Turkiye. Workplace Dust Exposure Limit Values (Annex 1), Regulation on Dust Control, No. 28812, as amended (11 2013) |
| Magnesite - Respirable dust. | TWA | 5 mg/m3 | Turkiye. Workplace Dust Exposure Limit Values (Annex 1), Regulation on Dust Control, No. 28812, as amended (11 2013) |
| Silicon dioxide (amorphous) - Respirable fraction. | LIMIT VAL | 5 mg/m3 | Turkiye. Workplace Dust Exposure Limit Values (Annex 1), Regulation on Dust Control, No. 28812, as amended (11 2013) Inert or Nuisance Dust: Respirable Fraction |
| Silicon dioxide (amorphous) - Total dust. | LIMIT VAL | 15 mg/m3 | Turkiye. Workplace Dust Exposure Limit Values (Annex 1), Regulation on Dust Control, No. 28812, as amended (11 2013) Inert or Nuisance Dust: Total Dust |
| Silicon dioxide (amorphous) - Dust. | LIMIT VAL | 0,8 mg/m3 | Turkiye. Workplace Dust Exposure Limit Values (Annex 1), Regulation on Dust Control, No. 28812, as amended (11 2013) The value is calculated from the equation (80 mg/m3)/(SiO2%+2), using a value of 100% SiO2. Lower values of % SiO2 will give higher exposure limits. The value is calculated from the equation (80 mg/m3)/(SiO2%+2), using a value of 100% SiO2. Lower values of % SiO2 will give higher exposure limits. Amorphous structure (containing natural diatomaceous earth) |
| Iron oxide - Respirable dust. | TWA | 5 mg/m3 | Turkiye. Workplace Dust Exposure Limit Values (Annex 1), Regulation on Dust Control, No. 28812, as amended (11 2013) |
| Iron oxide - Total dust. | TWA | 15 mg/m3 | Turkiye. Workplace Dust Exposure Limit Values (Annex 1), Regulation on Dust Control, No. 28812, as amended (11 2013) |
| Iron oxide - Respirable fraction. | LIMIT VAL | 5 mg/m3 | Turkiye. Workplace Dust Exposure Limit Values (Annex 1), Regulation on Dust Control, No. 28812, as amended (11 2013) Inert or Nuisance Dust: Respirable Fraction |
| Iron oxide - Total dust. | LIMIT VAL | 15 mg/m3 | Turkiye. Workplace Dust Exposure Limit Values (Annex 1), Regulation on Dust Control, No. 28812, as amended (11 2013) Inert or Nuisance Dust: Total Dust |
| Zirconium oxide - Total dust. | LIMIT VAL | 15 mg/m3 | Turkiye. Workplace Dust Exposure Limit Values (Annex 1), Regulation on Dust Control, No. 28812, as amended (11 2013) Inert or Nuisance Dust: Total Dust |
| Zirconium oxide - Respirable fraction. | LIMIT VAL | 5 mg/m3 | Turkiye. Workplace Dust Exposure Limit Values (Annex 1), Regulation on Dust Control, No. 28812, as amended (11 2013) Inert or Nuisance Dust: Respirable Fraction |
| Silicon - Respirable dust. | TWA | 5 mg/m3 | Turkiye. Workplace Dust Exposure Limit Values (Annex 1), Regulation on Dust Control, No. 28812, as amended (11 2013) Silicon (Respirable) |
| Silicon - Total dust. | TWA | 15 mg/m3 | Turkiye. Workplace Dust Exposure Limit Values (Annex 1), Regulation on Dust Control, No. 28812, as amended (11 2013) Silicon (Total Dust) |

**If member state not listed, refer to the European Union value.**

## Biological Limit Values

**European Union biological limit value is not available.**

## Additional exposure limits under the conditions of use

**Additional exposure limits under the conditions of use: European Union**

| Chemical Identity | Type | Exposure Limit Values | Source |
|---|---|---|---|
| Carbon dioxide | TWA | 5.000 ppm | EU. Indicative Exposure Limit Values in Directives 91/322/EEC, 2000/39/EC, 2006/15/EC, 2009/161/EU (Indicative) |
| Carbon monoxide | STEL | 100 ppm | EU. Indicative Exposure Limit Values in Directives 91/322/EEC, 2000/39/EC, 2006/15/EC, 2009/161/EU |

| | | | |
|---|---|---|---|
| | | | (Indicative) |
| | TWA | 20 ppm | EU. Indicative Exposure Limit Values in Directives 91/322/EEC, 2000/39/EC, 2006/15/EC, 2009/161/EU (Indicative) |
| | STEL | 100 ppm | EU. Scientific Committee on Occupational Exposure Limit Values (SCOELs), European Commission - SCOEL, as amended |
| | TWA | 20 ppm | EU. Scientific Committee on Occupational Exposure Limit Values (SCOELs), European Commission - SCOEL, as amended |
| | TWA | 20 ppm | EU. OELs, Directive 2004/37/EC on carcinogen and mutagens from Annex III, Part A |
| | STEL | 100 ppm | EU. OELs, Directive 2004/37/EC on carcinogen and mutagens from Annex III, Part A |
| | STEL | 117 mg/m3 | EU. OELs, Directive 2004/37/EC on carcinogen and mutagens from Annex III, Part A |
| Nitrogen dioxide | TWA | 0,5 ppm | EU. Indicative Exposure Limit Values in Directives 91/322/EEC, 2000/39/EC, 2006/15/EC, 2009/161/EU (Indicative) |
| | STEL | 1 ppm | EU. Indicative Exposure Limit Values in Directives 91/322/EEC, 2000/39/EC, 2006/15/EC, 2009/161/EU (Indicative) |
| | STEL | 1 ppm | EU. Scientific Committee on Occupational Exposure Limit Values (SCOELs), European Commission - SCOEL, as amended |
| | TWA | 0,5 ppm | EU. Scientific Committee on Occupational Exposure Limit Values (SCOELs), European Commission - SCOEL, as amended |
| Manganese - Respirable fraction. - as Mn | TWA | 0,05 mg/m3 | EU. Indicative Exposure Limit Values in Directives 91/322/EEC, 2000/39/EC, 2006/15/EC, 2009/161/EU (Indicative) |
| Manganese - Inhalable fraction. - as Mn | TWA | 0,2 mg/m3 | EU. Indicative Exposure Limit Values in Directives 91/322/EEC, 2000/39/EC, 2006/15/EC, 2009/161/EU (Indicative) |
| Manganese - Respirable fraction. | TWA | 0,050 mg/m3 | EU. Scientific Committee on Occupational Exposure Limit Values (SCOELs), European Commission - SCOEL, as amended |
| Manganese - Inhalable fraction. | TWA | 0,200 mg/m3 | EU. Scientific Committee on Occupational Exposure Limit Values (SCOELs), European Commission - SCOEL, as amended |

**Additional exposure limits under the conditions of use: Bulgaria**

| Chemical Identity | Type | Exposure Limit Values | Source |
|---|---|---|---|
| Carbon monoxide | STEL | 100 ppm | Bulgaria. Occupational Exposure Limit Values of Carcinogens, Mutagens and Toxic for Reproduction Substances at Work (Reg. No 10, Annex 1, D.V.94/2003), as amended |
| | TWA | 20 ppm | Bulgaria. Occupational Exposure Limit Values of Carcinogens, Mutagens and Toxic for Reproduction Substances at Work (Reg. No 10, Annex 1, D.V.94/2003), as amended |

**Additional exposure limits under the conditions of use: Estonia**

| Chemical Identity | Type | Exposure Limit Values | Source |
|---|---|---|---|
| Carbon monoxide | TWA | 20 ppm | Estonia. OELs. Occupational Exposure Limits of Hazardous Substances (Regulation No. 105/2001, Annex), as amended |
| | STEL | 100 ppm | Estonia. OELs. Occupational Exposure Limits of Hazardous Substances (Regulation No. 105/2001, Annex), as amended |
| Nitrogen dioxide | STEL | 5 ppm | Estonia. OELs. Occupational Exposure Limits of Hazardous Substances (Regulation No. 105/2001, Annex), as amended |
| | TWA | 2 ppm | Estonia. OELs. Occupational Exposure Limits of Hazardous Substances (Regulation No. 105/2001, Annex), as amended |
| Manganese - Fine dust, respiratory fraction - as Mn | TWA | 0,05 mg/m3 | Estonia. OELs. Occupational Exposure Limits of Hazardous Substances (Regulation No. 105/2001, Annex), as amended |
| Manganese - Total dust, | TWA | 0,2 mg/m3 | Estonia. OELs. Occupational Exposure Limits of Hazardous |

| | | | |
|---|---|---|---|
| respiratory fraction - as Mn | | | Substances (Regulation No. 105/2001, Annex), as amended |

**Additional exposure limits under the conditions of use: Finland**

| Chemical Identity | Type | Exposure Limit Values | Source |
|---|---|---|---|
| Carbon monoxide | HTP 15MIN | 100 ppm | Finland. Regulation on Carcinogenic, Mutagenic and Toxic to Reproduction Substances at Work (113/2024) |
| | HTP 8H | 20 ppm | Finland. Regulation on Carcinogenic, Mutagenic and Toxic to Reproduction Substances at Work (113/2024) |

**Additional exposure limits under the conditions of use: France**

| Chemical Identity | Type | Exposure Limit Values | Source |
|---|---|---|---|
| Carbon monoxide | VLE | 100 ppm | France. Threshold Limit Values (VLEP) for Occupational Exposure to Chemicals in France, INRS ED 984, as amended (Regulatory binding (VRC)) |
| | VME | 20 ppm | France. Threshold Limit Values (VLEP) for Occupational Exposure to Chemicals in France, INRS ED 984, as amended (Regulatory binding (VRC)) |
| Nitrogen dioxide | VME | 0,5 ppm | France. Threshold Limit Values (VLEP) for Occupational Exposure to Chemicals in France, INRS ED 984, as amended (Regulatory binding (VRC)) |
| | VLE | 1 ppm | France. Threshold Limit Values (VLEP) for Occupational Exposure to Chemicals in France, INRS ED 984, as amended (Regulatory binding (VRC)) |
| | VME | 0,5 ppm | France. OELs. Threshold Limit Values (VLEP) for Occupational Exposure to Chemicals in France according to INRS, ED 984, as amended (Binding regulatory limit values (article R. 4412-149 of the Labor Code)) |
| | VLE | 1 ppm | France. OELs. Threshold Limit Values (VLEP) for Occupational Exposure to Chemicals in France according to INRS, ED 984, as amended (Binding regulatory limit values (article R. 4412-149 of the Labor Code)) |
| Ozone | VLE | 0,2 ppm | France. Threshold Limit Values (VLEP) for Occupational Exposure to Chemicals in France, INRS ED 984, as amended (Indicative limit (VL)) |
| | VME | 0,1 ppm | France. OELs. Threshold Limit Values (VLEP) for Occupational Exposure to Chemicals in France according to INRS, ED 984, as amended |
| | VLE | 0,2 ppm | France. OELs. Threshold Limit Values (VLEP) for Occupational Exposure to Chemicals in France according to INRS, ED 984, as amended |
| Manganese - Inhalable fraction. - as Mn | VME | 0,20 mg/m3 | France. Threshold Limit Values (VLEP) for Occupational Exposure to Chemicals in France, INRS ED 984, as amended (Regulatory indicative (VRI)) |
| Manganese - Respirable fraction. - as Mn | VME | 0,05 mg/m3 | France. Threshold Limit Values (VLEP) for Occupational Exposure to Chemicals in France, INRS ED 984, as amended (Regulatory indicative (VRI)) |

**Additional exposure limits under the conditions of use: Germany**

| Chemical Identity | Type | Exposure Limit Values | Source |
|---|---|---|---|
| Carbon monoxide | AGW | 20 ppm | Germany. TRGS 900, Occupational Exposure Limits (AGW), as amended (Even if the AGW and BGW values are complied with, there still may be a risk of reproductive damage (see Number 2.7).) |
| Nitrogen dioxide | AGW | 0,5 ppm | Germany. TRGS 900, Occupational Exposure Limits (AGW), as amended |
| Manganese - Inhalable fraction. | MAK | 0,2 mg/m3 | Germany. DFG MAK List (advisory OELs). Commission for the Investigation of Health Hazards of Chemical Compounds in the Work Area (DFG), as amended (Listed) |
| Manganese - Respirable fraction. | MAK | 0,02 mg/m3 | Germany. DFG MAK List (advisory OELs). Commission for the Investigation of Health Hazards of Chemical Compounds in the Work Area (DFG), as amended (Listed) |
| Manganese - Inhalable | AGW | 0,2 mg/m3 | Germany. TRGS 900, Occupational Exposure Limits (AGW), |

| | | | |
|---|---|---|---|
| fraction. - as Mn | | | as amended (If the AGW and BGW values are complied with, there should be no risk of reproductive damage (see Number 2.7).) |
| Manganese - Respirable fraction. - as Mn | AGW | 0,02 mg/m3 | Germany. TRGS 900, Occupational Exposure Limits (AGW), as amended (If the AGW and BGW values are complied with, there should be no risk of reproductive damage (see Number 2.7).) |

**Additional exposure limits under the conditions of use: Italy**

| Chemical Identity | Type | Exposure Limit Values | Source |
|---|---|---|---|
| Carbon monoxide | TWA | 20 ppm | Italy. Occupational Exposure Limits, (OELs), Legislative Decree n.81, as amended |
| | STEL | 100 ppm | Italy. Occupational Exposure Limits, (OELs), Legislative Decree n.81, as amended |
| | TWA | 20 ppm | Italy. Occupational Exposure Limits, (OELs), Legislative Decree n.81, as amended |
| | STEL | 100 ppm | Italy. Occupational Exposure Limits, (OELs), Legislative Decree n.81, as amended |
| Nitrogen dioxide | STEL | 1 ppm | Italy. Occupational Exposure Limits, (OELs), Legislative Decree n.81, as amended |
| | TWA | 0,5 ppm | Italy. Occupational Exposure Limits, (OELs), Legislative Decree n.81, as amended |
| | TWA | 0,5 ppm | Italy. Occupational Exposure Limits, (OELs), Legislative Decree n.81, as amended |
| | STEL | 1 ppm | Italy. Occupational Exposure Limits, (OELs), Legislative Decree n.81, as amended |

**Additional exposure limits under the conditions of use: Latvia**

| Chemical Identity | Type | Exposure Limit Values | Source |
|---|---|---|---|
| Manganese - Respirable fraction. - Manganese | TWA | 0,05 mg/m3 | Latvia. OELs. Occupational exposure limit values of chemical substances in work environment, as amended |
| Manganese - Inhalable fraction. - Manganese | TWA | 0,2 mg/m3 | Latvia. OELs. Occupational exposure limit values of chemical substances in work environment, as amended |
| Manganese - Condensation aerosol | TWA | 0,1 mg/m3 | Latvia. OELs. Occupational exposure limit values of chemical substances in work environment, as amended |

**Additional exposure limits under the conditions of use: Lithuania**

| Chemical Identity | Type | Exposure Limit Values | Source |
|---|---|---|---|
| Carbon monoxide | IPRV | 20 ppm | Lithuania. OELs. Occupational Exposure Limit Values for Chemical Substances (Hygiene Norm HN 23:2011; Order No. V-824/A1-389, Annex 1, tbl. 1), as amended (Expiration date: 20 Feb 2023) |
| Nitrogen dioxide | IPRV | 1 ppm | Lithuania. OELs. Occupational Exposure Limit Values for Chemical Substances (Hygiene Norm HN 23:2011; Order No. V-824/A1-389, Annex 1, tbl. 1), as amended (Expiration date: 20 Feb 2023) |

**Additional exposure limits under the conditions of use: The Netherlands**

| Chemical Identity | Type | Exposure Limit Values | Source |
|---|---|---|---|
| Carbon monoxide | TGG 15 | 100 ppm | Netherlands. OELs (binding) per Annex XIII of Working Conditions Regulation, as amended |
| | TGG | 20 ppm | Netherlands. OELs (binding) per Annex XIII of Working Conditions Regulation, as amended |
| Nitrogen dioxide | TGG | 0,96 mg/m3 | Netherlands. OELs (binding) per Annex XIII of Working Conditions Regulation, as amended |
| | TGG 15 | 1,91 mg/m3 | Netherlands. OELs (binding) per Annex XIII of Working Conditions Regulation, as amended |
| Manganese - Respirable fraction. - as Mn | TGG 15 | 0,05 mg/m3 | Netherlands. OELs (binding) per Annex XIII of Working Conditions Regulation, as amended |

| | | | |
|---|---|---|---|
| Manganese - Inhalable fraction. - as Mn | TGG | 0,2 mg/m3 | Netherlands. OELs (binding) per Annex XIII of Working Conditions Regulation, as amended |
| Manganese - Inhalable - as Mn | TGG | 0,2 mg/m3 | Netherlands. OELs (binding) per Annex XIII of Working Conditions Regulation, as amended |
| Manganese - Respirable. - as Mn | TGG | 0,05 mg/m3 | Netherlands. OELs (binding) per Annex XIII of Working Conditions Regulation, as amended |

**Additional exposure limits under the conditions of use: Norway**

| Chemical Identity | Type | Exposure Limit Values | Source |
|---|---|---|---|
| Carbon monoxide | NORMEN | 25 ppm | Norway. Occupational Limit Values: Annex 1, Regulation No. 1358 (Forskrift om tiltaks- og grenseverdier), as amended (The EU has an indicative threshold for the substance.) |
| | STEL | 100 ppm | Norway. Occupational Limit Values: Annex 1, Regulation No. 1358 (Forskrift om tiltaks- og grenseverdier), as amended (The EU has an indicative threshold for the substance.) |
| Nitrogen dioxide | NORMEN | 0,6 ppm | Norway. Occupational Limit Values: Annex 1, Regulation No. 1358 (Forskrift om tiltaks- og grenseverdier), as amended (The EU has an indicative threshold for the substance.) |

**Additional exposure limits under the conditions of use: Poland**

| Chemical Identity | Type | Exposure Limit Values | Source |
|---|---|---|---|
| Manganese - as Mn | NDS | 0,3 mg/m3 | Poland. Maximum permissible concentrations and intensities of harmful factors in the work environment (Dz.U.Poz. 1286/2018, Annex 1), as amended |

**Additional exposure limits under the conditions of use: Portugal**

| Chemical Identity | Type | Exposure Limit Values | Source |
|---|---|---|---|
| Carbon monoxide | TWA | 20 ppm | Portugal. OELs. Decree-Law No. 24/2012, as amended |
| | STEL | 100 ppm | Portugal. OELs. Decree-Law No. 24/2012, as amended |
| Nitrogen dioxide | TWA | 0,2 ppm | Portugal. VLEs. Norm on occupational exposure to chemical agents (NP 1796), as amended |
| | TWA | 0,5 ppm | Portugal. OELs. Decree-Law No. 24/2012, as amended |
| | STEL | 1 ppm | Portugal. OELs. Decree-Law No. 24/2012, as amended |
| Ozone | TWA | 0,20 ppm | Portugal. VLEs. Norm on occupational exposure to chemical agents (NP 1796), as amended |
| Manganese - Respirable fraction. - as Mn | TWA | 0,02 mg/m3 | Portugal. VLEs. Norm on occupational exposure to chemical agents (NP 1796), as amended |
| Manganese - Inhalable fraction. - as Mn | TWA | 0,1 mg/m3 | Portugal. VLEs. Norm on occupational exposure to chemical agents (NP 1796), as amended |
| Manganese - Inhalable fraction. - Manganese | TWA | 0,2 mg/m3 | Portugal. OELs. Decree-Law No. 24/2012, as amended |
| Manganese - Respirable fraction. - Manganese | TWA | 0,05 mg/m3 | Portugal. OELs. Decree-Law No. 24/2012, as amended |
| Manganese - Inhalable fraction. - Manganese | TWA | 0,2 mg/m3 | Portugal. OELs. Decree-Law No. 24/2012, as amended |

**Additional exposure limits under the conditions of use: Slovakia**

| Chemical Identity | Type | Exposure Limit Values | Source |
|---|---|---|---|
| Carbon monoxide | TWA | 20 ppm | Slovakia. OELs. Maximum permissible exposure limits for chemical factors in workplace air (Regulation No 355/2006, Annex 1, Tables 1-7), as amended (Maximum exposure limits for gases, vapors and aerosols in workplace air (NPEL);Table 1.) |
| | STEL | 100 ppm | Slovakia. OELs. Maximum permissible exposure limits for chemical factors in workplace air (Regulation No 355/2006, Annex 1, Tables 1-7), as amended (Maximum exposure limits for gases, vapors and aerosols in workplace air (NPEL);Table 1.) |

### Additional exposure limits under the conditions of use: Slovenia

| Chemical Identity | Type | Exposure Limit Values | Source |
|---|---|---|---|
| Carbon monoxide | MV | 20 ppm | Slovenia. Occupational Exposure Limit Values for Carcinogens, Mutagens and Reprotoxic Substances (Reg. on Protection from Exposure to CMR Substances, 29/2024, Annex III, Table 3.1), as amended |
| | KTV | 100 ppm | Slovenia. Occupational Exposure Limit Values for Carcinogens, Mutagens and Reprotoxic Substances (Reg. on Protection from Exposure to CMR Substances, 29/2024, Annex III, Table 3.1), as amended |
| Manganese - Inhalable fraction. - as Mg | KTV | 1,6 mg/m3 | Slovenia. OELs. Occupational Exposure Limits of Chemicals at Work (Reg. on Protection of Workers from Risks due to Exp. to Chemicals at Work, Annex 1, 72/2021), as amended |
| Manganese - Respirable fraction. - as Mg | TWA | 0,05 mg/m3 | Slovenia. OELs. Occupational Exposure Limits of Chemicals at Work (Reg. on Protection of Workers from Risks due to Exp. to Chemicals at Work, Annex 1, 72/2021), as amended (If in compliance with the OEL and BEL values, then there should be no risk of reproductive damage.) |
| | KTV | 0,4 mg/m3 | Slovenia. OELs. Occupational Exposure Limits of Chemicals at Work (Reg. on Protection of Workers from Risks due to Exp. to Chemicals at Work, Annex 1, 72/2021), as amended |
| Manganese - Inhalable fraction. - as Mg | TWA | 0,2 mg/m3 | Slovenia. OELs. Occupational Exposure Limits of Chemicals at Work (Reg. on Protection of Workers from Risks due to Exp. to Chemicals at Work, Annex 1, 72/2021), as amended (If in compliance with the OEL and BEL values, then there should be no risk of reproductive damage.) |

### Additional exposure limits under the conditions of use: Spain

| Chemical Identity | Type | Exposure Limit Values | Source |
|---|---|---|---|
| Nitrogen dioxide | VLA-ED | 1,5 ppm | Spain. Occupational Exposure Limits, as amended |
| | VLA-EC | 3 ppm | Spain. Occupational Exposure Limits, as amended |

### Additional exposure limits under the conditions of use: Switzerland

| Chemical Identity | Type | Exposure Limit Values | Source |
|---|---|---|---|
| Carbon dioxide | TWA | 5.000 ppm | Switzerland. SUVA Grenzwerte am Arbeitsplatz, as amended |
| Carbon monoxide | STEL | 60 ppm | Switzerland. SUVA Grenzwerte am Arbeitsplatz, as amended |
| | TWA | 30 ppm | Switzerland. SUVA Grenzwerte am Arbeitsplatz, as amended |
| Nitrogen dioxide | STEL | 3 ppm | Switzerland. SUVA Grenzwerte am Arbeitsplatz, as amended |
| | TWA | 3 ppm | Switzerland. SUVA Grenzwerte am Arbeitsplatz, as amended |
| Ozone | TWA | 0,1 ppm | Switzerland. SUVA Grenzwerte am Arbeitsplatz, as amended |
| | STEL | 0,1 ppm | Switzerland. SUVA Grenzwerte am Arbeitsplatz, as amended |
| Manganese - Inhalable fraction. | TWA | 0,5 mg/m3 | Switzerland. SUVA Grenzwerte am Arbeitsplatz, as amended (Provisional value.) |

### Additional exposure limits under the conditions of use: Türkiye

| Chemical Identity | Type | Exposure Limit Values | Source |
|---|---|---|---|
| Carbon dioxide | MAK | 5.000 ppm | Turkey. MAK (Ordinance No. 1475 on Precautions Required in Workplaces Working with Flammable, Explosive, Dangerous and Harmful Substances, Annexes 1-3 (1973)) |
| | TWA | 5.000 ppm | Turkiye. OELs. Regulation on Health and Safety Measures while Working with Chemical Substances, Annex I, Occupational Exposure Limit Values, RG No. 28733, as amended |

### Additional exposure limits under the conditions of use: United Kingdom

| Chemical Identity | Type | Exposure Limit Values | Source |
|---|---|---|---|
| Carbon dioxide | TWA | 5.000 ppm | UK. EH40 Workplace Exposure Limits (WELs) |

| | | | |
|---|---|---|---|
| | STEL | 15.000 ppm | UK. EH40 Workplace Exposure Limits (WELs) |
| Carbon monoxide | STEL | 200 ppm | UK. EH40 Workplace Exposure Limits (WELs) |
| | TWA | 30 ppm | UK. EH40 Workplace Exposure Limits (WELs) |
| | STEL | 100 ppm | UK. EH40 Workplace Exposure Limits (WELs) |
| | TWA | 20 ppm | UK. EH40 Workplace Exposure Limits (WELs) |
| | TWA | 30 ppm | UK. EH40 Workplace Exposure Limits (WELs) (The expiration date of this limit: 21 August 2023) |
| | STEL | 200 ppm | UK. EH40 Workplace Exposure Limits (WELs) (The expiration date of this limit: 21 August 2023) |
| Nitrogen dioxide | TWA | 0,5 ppm | UK. EH40 Workplace Exposure Limits (WELs) |
| | STEL | 1 ppm | UK. EH40 Workplace Exposure Limits (WELs) |
| Ozone | STEL | 0,2 ppm | UK. EH40 Workplace Exposure Limits (WELs) |
| Manganese - Respirable fraction. - as Mn | TWA | 0,05 mg/m3 | UK. EH40 Workplace Exposure Limits (WELs) |
| Manganese - Inhalable fraction. - as Mn | TWA | 0,2 mg/m3 | UK. EH40 Workplace Exposure Limits (WELs) |

No data is available if not listed.

Note: the substances contained in the materials being joined, as well as the ones on their surface, may form other air contaminants. Refer to the relevant SDS or to emission samplings by a qualified professional, to determine applicable exposure limits.

**8.2 Exposure controls**

**Appropriate Engineering Controls**

**Ventilation:** Use enough ventilation and local exhaust at the arc, flame or heat source to keep the fumes and gases from the worker's breathing zone and the general area. Train the operator to keep their head out of the fumes. **Keep exposure as low as possible.**

**Individual protection measures, such as personal protective equipment (PPE)**

**General information:**

**Exposure Guidelines:** To reduce the potential for overexposure, use controls such as adequate ventilation and personal protective equipment (PPE). Overexposure refers to exceeding applicable local limits, the American Conference of Governmental Industrial Hygienists (ACGIH) Threshold Limit Values (TLVs) or the Occupational Safety and Health Administration's (OSHA) Permissible Exposure Limits (PELs). Workplace exposure levels should be established by competent industrial hygiene assessments. Unless exposure levels are confirmed to be below the applicable local limit, TLV or PEL, whichever is lower, respirator use is required. Absent these controls, overexposure to one or more compound constituents, including those in the fume or airborne particles, may occur resulting in potential health hazards. According to the ACGIH, TLVs and Biological Exposure Indices (BEIs) "represent conditions under which ACGIH believes that nearly all workers may be repeatedly exposed without adverse health effects." The ACGIH further states that the TLV-TWA should be used as a guide in the control of health hazards and should not be used to indicate a fine line between safe and dangerous exposures. See Section 10 for information on constituents which have some potential to present health hazards. Welding consumables and materials being joined may contain chromium as an unintended trace element. Materials that contain chromium may produce some amount of hexavalent chromium (CrVI) and other chromium compounds as a byproduct in the fume. In 2018, the American Conference of Governmental Industrial Hygienists (ACGIH) lowered the Threshold Limit Value (TLV) for hexavalent chromium from 50 micrograms per cubic meter of air (50 µg/m³) to 0.2 µg/m³. At these new limits, CrVI exposures at or above the TLV may be possible in cases where adequate ventilation is not provided. CrVI compounds are on the IARC and NTP lists as posing a lung cancer and sinus cancer risk. Workplace conditions are unique and welding fume exposures levels vary. Workplace

exposure assessments must be conducted by a qualified professional, such as an industrial hygienist, to determine if exposures are below applicable limits and to make recommendations when necessary for preventing overexposures.

**Eye/face protection:** Wear helmet or use face shield with filter lens shade number 12 or darker for open arc processes – or follow the recommendations as specified in ANSI Z49.1, Section 4; ISO/TR 18786:2014, based on your process and settings. No specific lens shade recommendation for submerged arc or electroslag processes. Shield others by providing appropriate screens and flash goggles.

**Skin protection**

**Hand Protection:** Wear protective gloves. Suitable gloves can be recommended by the glove supplier.

**Other:** **Protective Clothing:** Wear hand, head, and body protection which help to prevent injury from radiation, open flames, hot surfaces, sparks and electrical shock. See Z49.1, ISO/TR 18786:2014, ISO/TR 13392:2014. At a minimum, this includes welder's gloves and a protective face shield when welding, and may include arm protectors, aprons, hats, shoulder protection, as well as dark substantial clothing when welding, brazing and soldering. Wear dry gloves free of holes or split seams. Train the operator not to permit electrically live parts or electrodes from contacting the skin . . . or clothing or gloves if they are wet. Insulate yourself from the work piece and ground using dry plywood, rubber mats or other dry insulation.

**Respiratory Protection:** Keep your head out of fumes. Use enough ventilation and local exhaust to keep fumes and gases from your breathing zone and the general area. An approved respirator should be used unless exposure assessments are below applicable exposure limits.
Workplace exposure levels should be established by competent industrial hygiene assessments. Unless exposure levels are confirmed to be below the applicable local limit, TLV or PEL, whichever is lower, respirator use is required.

**Hygiene measures:** Do not eat, drink or smoke when using the product. Always observe good personal hygiene measures, such as washing after handling the material and before eating, drinking, and/or smoking. Routinely wash work clothing and protective equipment to remove contaminants. Determine the composition and quantity of fumes and gases to which workers are exposed by taking an air sample from inside the welder's helmet if worn or in the worker's breathing zone. Improve ventilation if exposures are not below limits. See ISO 10882-1:2024; ANSI/AWS F1.1, F1.2, F1.3 and F1.5, available from the American Welding Society, www.aws.org.

## SECTION 9: Physical and chemical properties

### 9.1 Information on basic physical and chemical properties

| | |
|---|---|
| **Appearance:** | Steel rod with extruded flux coating. |
| **Physical state:** | Solid |
| **Form:** | Solid |
| **Color:** | No data available. |
| **Odor:** | No data available. |
| **Odor Threshold:** | No data available. |

| | |
|---|---|
| **pH:** | No data available. |
| **Melting Point:** | No data available. |
| **Boiling Point:** | No data available. |
| **Flash Point:** | No data available. |
| **Evaporation Rate:** | No data available. |
| **Flammability (solid, gas):** | No data available. |
| **Flammability Limit - Upper (%):** | No data available. |
| **Flammability Limit - Lower (%):** | No data available. |
| **Vapor pressure:** | No data available. |
| **Relative vapor density:** | No data available. |
| **Density:** | No data available. |
| **Relative density:** | No data available. |
| **Solubility(ies)** | |
| **Solubility in Water:** | No data available. |
| **Solubility (other):** | No data available. |
| **Partition coefficient (n-octanol/water):** | No data available. |
| **Auto-ignition temperature:** | No data available. |
| **Decomposition Temperature:** | No data available. |
| **SADT:** | No data available. |
| **Viscosity:** | No data available. |
| **Explosive properties:** | No data available. |
| **Oxidizing properties:** | No data available. |

**9.2 Other information**

| | |
|---|---|
| **VOC Content:** | Not available. |
| **Bulk density:** | Not available. |
| **Dust Explosion Limit, Upper:** | Not available. |
| **Dust Explosion Limit, Lower:** | Not available. |
| **Dust Explosion Description Number Kst:** | Not available. |
| **Minimum ignition energy:** | Not available. |
| **Minimum ignition temperature:** | Not available. |
| **Metal Corrosion:** | Not available. |

## SECTION 10: Stability and reactivity

| | |
|---|---|
| **10.1 Reactivity:** | The product is non-reactive under normal conditions of use, storage and transport. |
| **10.2 Chemical Stability:** | Material is stable under normal conditions. |
| **10.3 Possibility of hazardous reactions:** | None under normal conditions. |
| **10.4 Conditions to avoid:** | Avoid heat or contamination. |
| **10.5 Incompatible Materials:** | Strong acids. Strong oxidizing substances. Strong bases. |

**10.6 Hazardous Decomposition Products:**

Fumes and gases from welding and its allied processes such as brazing and soldering cannot be classified simply. The composition and quantity of both are dependent upon the metal to which the joining or hot work is applied, the process, procedure - and where applicable - the electrode or consumable used. Other conditions which also influence the composition and quantity of the fumes and gases to which workers may be exposed include: coatings on the metal being welded or worked (such as paint, plating, or galvanizing), the number of operators and the volume of the work area, the quality and amount of ventilation, the position of the operator's head with respect to the fume plume, as well as the presence of contaminants in the atmosphere (such as chlorinated hydrocarbon vapors from cleaning and degreasing activities.)

In cases where an electrode or other applied material is consumed, the fume and gas decomposition products generated are different in percent and form from the ingredients listed in Section 3. Decomposition products of normal operation include those originating from the volatilization, reaction, or oxidation of the materials shown in Section 3, plus those from the base metal and coating, etc., as noted above. Reasonably expected fume constituents produced during arc welding and brazing include the oxides of iron, manganese and other metals present in the welding consumable or base metal. Hexavalent chromium compounds may be in the welding or brazing fume of consumables or base metals which contain chromium. Gaseous and particulate fluoride may be in the fume of consumables or flux materials which contain fluoride. Gaseous reaction products may include carbon monoxide and carbon dioxide. Ozone and nitrogen oxides may be formed by the radiation from the arc associated with welding.

## SECTION 11: Toxicological information

**General information:**

The International Agency for Research on Cancer (IARC) has determined welding fumes and ultraviolet radiation from welding are carcinogenic to humans (Group 1). According to IARC, welding fumes cause cancer of the lung and positive associations have been observed with cancer of the kidney. Also according to IARC, ultraviolet radiation from welding causes ocular melanoma. IARC identifies gouging, brazing, carbon arc or plasma arc cutting, and soldering as processes closely related to welding. Read and understand the manufacturer’s instructions, Safety Data Sheets and the precautionary labels before using this product.

**Information on likely routes of exposure**

**Inhalation:**

Potential chronic health hazards related to the use of welding consumables are most applicable to the inhalation route of exposure. Refer to Inhalation statements in Section 11.

**Skin Contact:**

Arc rays can burn skin. Skin cancer has been reported.

**Eye contact:**

Arc rays can injure eyes.

**Ingestion:**

Health injuries from ingestion are not known or expected under normal use.

**Symptoms related to the physical, chemical and toxicological characteristics**

| | |
|---|---|
| **Inhalation:** | Respiratory exposure to the crystalline silica present in this welding electrode is not anticipated during normal use. Respiratory overexposure to airborne crystalline silica is known to cause silicosis, a form of disabling pulmonary fibrosis which can be progressive and may lead to death. Crystalline silica is on the IARC (International Agency for Research on Cancer) and NTP (National Toxicology Program) lists as posing a cancer risk to humans. Note: All regional authorities do not use the same criteria for assigning carcinogenic classifications to chemicals. For example, the European Union (EU) CLP does not require classifying crystalline silica as a carcinogenic compound. Short-term (acute) overexposure to fumes and gases from welding and allied processes may result in discomfort such as metal fume fever, dizziness, nausea, or dryness or irritation of nose, throat, or eyes. May aggravate pre-existing respiratory problems (e.g. asthma, emphysema). Long-term (chronic) overexposure to fumes and gases from welding and allied processes can lead to siderosis (iron deposits in lung), central nervous system effects, bronchitis and other pulmonary effects. |

**11.1 Information on hazard classes as defined in Regulation (EC) No 1272/2008**

**Acute toxicity (list all possible routes of exposure)**

**Oral**

| | |
|---|---|
| **Product:** | Not classified |
| **Specified substance(s):** | |
| Iron | LD 50 (Rat): 98,6 g/kg |
| Zircon | LD 50 (Rat): 3.200 mg/kg |
| Limestone | LD 50 (Rat): 6.450 mg/kg |
| Sodium carbonate | LD 50 (Rat): 2.800 mg/kg |
| Carboxymethyl cellulose, sodium salt | LD 50 (Rat): 2.700 mg/kg |

**Dermal**

| | |
|---|---|
| **Product:** | Not classified |

**Inhalation**

| | |
|---|---|
| **Product:** | Not classified |
| **Specified substance(s):** | |
| Sodium carbonate | LC 50 (Rat, 2 h): 2,3 mg/l |
| Carboxymethyl cellulose, sodium salt | LC 50 (Rat, 4 h): 5.800 mg/m3 |

**Repeated dose toxicity**

| | |
|---|---|
| **Product:** | Not classified |

**Skin Corrosion/Irritation**

| | |
|---|---|
| **Product:** | Not classified |

**Serious Eye Damage/Eye Irritation**

| | |
|---|---|
| **Product:** | Not classified |

**Respiratory or Skin Sensitization**

| | |
|---|---|
| **Product:** | Not classified |
| **Specified substance(s):** | |
| Iron | Skin sensitization:, in vivo (Guinea pig): Not sensitising |
| Titanium dioxide (naturally occurring) | Skin sensitization:, in vivo (Guinea pig): Not sensitising<br>Skin sensitization:, in vivo (Guinea pig): Not Classified |
| Potassium silicate | Skin sensitization:, in vivo (Guinea pig): Not sensitising |
| Silicon dioxide (amorphous) | Skin sensitization:, in vivo (Guinea pig): Not Classified |

| | |
|---|---|
| Aluminum oxide | Skin sensitization:, in vivo (Guinea pig): Not Classified<br>Skin sensitization:, skin sensitisation, other: Not Classified<br>Skin sensitization:, Skin Sensitisation (Guinea pig): Not sensitising |
| Iron oxide | Skin sensitization:, in vivo (Guinea pig): Not sensitising<br>Skin sensitization:, in vivo: Not sensitising |
| Zirconium oxide | Skin sensitization:, in vivo (Guinea pig): Not sensitising |
| Titanium dioxide (synthetic) | Skin sensitization:, in vivo (Guinea pig): Not sensitising<br>Skin sensitization:, in vivo (Guinea pig): Not Classified |

**Carcinogenicity**

**Product:** Arc rays: Skin cancer has been reported.

**IARC Monographs on the Evaluation of Carcinogenic Risks to Humans:**

**Specified substance(s):**

| | |
|---|---|
| Titanium dioxide (naturally occurring) | Overall evaluation: 2B. Possibly carcinogenic to humans. |
| Quartz | Overall evaluation: 1. Carcinogenic to humans. |
| Silicon dioxide (amorphous) | Overall evaluation: 3. Not classifiable as to carcinogenicity to humans. |
| Iron oxide | Overall evaluation: 3. Not classifiable as to carcinogenicity to humans. |
| Titanium dioxide (synthetic) | Overall evaluation: 2B. Possibly carcinogenic to humans. |

**Germ Cell Mutagenicity**

**In vitro**

**Product:** Not classified

**In vivo**

**Product:** Not classified

**Reproductive toxicity**

**Product:** Not classified

**Specific Target Organ Toxicity - Single Exposure**

**Product:** Not classified

**Specific Target Organ Toxicity - Repeated Exposure**

**Product:** Not classified

**Aspiration Hazard**

**Product:** Not classified

## 11.2 Information on other hazards

**Endocrine disrupting properties**

**Product:** The substance/mixture does not contain components considered to have endocrine disrupting properties according to REACH Article 57(f) or Commission Delegated regulation (EU) 2017/2100 or Commission Regulation (EU) 2018/605 at levels of 0.1% or higher.;

**Other information**

**Product:** Organic polymers may be used in the manufacture of various welding consumables. Overexposure to their decomposition byproducts may result in a condition known as polymer fume fever. Polymer fume fever usually occurs within 4 to 8 hours of exposure with the presentation of flu like symptoms, including mild pulmonary irritation with or without an increase in body temperature. Signs of exposure can include an increase in white blood cell count. Resolution of symptoms typically occurs quickly, usually not lasting longer than 48 hours.;

**Symptoms related to the physical, chemical and toxicological characteristics under the condition of use**

**Inhalation:**
**Specified substance(s):**

| | |
|---|---|
| Manganese | Overexposure to manganese fumes may affect the brain and central nervous system, resulting in poor coordination, difficulty speaking, and arm or leg tremor. This condition can be irreversible. |

**Additional toxicological Information under the conditions of use:**
**Acute toxicity**

**Inhalation**
**Specified substance(s):**

| | |
|---|---|
| Carbon dioxide | LC Lo (Human, 5 min): 90000 ppm |
| Carbon monoxide | LC 50 (Rat, 4 h): 1300 ppm |
| Nitrogen dioxide | LC 50 (Rat, 4 h): 88 ppm |
| Ozone | LC Lo (Human, 30 min): 50 ppm |

**Other effects:**
**Specified substance(s):**

| | |
|---|---|
| Carbon dioxide | Asphyxia |
| Carbon monoxide | Carboxyhemoglobinemia |
| Nitrogen dioxide | Lower respiratory tract irritation |

## SECTION 12: Ecological information

**12.1 Toxicity**
**Acute hazards to the aquatic environment:**
**Fish**
**Product:** Not classified.
**Specified substance(s):**

| | |
|---|---|
| Sodium carbonate | LC 50 (Fathead minnow (Pimephales promelas), 96 h): < 1.220 mg/l |

**Aquatic Invertebrates**
**Product:** Not classified.
**Specified substance(s):**

| | |
|---|---|
| Manganese | EC 50 (Water flea (Daphnia magna), 48 h): 40 mg/l |
| Sodium carbonate | EC 50 (Water flea (Ceriodaphnia dubia), 48 h): 156,6 - 298,9 mg/l |
| Carboxymethyl cellulose, sodium salt | EC 50 (Water flea (Ceriodaphnia dubia), 48 h): 46,04 - 165,37 mg/l |

**Chronic hazards to the aquatic environment:**
**Fish**
**Product:** Not classified.

**Aquatic Invertebrates**
**Product:** Not classified.
**Specified substance(s):**

| | |
|---|---|
| Iron | NOEC (Daphnia magna): 2 mg/l NOEC (Arrenurus manubriator): 800 mg/l NOEC (Chironomus attenuatus): 200 mg/l NOEC (Daphnia pulex): 0,63 mg/l NOEC (Haliotis rubra): 1,28 mg/l |
| Titanium dioxide (naturally occurring) | NOEC (Daphnia magna): 30 mg/l NOEC (Lumbriculus variegatus): >= 100 mg/l NOEC (Daphnia magna): < 0,1 mg/l NOEC : > 1 mg/l NOEC (Daphnia |

| | |
|---|---|
| | magna): >= 3,12 mg/l |
| Manganese | NOEC (Ceriodaphnia dubia): 1,7 mg/l NOEC (Daphnia magna): < 1,1 mg/l |
| Silicon dioxide (amorphous) | NOEC (Daphnia magna): 100 mg/l NOEC (Mysid shrimp): 346,737 mg/l NOEC (Daphnid): 34,223 mg/l NOEC (Daphnia magna): 250 mg/l NOEC (Daphnia magna): 149,2 mg/l |
| Aluminum oxide | NOEC (Brachionus calyciflorus): 405 µg/l NOEC (Lymnaea stagnalis): 1.059,9 µg/l NOEC (Chironomus riparius): 4.281,8 µg/l NOEC (Brachionus calyciflorus): 963 µg/l NOEC (Ceriodaphnia dubia): 3.161,3 µg/l |
| Iron oxide | NOEC (Daphnia magna): 2 mg/l NOEC (Daphnia pulex): 2,5 mg/l NOEC (Chironomus attenuatus): 200 mg/l NOEC (Daphnia magna): >= 20 mg/l NOEC : >= 20 mg/l |
| Titanium dioxide (synthetic) | NOEC (Daphnia magna): 30 mg/l NOEC (Lumbriculus variegatus): >= 100 mg/l NOEC (Daphnia magna): < 0,1 mg/l NOEC : > 1 mg/l NOEC (Daphnia magna): >= 3,12 mg/l |

**Toxicity to Aquatic Plants**

**Product:** Not classified.

**12.2 Persistence and Degradability**

**Biodegradation**

**Product:** No data available.

**12.3 Bioaccumulative potential**

**Bioconcentration Factor (BCF)**

**Product:** No data available.

**12.4 Mobility in soil:** No data available.

**12.5 Results of PBT and vPvB assessment:**

**Product:** This substance/mixture contains no components considered to be either persistent, bioaccumulative and toxic (PBT), or very persistent and very bioaccumulative (vPvB) at levels of 0.1% or higher.

**12.6 Endocrine disrupting properties:**

**Product:** The substance/mixture does not contain components considered to have endocrine disrupting properties according to REACH Article 57(f) or Commission Delegated regulation (EU) 2017/2100 or Commission Regulation (EU) 2018/605 at levels of 0.1% or higher.

**12.7 Other adverse effects:**

**Other hazards**

**Product:** No data available.

## SECTION 13: Disposal considerations

**13.1 Waste treatment methods**

**General information:** The generation of waste should be avoided or minimized whenever possible. When practical, recycle in an environmentally acceptable, regulatory compliant manner. Dispose of non-recyclable products in accordance with all applicable Federal, State, Provincial, and Local requirements.

**Disposal instructions:** Disposal of this product may be regulated as a Hazardous Waste. The welding consumable and/or by-product from the welding process (including, but not limited to slag, dust, etc.) may contain levels of leachable heavy metals such as Barium or Chromium. Prior to disposal, a representative sample must be analyzed in accordance with local laws to determine if any constituents exist above regulated threshold levels. Discard any product, residue, disposable container, or liner in an environmentally acceptable manner according to Federal, State and Local Regulations. Waste codes must be assigned by the user in accordance with the European Waste Catalogue.

**Contaminated Packaging:** Dispose of contents/container to an appropriate treatment and disposal facility in accordance with applicable laws and regulations, and product characteristics at time of disposal.

## SECTION 14: Transport information

**ADR**

| | |
|---|---|
| 14.1 UN number or ID number: | |
| 14.2 UN Proper Shipping Name: | NOT DG REGULATED |
| 14.3 Transport Hazard Class(es) | |
| Class: | NR |
| Label(s): | – |
| Hazard No. (ADR): | – |
| Tunnel restriction code: | |
| 14.4 Packing Group: | – |
| Limited quantity | |
| Excepted quantity | |
| 14.5 Environmental hazards | No |
| 14.6 Special precautions for user: | None. |

**ADN**

| | |
|---|---|
| 14.1 UN number or ID number: | |
| 14.2 UN Proper Shipping Name: | NOT DG REGULATED |
| 14.3 Transport Hazard Class(es) | |
| Class: | NR |
| Label(s): | – |
| Hazard No. (ADR): | – |
| 14.4 Packing Group: | – |
| Limited quantity | |
| Excepted quantity | |
| 14.5 Environmental hazards | No |
| 14.6 Special precautions for user: | None. |

**RID**

| | |
|---|---|
| 14.1 UN number or ID number: | |
| 14.2 UN Proper Shipping Name | NOT DG REGULATED |
| 14.3 Transport Hazard Class(es) | |
| Class: | NR |
| Label(s): | – |
| 14.4 Packing Group: | – |
| 14.5 Environmental hazards | No |
| 14.6 Special precautions for user: | None. |

**IMDG**

| | |
|---|---|
| 14.1 UN number or ID number: | |
| 14.2 UN Proper Shipping Name: | NOT DG REGULATED |
| 14.3 Transport Hazard Class(es) | |
| Class: | NR |
| Label(s): | – |
| EmS No.: | |
| 14.4 Packing Group: | – |
| Limited quantity | |
| Excepted quantity | |
| 14.5 Environmental hazards | No |
| 14.6 Special precautions for user: | None. |

**IATA**

| | |
|---|---|
| 14.1 UN number or ID number: | |
| 14.2 Proper Shipping Name: | NOT DG REGULATED |
| 14.3 Transport Hazard Class(es): | |
| Class: | NR |
| Label(s): | – |
| 14.4 Packing Group: | – |
| Cargo aircraft only : | |
| Passenger and cargo aircraft : | |
| Limited quantity: | |
| Excepted quantity | |
| 14.5 Environmental hazards | No |
| 14.6 Special precautions for user: | None. |
| Cargo aircraft only: | Allowed. |

**14.7 Maritime transport in bulk according to IMO instruments**: Not applicable

## SECTION 15: Regulatory information

**15.1 Safety, health and environmental regulations/legislation specific for the substance or mixture:**

**EU Regulations**

**Regulation 1005/2009/EC on substances that deplete the ozone layer, Annex I, Controlled Substances:** None present or none present in regulated quantities.

**EU. REACH Annex XIV, Substances Subject to Authorization:** None present or none present in regulated quantities.

**EU. Regulation 2019/1021/EU on persistent organic pollutants (POPs) (recast), as amended:** None present or none present in regulated quantities.

**EU. Directive 2010/75/EU on Industrial Emissions (IPPC), Annex II, L 334/17:** None present or none present in regulated quantities.

**Regulation (EU) No. 649/2012 concerning the export and import of dangerous chemicals, Annex I, Part 1 as amended:** None present or none present in regulated quantities.

**Regulation (EU) No. 649/2012 concerning the export and import of dangerous chemicals, Annex I, Part 2 as amended:** None present or none present in regulated quantities.

**Regulation (EU) No. 649/2012 concerning the export and import of dangerous chemicals, Annex I, Part 3 as amended:** None present or none present in regulated quantities.

**Regulation (EU) No. 649/2012 concerning the export and import of dangerous chemicals, Annex V as**

**amended:** None present or none present in regulated quantities.

**EU. REACH Candidate List of Substances of Very High Concern for Authorization (SVHC):** None present or none present in regulated quantities.

**Regulation (EC) No. 1907/2006 Annex XVII Substances subject to restriction on marketing and use:**

| Chemical name | CAS-No. | Number on list |
|---|---|---|
| Titanium dioxide (naturally occurring) | 13463-67-7 | 3 |
| Zircon | 14940-68-2 | 75 |
| Sodium carbonate | 497-19-8 | 75, 75, 3 |
| Titanium dioxide (synthetic) | 13463-67-7 | 75, 3 |

**Directive 2004/37/EC on the protection of workers from the risks related to exposure to carcinogens and mutagens at work.:**

| Chemical name | CAS-No. | Concentration |
|---|---|---|
| Quartz | 14808-60-7 | 1,0 - 10% |

**Directive 92/85/EEC: on the safety and health of pregnant workers and workers who have recently given birth or are breast feeding.:**

| Chemical name | CAS-No. | Concentration |
|---|---|---|
| Titanium dioxide (naturally occurring) | 13463-67-7 | 10 - 20% |
| Titanium dioxide (synthetic) | 13463-67-7 | 0,1 - 1,0% |
| Vanadium pentoxide | 1314-62-1 | 0 - <0,1% |
| Nickel | 7440-02-0 | 0 - <0,1% |

**EU. Directive 2012/18/EU (SEVESO III) on major accident hazards involving dangerous substances, Annex I:** None present or none present in regulated quantities.

**EU. Regulation No. 166/2006 PRTR (Pollutant Release and Transfer Registry), Annex II: Pollutants:**

| Chemical name | CAS-No. | Concentration |
|---|---|---|
| Limestone | 1317-65-3 | 0,1 - 1,0% |
| Magnesite | 546-93-0 | 0,1 - 1,0% |
| Silicon dioxide (amorphous) | 7631-86-9 | 0,1 - 1,0% |
| Iron oxide | 1309-37-1 | 0,1 - 1,0% |
| Zirconium oxide | 1314-23-4 | 0,1 - 1,0% |
| Silicon | 7440-21-3 | 0,1 - 1,0% |
| Nickel | 7440-02-0 | 0 - <0,1% |
| Copper and/or copper alloys and compounds (as Cu) | 7440-50-8 | 0 - <0,1% |
| Chromium oxide | 1308-38-9 | 0 - <0,1% |
| Chromium and chromium alloys or compounds (as Cr) | 7440-47-3 | 0 - <0,1% |

**Directive 98/24/EC on the protection of workers from the risks related to chemical agents at work:**

| Chemical name | CAS-No. | Concentration |
|---|---|---|
| Titanium dioxide (naturally occurring) | 13463-67-7 | 10 - 20% |
| Sodium carbonate | 497-19-8 | 0,1 - 1,0% |
| Titanium dioxide (synthetic) | 13463-67-7 | 0,1 - 1,0% |
| Vanadium pentoxide | 1314-62-1 | 0 - <0,1% |
| Nickel | 7440-02-0 | 0 - <0,1% |

| | | |
|---|---|---|
| Copper and/or copper alloys and compounds (as Cu) | 7440-50-8 | 0 - <0,1% |

**EU. Restricted Explosives Precursors: Annex I, Regulation 2019/1148/EU on Explosives Precursors (EUEXPL1D):** None present or none present in regulated quantities.

**EU. Reportable (Annex II) Explosives Precursors, Regulation 2019/1148/EU on Explosives Precursors (EUEXPL2D):** None present or none present in regulated quantities.

**EU. Reportable (Annex II) Explosives Precursors, Regulation 2019/1148/EU on Explosives Precursors (EUEXPL2L):** None present or none present in regulated quantities.

**National Regulations**

**Water Hazard Class (WGK):** WGK 3: severely water-endangering.

**TA Luft, Technical Guidance Air:**

| | |
|---|---|
| Quartz | Number 5.2.7.1.1, Carcinogenic substance |
| Manganese | Number 5.2.2 Class III, Inorganic dust-forming substance |
| Vanadium pentoxide | Number 5.2.2 Class III, Inorganic dust-forming substance |
| Nickel | Number 5.2.2 Class II, Inorganic dust-forming substance |
| Copper and/or copper alloys and compounds (as Cu) | Number 5.2.2 Class III, Inorganic dust-forming substance |
| Chromium oxide | Number 5.2.2 Class III, Inorganic dust-forming substanceNumber 5.2.2 Class III, Inorganic dust-forming substance |
| Chromium and chromium alloys or compounds (as Cr) | Number 5.2.2 Class III, Inorganic dust-forming substance |

**INRS, maladies professionelles, table of work-related illnesses**

**Listed:** 44 bis
44
A
94
66

**International regulations**

| | |
|---|---|
| **Montreal protocol** | Not applicable |
| **Stockholm convention** | Not applicable |
| **Rotterdam convention** | Not applicable |
| **Kyoto protocol** | Not applicable |

**15.2 Chemical safety assessment:** No Chemical Safety Assessment has been carried out.

**Inventory Status:**

| | |
|---|---|
| **Canada DSL Inventory List:** | One or more components are not listed or are exempt from listing. |
| **Canada NDSL Inventory:** | One or more components are not listed or are exempt from listing. |

| | |
|---|---|
| **Ontario Inventory:** | One or more components are not listed or are exempt from listing. |
| **China Inv. Existing Chemical Substances:** | On or in compliance with the inventory |
| **Japan (ENCS) List:** | One or more components are not listed or are exempt from listing. |
| **Japan ISHL Listing:** | One or more components are not listed or are exempt from listing. |
| **Japan Pharmacopoeia Listing:** | One or more components are not listed or are exempt from listing. |
| **Korea Existing Chemicals Inv. (KECI):** | On or in compliance with the inventory |
| **Mexico INSQ:** | One or more components are not listed or are exempt from listing. |
| **New Zealand Inventory of Chemicals:** | On or in compliance with the inventory |
| **Philippines PICCS:** | On or in compliance with the inventory |
| **Taiwan Chemical Substance Inventory:** | On or in compliance with the inventory |
| **US TSCA Inventory:** | One or more components are not listed or are exempt from listing. |
| **EINECS, ELINCS or NLP:** | One or more components are not listed or are exempt from listing. |
| **Australia Industrial Chem. Act (AIIC):** | On or in compliance with the inventory |
| **Switzerland New Subs Notified/Registered:** | One or more components are not listed or are exempt from listing. |
| **Thailand Existing Chemical Inv. List:** | One or more components are not listed or are exempt from listing. |
| **Vietnam National Chemical Inventory:** | On or in compliance with the inventory |

## SECTION 16: Other information

**Definitions:**

**References**

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| PBT | PBT: persistent, bioaccumulative and toxic substance. |
| vPvB | vPvB: very persistent and very bioaccumulative substance. |

**Abbreviations and acronyms:**

ADN - European Agreement concerning the International Carriage of Dangerous Goods by Inland Waterways; ADR - Agreement concerning the International Carriage of Dangerous Goods by Road; AIIC - Australian Inventory of Industrial Chemicals; ASTM - American Society for the Testing of Materials; bw - Body weight; CLP - Classification Labelling Packaging Regulation; Regulation (EC) No 1272/2008; CMR - Carcinogen, Mutagen or Reproductive Toxicant; DIN - Standard of the German Institute for Standardisation; DSL - Domestic Substances List (Canada); ECHA - European Chemicals Agency; EC-Number - European Community number; ECx - Concentration associated with x% response; EIGA - European Industrial Gases Association; ELx - Loading rate associated with x% response; EmS - Emergency Schedule; ENCS - Existing and New Chemical Substances (Japan); ErCx - Concentration associated with x% growth rate response; GHS - Globally Harmonized System; GLP - Good Laboratory Practice; IARC - International Agency for Research on Cancer; IATA - International Air Transport Association; IBC - International Code for the Construction and Equipment of Ships carrying Dangerous Chemicals in Bulk; IC50 - Half maximal inhibitory concentration; ICAO - International Civil Aviation Organization; IECSC - Inventory of Existing Chemical Substances in China; IMDG - International Maritime Dangerous Goods; IMO - International Maritime Organization; ISHL - Industrial

Safety and Health Law (Japan); ISO - International Organisation for Standardization; KECI - Korea Existing Chemicals Inventory; LC50 - Lethal Concentration to 50 % of a test population; LD50 - Lethal Dose to 50% of a test population (Median Lethal Dose); MARPOL - International Convention for the Prevention of Pollution from Ships; n.o.s. - Not Otherwise Specified; NO(A)EC - No Observed (Adverse) Effect Concentration; NO(A)EL - No Observed (Adverse) Effect Level; NOELR - No Observable Effect Loading Rate; NZIoC - New Zealand Inventory of Chemicals; OECD - Organization for Economic Co-operation and Development; OPPTS - Office of Chemical Safety and Pollution Prevention; PBT - Persistent, Bioaccumulative and Toxic substance; PICCS - Philippines Inventory of Chemicals and Chemical Substances; (Q)SAR - (Quantitative) Structure Activity Relationship; REACH - Regulation (EC) No 1907/2006 of the European Parliament and of the Council concerning the Registration, Evaluation, Authorisation and Restriction of Chemicals; RID - Regulations concerning the International Carriage of Dangerous Goods by Rail; SADT - Self-Accelerating Decomposition Temperature; SDS - Safety Data Sheet; SVHC - substance of very high concern; TCSI - Taiwan Chemical Substance Inventory; TECI - Thailand Existing Chemicals Inventory; TRGS - Technical Rule for Hazardous Substances; TSCA - Toxic Substances Control Act (United States); UN - United Nations; vPvB - Very Persistent and Very Bioaccumulative

**Notes:**

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| Note 10 | The classification as a carcinogen by inhalation applies only to mixtures in powder form containing 1 % or more of titanium dioxide which is in the form of or incorporated in particles with aerodynamic diameter ≤ 10 µm. |
| Note V | If the substance is to be placed on the market as fibres (with diameter < 3 µm, length > 5 µm and aspect ratio ≥ 3:1) or particles of the substance fulfilling the WHO fibre criteria or as particles with modified surface chemistry, their hazardous properti |

**Key literature references and sources for data:** According to Regulation (EC) No. 1907/2006 (REACH) Article 31, Annex II as amended.

**Wording of the statements in section 2 and 3**

| | |
|---|---|
| H315 | Causes skin irritation. |
| H319 | Causes serious eye irritation. |
| H351 | Suspected of causing cancer. |
| H372 | Causes damage to organs through prolonged or repeated exposure. |
| EUH210 | Safety data sheet available on request. |

**Training information:** Read and understand all product instructions, labels, and warnings. Follow all applicable local laws and regulations, as well as all internal process procedures and instructions.

**Other information:** Additional information is available by request.

**Issue Date:** 09.05.2025

**Disclaimer:**

The Lincoln Electric Company urges each end user and recipient of this SDS to study it carefully. See also www.lincolnelectric.com/safety. If necessary, consult an industrial hygienist or other expert to understand this information and safeguard the environment and protect workers from potential hazards associated with the handling or use of this product. This information is believed to be accurate as of the revision date shown above. However, no warranty, expressed or implied, is given. Because the conditions or methods of use are beyond Lincoln Electric's control, we assume no liability resulting from the use of this product. Regulatory requirements are subject to change and may differ between various locations. Compliance with all applicable Federal, State, Provincial, and local laws and regulations remain the responsibility of the user.

# Annex to the extended Safety Data Sheet (eSDS)
# Exposure Scenario:

Read and understand the **"Recommendations for Exposure Scenarios, Risk Management Measures and to identify Operational Conditions under which metals, alloys and metallic articles may be safely welded"**, which is available from your supplier and at http://european-welding.org/health-safety.

Welding/Brazing produces fumes which can affect human health and the environment. Fumes are a varying mixture of airborne gases and fine particles which, if inhaled or swallowed, constitute a health hazard. The degree of risk will depend on the composition of the fume, concentration of the fume and duration of exposure. The fume composition is dependent upon the material being worked, the process and consumables being used, coatings on the work such as paint, galvanizing or plating, oil or contaminants from cleaning and degreasing activities. A systematic approach to the assessment of exposure is necessary, taking into account the particular circumstances for the operator and ancillary worker that can be exposed.

Considering the emission of fumes when welding, brazing or cutting of metals, it is recommended to (1) arrange risk management measures through applying general information and guidelines provided by this exposure scenario and (2) using the information provided by the Safety Data Sheet, issued in accordance with REACH, by the welding consumable manufacturer.

The employer shall ensure that the risk from welding fumes to the safety and health of workers is eliminated or reduced to a minimum. The following principle shall be applied:
1- Select the applicable process/material combinations with the lowest class, whenever possible.
2- Set welding process with the lowest emission parameter.
3- Apply the relevant collective protective measure in accordance with class number. In general, the use of PPE is taken into account after all other measures is applied.
4- Wear the relevant personal protective equipment in accordance with the duty cycle.

In addition, compliance with the National Regulations regarding the exposure to welding fumes of welders and related personnel shall be verified.