

# SAFETY DATA SHEET

## 1. PRODUCT AND COMPANY IDENTIFICATION

**Product Name:** Lincolnweld® 780®

**Other means of identification**

**SDS number:** 200000000886

**Recommended use and restriction on use**

**Recommended use:** SAW (Submerged Arc Welding)

**Restrictions on use:** Not known. Read this SDS before using this product.

**Manufacturer/Importer/Supplier/Distributor Information**

**Company Name:** The Lincoln Electric Company  
**Address:** 22801 Saint Clair Avenue  
Cleveland, Ohio 44117  
USA

**Telephone:** +1 (216) 481-8100

**Contact Person:** Safety Data Sheet Questions: [www.lincolnelectric.com/sds](http://www.lincolnelectric.com/sds)  
Arc Welding Safety Information: [www.lincolnelectric.com/safety](http://www.lincolnelectric.com/safety)

**Company Name:** The Lincoln Electric Company of Canada LP  
**Address:** 179 Wicksteed Avenue  
Toronto, Ontario M4G 2B9  
Canada

**Telephone:** +1 (416) 421-2600

**Contact Person:** Safety Data Sheet Questions: [www.lincolnelectric.com/sds](http://www.lincolnelectric.com/sds)  
Arc Welding Safety Information: [www.lincolnelectric.com/safety](http://www.lincolnelectric.com/safety)

**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

## 2. HAZARDS IDENTIFICATION

Classified according to the criteria of the Globally Harmonized System of Classification and Labeling of Chemicals (GHS), The United States Occupational Safety and Health Administration's Hazard Communication Standard (29 CFR 1910.1200), Canada's Hazardous Product Regulations and Mexico's Harmonized System for the Identification and Communication of Hazards and Risks from Hazardous Chemicals in the Workplace.

The product contains less than 0.1% of respirable crystalline silica.

**Hazard Classification**

**Health Hazards**

Carcinogenicity

Category 2

**Label Elements**

**Hazard Symbol:**



**Signal Word:** Warning

**Hazard Statement:** Suspected of causing cancer.

**Precautionary Statements:**

**Prevention:** Obtain special instructions before use. Do not handle until all safety precautions have been read and understood. Use personal protective equipment as required.

**Response:** IF exposed or concerned: Get medical advice/attention.

**Storage:** Store locked up.

**Disposal:** Dispose of contents/ container to an approved facility in accordance with local, regional, national and international regulations.

**Other hazards which do not result in GHS classification:** 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 Identity | CAS-No.    |
|-------------------|------------|
| Carbon dioxide    | 124-38-9   |
| Carbon monoxide   | 630-08-0   |
| Nitrogen dioxide  | 10102-44-0 |
| Ozone             | 10028-15-6 |

**3. COMPOSITION / INFORMATION ON INGREDIENTS**

**Reportable Hazardous Ingredients Mixtures**

| Chemical Identity | CAS number | Content in percent (%)* |
|-------------------|------------|-------------------------|
|-------------------|------------|-------------------------|

|  |            |           |
|--|------------|-----------|
| Manganese oxide (MnO <sub>2</sub> )    | 1313-13-9  | 10 - <20% |
| Titanium dioxide (naturally occurring) | 13463-67-7 | 5 - <10%  |
| Sodium silicate                        | 1344-09-8  | 5 - <10%  |
| Potassium oxide                        | 12136-45-7 | 0.1 - <1% |
| Calcium oxide                          | 1305-78-8  | 0.1 - <1% |
| Quartz                                 | 14808-60-7 | 0.1 - <1% |

\* All concentrations are percent by weight unless ingredient is a gas. Gas concentrations are in percent by volume.

**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.

**4. FIRST AID MEASURES**

**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.

**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.

**Most important symptoms/effects, acute and delayed**

**Symptoms:** 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.

**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.

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

**Treatment:** Treat symptomatically.

**5. FIRE-FIGHTING MEASURES**

**General Fire Hazards:** As shipped, this product is nonflammable. However, welding arc and sparks as well as open flames and hot surfaces associated with brazing and soldering can ignite combustible and flammable materials. Read and understand American National Standard Z49.1, "Safety in Welding, Cutting and Allied Processes" and National Fire Protection Association NFPA 51B, "Standard for Fire Prevention during Welding, Cutting and Other Hot Work" before using this product.

**Suitable (and unsuitable) 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.

**Specific hazards arising from the chemical:** Welding arc and sparks can ignite combustibles and flammable products.

**Special protective equipment and precautions for fire-fighters**

**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.

**6. ACCIDENTAL RELEASE MEASURES**

**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.

**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.

**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.

**7. HANDLING AND STORAGE**

**Precautions for safe handling:** Prevent formation of dust. Provide appropriate exhaust ventilation at places where dust is formed.

Read and understand the manufacturer's instruction and the precautionary label on the product. Refer to Lincoln Safety Publications at [www.lincolnelectric.com/safety](http://www.lincolnelectric.com/safety). See 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](http://www.gpo.gov). Do not handle until all safety precautions have been read and understood. Obtain special instructions before use. Use personal protective equipment as required.

Conditions for safe storage, including any incompatibilities: Store locked up.

**8. EXPOSURE CONTROLS / PERSONAL PROTECTION**

**Control Parameters**

**Occupational Exposure Limits: US**

| Chemical Identity   | Type    | Exposure Limit Values                           | Source  |
|---|---------|---|---|
| Manganese oxide (MnO <sub>2</sub> ) - Inhalable fraction. - as Mn       | TWA     | 0.1 mg/m <sup>3</sup>                           | US. ACGIH Threshold Limit Values (02 2013)                                  |
| Manganese oxide (MnO <sub>2</sub> ) - Respirable fraction. - as Mn      | TWA     | 0.02 mg/m <sup>3</sup>                          | US. ACGIH Threshold Limit Values (02 2013)                                  |
| Manganese oxide (MnO <sub>2</sub> ) - Fume. - as Mn                     | STEL    | 3 mg/m <sup>3</sup>                             | US. NIOSH: Pocket Guide to Chemical Hazards, as amended (2005)              |
|   | REL     | 1 mg/m <sup>3</sup>                             | US. NIOSH: Pocket Guide to Chemical Hazards, as amended (2005)              |
| Manganese oxide (MnO <sub>2</sub> )                                     | IDLH    | 500 mg/m <sup>3</sup>                           | US. NIOSH. Immediately Dangerous to Life or Health (IDLH) Values (10 2017)  |
| Manganese oxide (MnO <sub>2</sub> ) - as Mn                             | Ceiling | 5 mg/m <sup>3</sup>                             | US. OSHA Table Z-1 Limits for Air Contaminants (29 CFR 1910.1000) (02 2006) |
| Titanium dioxide (naturally occurring)                                  | IDLH    | 5,000 mg/m <sup>3</sup>                         | US. NIOSH. Immediately Dangerous to Life or Health (IDLH) Values (10 2017)  |
| Titanium dioxide (naturally occurring) - Total dust.                    | PEL     | 15 mg/m <sup>3</sup>                            | US. OSHA Table Z-1 Limits for Air Contaminants (29 CFR 1910.1000) (02 2006) |
| Titanium dioxide (naturally occurring) - Respirable fraction.           | TWA     | 5 mg/m <sup>3</sup>                             | US. OSHA Table Z-3 (29 CFR 1910.1000) (03 2016)                             |
| Titanium dioxide (naturally occurring) - Total dust.                    | TWA     | 50 millions of particles per cubic foot of air  | US. OSHA Table Z-3 (29 CFR 1910.1000) (03 2016)                             |
| Titanium dioxide (naturally occurring) - Respirable fraction.           | TWA     | 15 millions of particles per cubic foot of air  | US. OSHA Table Z-3 (29 CFR 1910.1000) (03 2016)                             |
| Titanium dioxide (naturally occurring) - Total dust.                    | TWA     | 15 mg/m <sup>3</sup>                            | US. OSHA Table Z-3 (29 CFR 1910.1000) (03 2016)                             |
| Titanium dioxide (naturally occurring) - Respirable finescale particles | TWA     | 2.5 mg/m <sup>3</sup>                           | US. ACGIH Threshold Limit Values (01 2022)                                  |
| Titanium dioxide (naturally occurring) - Respirable nanoscale particles | TWA     | 0.2 mg/m <sup>3</sup>                           | US. ACGIH Threshold Limit Values (01 2022)                                  |
| Calcium oxide   | TWA     | 2 mg/m <sup>3</sup>                             | US. ACGIH Threshold Limit Values (12 2010)                                  |
|   | PEL     | 5 mg/m <sup>3</sup>                             | US. OSHA Table Z-1 Limits for Air Contaminants (29 CFR 1910.1000) (02 2006) |
|   | REL     | 2 mg/m <sup>3</sup>                             | US. NIOSH: Pocket Guide to Chemical Hazards, as amended (2005)              |
| Quartz - Respirable.  | IDLH    | 25 mg/m <sup>3</sup>                            | US. NIOSH. Immediately Dangerous to Life or Health (IDLH) Values (10 2017)  |
|   | TWA     | 2.4 millions of particles per cubic foot of air | US. OSHA Table Z-3 (29 CFR 1910.1000) (2000)                                |
| Quartz - Respirable dust.   | TWA     | 0.1 mg/m <sup>3</sup>                           | US. OSHA Table Z-3 (29 CFR 1910.1000) (2000)                                |
|   | REL     | 0.05 mg/m <sup>3</sup>                          | US. NIOSH: Pocket Guide to Chemical Hazards, as amended (2005)              |

|                               |          |                         |  |
|-------------------------------|----------|-------------------------|--|
| Quartz - Respirable dust.     | TWA      | 0.05 mg/m <sup>3</sup>  | US. OSHA Specifically Regulated Substances (29 CFR 1910.1001-1050) (03 2016) |
|                               | OSHA_ACT | 0.025 mg/m <sup>3</sup> | US. OSHA Specifically Regulated Substances (29 CFR 1910.1001-1050) (03 2016) |
| Quartz - Respirable dust.     | PEL      | 0.05 mg/m <sup>3</sup>  | US. OSHA Table Z-1 Limits for Air Contaminants (29 CFR 1910.1000) (03 2016)  |
| Quartz                        | IDLH     | 50 mg/m <sup>3</sup>    | US. NIOSH. Immediately Dangerous to Life or Health (IDLH) Values (10 2017)   |
| Quartz - Respirable fraction. | TWA      | 0.025 mg/m <sup>3</sup> | US. ACGIH Threshold Limit Values (02 2020)                                   |

### Occupational Exposure Limits: Canada

| Chemical Identity  | Type       | Exposure Limit Values  | Source  |
|--|------------|------------------------|---|
| Manganese oxide (MnO <sub>2</sub> ) - Inhalable fraction. - as Mn  | TWA        | 0.1 mg/m <sup>3</sup>  | Canada. Manitoba OELs (Reg. 217/2006, The Workplace Safety And Health Act), as amended (03 2013)  |
| Manganese oxide (MnO <sub>2</sub> ) - Respirable fraction. - as Mn | TWA        | 0.02 mg/m <sup>3</sup> | Canada. Manitoba OELs (Reg. 217/2006, The Workplace Safety And Health Act), as amended (03 2013)  |
| Manganese oxide (MnO <sub>2</sub> ) - Inhalable fraction. - as Mn  | TWA        | 0.1 mg/m <sup>3</sup>  | Canada. Ontario OELs. (Control of Exposure to Biological or Chemical Agents), as amended (01 2020)  |
| Manganese oxide (MnO <sub>2</sub> ) - as Mn                        | 8 HR ACL   | 0.2 mg/m <sup>3</sup>  | Canada. Saskatchewan OELs (Occupational Health and Safety Regulations, 1996, Table 21), as amended (05 2009)                                  |
|  | 15 MIN ACL | 0.6 mg/m <sup>3</sup>  | Canada. Saskatchewan OELs (Occupational Health and Safety Regulations, 1996, Table 21), as amended (05 2009)                                  |
| Manganese oxide (MnO <sub>2</sub> ) - Fume, total dust. - as Mn    | TWA        | 0.2 mg/m <sup>3</sup>  | Canada. Quebec OELs. (Ministry of Labor - Regulation respecting occupational health and safety), as amended (09 2017)                         |
| Manganese oxide (MnO <sub>2</sub> ) - as Mn                        | TWA        | 0.2 mg/m <sup>3</sup>  | Canada. Alberta OELs (Occupational Health & Safety Code, Schedule 1, Table 2), as amended (08 2020)   |
| Manganese oxide (MnO <sub>2</sub> ) - Respirable. - as Mn          | TWA        | 0.02 mg/m <sup>3</sup> | Canada. British Columbia OELs: Table of Exposure Limits for Chemical Biological Substances (Workers Compensation Board); as amended (06 2022) |
| Manganese oxide (MnO <sub>2</sub> ) - Total - as Mn                | TWA        | 0.2 mg/m <sup>3</sup>  | Canada. British Columbia OELs: Table of Exposure Limits for Chemical Biological Substances (Workers Compensation Board); as amended (06 2022) |
| Calcium fluoride - as F  | TWA        | 2.5 mg/m <sup>3</sup>  | Canada. Alberta OELs (Occupational Health & Safety Code, Schedule 1, Table 2), as amended (07 2009)   |
|  | TWA        | 2.5 mg/m <sup>3</sup>  | Canada. Alberta OELs (Occupational Health & Safety Code, Schedule 1, Table 2), as amended (07 2009)   |
|  | TWA        | 2.5 mg/m <sup>3</sup>  | Canada. Manitoba OELs (Reg. 217/2006, The Workplace Safety And Health Act), as amended (03 2011)  |
|  | TWA        | 2.5 mg/m <sup>3</sup>  | Canada. Ontario OELs. (Control of Exposure to Biological or Chemical Agents), as amended (11 2010)  |
|  | 8 HR ACL   | 2.5 mg/m <sup>3</sup>  | Canada. Saskatchewan OELs (Occupational Health and Safety Regulations, 1996, Table 21), as amended (05 2009)                                  |
|  | 15 MIN ACL | 5 mg/m <sup>3</sup>    | Canada. Saskatchewan OELs (Occupational Health and Safety Regulations, 1996, Table 21), as amended (05 2009)                                  |
|  | TWA        | 2.5 mg/m <sup>3</sup>  | Canada. Quebec OELs. (Ministry of Labor - Regulation respecting occupational  |

|   |            |           |   |
|---|------------|-----------|---|
|   |            |           | health and safety), as amended (09 2017)  |
|   | TWA        | 2.5 mg/m3 | Canada. British Columbia OELs: Table of Exposure Limits for Chemical Biological Substances (Workers Compensation Board); as amended (06 2022) |
| Titanium dioxide (naturally occurring)                                  | TWA        | 10 mg/m3  | Canada. Alberta OELs (Occupational Health & Safety Code, Schedule 1, Table 2), as amended (07 2009)   |
| Titanium dioxide (naturally occurring) - Total dust.                    | TWA        | 10 mg/m3  | Canada. British Columbia OELs: Table of Exposure Limits for Chemical Biological Substances (Workers Compensation Board); as amended (07 2007) |
| Titanium dioxide (naturally occurring) - Respirable fraction.           | TWA        | 3 mg/m3   | Canada. British Columbia OELs: Table of Exposure Limits for Chemical Biological Substances (Workers Compensation Board); as amended (07 2007) |
| Titanium dioxide (naturally occurring)                                  | TWA        | 10 mg/m3  | Canada. Ontario OELs. (Control of Exposure to Biological or Chemical Agents), as amended (11 2010)  |
|   | 8 HR ACL   | 10 mg/m3  | Canada. Saskatchewan OELs (Occupational Health and Safety Regulations, 1996, Table 21), as amended (05 2009)                                  |
|   | 15 MIN ACL | 20 mg/m3  | Canada. Saskatchewan OELs (Occupational Health and Safety Regulations, 1996, Table 21), as amended (05 2009)                                  |
| Titanium dioxide (naturally occurring) - Total dust.                    | TWA        | 10 mg/m3  | Canada. Quebec OELs. (Ministry of Labor - Regulation respecting occupational health and safety), as amended (09 2017)                         |
| Titanium dioxide (naturally occurring) - Respirable finescale particles | TWA        | 2.5 mg/m3 | Canada. Manitoba OELs (Reg. 217/2006, The Workplace Safety And Health Act), as amended (01 2022)  |
| Titanium dioxide (naturally occurring) - Respirable nanoscale particles | TWA        | 0.2 mg/m3 | Canada. Manitoba OELs (Reg. 217/2006, The Workplace Safety And Health Act), as amended (01 2022)  |
| Iron oxide - Dust. - as Fe  | TWA        | 5 mg/m3   | Canada. British Columbia OELs: Table of Exposure Limits for Chemical Biological Substances (Workers Compensation Board); as amended (07 2007) |
| Iron oxide - Fume. - as Fe  | STEL       | 10 mg/m3  | Canada. British Columbia OELs: Table of Exposure Limits for Chemical Biological Substances (Workers Compensation Board); as amended (07 2007) |
|   | TWA        | 5 mg/m3   | Canada. British Columbia OELs: Table of Exposure Limits for Chemical Biological Substances (Workers Compensation Board); as amended (07 2007) |
| Iron oxide - Respirable fraction.                                       | TWA        | 5 mg/m3   | Canada. Manitoba OELs (Reg. 217/2006, The Workplace Safety And Health Act), as amended (03 2011)  |
|   | TWA        | 5 mg/m3   | Canada. Ontario OELs. (Control of Exposure to Biological or Chemical Agents), as amended (11 2010)  |
| Iron oxide  | 8 HR ACL   | 10 mg/m3  | Canada. Saskatchewan OELs (Occupational Health and Safety Regulations, 1996, Table 21), as amended (05 2009)                                  |
|   | 15 MIN ACL | 20 mg/m3  | Canada. Saskatchewan OELs (Occupational Health and Safety Regulations, 1996, Table 21), as amended (05 2009)                                  |
| Iron oxide - Dust and fume. - as Fe                                     | 15 MIN ACL | 10 mg/m3  | Canada. Saskatchewan OELs (Occupational Health and Safety Regulations, 1996, Table 21), as amended (05 2009)                                  |
|   | 8 HR ACL   | 5 mg/m3   | Canada. Saskatchewan OELs (Occupational Health and Safety Regulations, 1996, Table 21), as amended (05 2009)                                  |
|   | TWA        | 5 mg/m3   | Canada. Quebec OELs. (Ministry of Labor   |



|   |            |          |   |
|---|------------|----------|---|
|   |            |          | - Regulation respecting occupational health and safety), as amended (09 2017)   |
| Iron oxide - Respirable.                            | TWA        | 5 mg/m3  | Canada. Alberta OELs (Occupational Health & Safety Code, Schedule 1, Table 2), as amended (08 2020)   |
| Silicon - Total dust.                               | TWA        | 10 mg/m3 | Canada. Ontario OELs. (Control of Exposure to Biological or Chemical Agents), as amended (07 2010)  |
| Silicon   | 8 HR ACL   | 10 mg/m3 | Canada. Saskatchewan OELs (Occupational Health and Safety Regulations, 1996, Table 21), as amended (05 2009)                                  |
|   | 15 MIN ACL | 20 mg/m3 | Canada. Saskatchewan OELs (Occupational Health and Safety Regulations, 1996, Table 21), as amended (05 2009)                                  |
| Silicon - Total dust.                               | TWA        | 10 mg/m3 | Canada. Quebec OELs. (Ministry of Labor - Regulation respecting occupational health and safety), as amended (09 2017)                         |
| Silicon - Respirable particles.                     | TWA        | 3 mg/m3  | Canada. Alberta OELs (Occupational Health & Safety Code, Schedule 1, Table 2), as amended (01 2019)   |
| Silicon - Total dust.                               | TWA        | 10 mg/m3 | Canada. British Columbia OELs: Table of Exposure Limits for Chemical Biological Substances (Workers Compensation Board); as amended (06 2020) |
| Silicon - Respirable fraction.                      | TWA        | 3 mg/m3  | Canada. British Columbia OELs: Table of Exposure Limits for Chemical Biological Substances (Workers Compensation Board); as amended (06 2020) |
| Silicon - Inhalable particles.                      | TWA        | 10 mg/m3 | Canada. Manitoba OELs (Reg. 217/2006, The Workplace Safety And Health Act), as amended (01 2021)  |
| Silicon - Respirable particles.                     | TWA        | 3 mg/m3  | Canada. Manitoba OELs (Reg. 217/2006, The Workplace Safety And Health Act), as amended (01 2021)  |
| Silicon - Respirable fraction.                      | TWA        | 3 mg/m3  | Canada. Ontario OELs. (Control of Exposure to Biological or Chemical Agents), as amended (01 2020)  |
| Silicon - Inhalable fraction.                       | TWA        | 10 mg/m3 | Canada. Ontario OELs. (Control of Exposure to Biological or Chemical Agents), as amended (01 2020)  |
| Silicon - Inhalable particles.                      | TWA        | 10 mg/m3 | Canada. Ontario OELs. (Control of Exposure to Biological or Chemical Agents), as amended (01 2020)  |
| Silicon - Respirable particles.                     | TWA        | 3 mg/m3  | Canada. Ontario OELs. (Control of Exposure to Biological or Chemical Agents), as amended (01 2020)  |
| Silicon - Total                                     | TWA        | 10 mg/m3 | Canada. Alberta OELs (Occupational Health & Safety Code, Schedule 1, Table 2), as amended (08 2020)   |
| Silicon dioxide (amorphous)                         | TWA        | 10 mg/m3 | Canada. Ontario OELs. (Control of Exposure to Biological or Chemical Agents), as amended (07 2010)  |
| Silicon dioxide (amorphous) - Respirable particles. | TWA        | 3 mg/m3  | Canada. Alberta OELs (Occupational Health & Safety Code, Schedule 1, Table 2), as amended (01 2019)   |
| Silicon dioxide (amorphous) - Respirable fraction.  | TWA        | 3 mg/m3  | Canada. British Columbia OELs: Table of Exposure Limits for Chemical Biological Substances (Workers Compensation Board); as amended (06 2020) |
| Silicon dioxide (amorphous) - Total dust.           | TWA        | 10 mg/m3 | Canada. British Columbia OELs: Table of Exposure Limits for Chemical Biological Substances (Workers Compensation Board); as amended (06 2020) |
| Silicon dioxide (amorphous) - Respirable particles. | TWA        | 3 mg/m3  | Canada. Manitoba OELs (Reg. 217/2006, The Workplace Safety And Health Act), as amended (01 2021)  |
| Silicon dioxide (amorphous) - Inhalable particles.  | TWA        | 10 mg/m3 | Canada. Manitoba OELs (Reg. 217/2006, The Workplace Safety And Health Act), as amended (01 2021)  |



|  |               |          |   |
|--|---------------|----------|---|
| Silicon dioxide (amorphous) - Respirable fraction.     | TWA           | 3 mg/m3  | Canada. Ontario OELs. (Control of Exposure to Biological or Chemical Agents), as amended (01 2020)  |
| Silicon dioxide (amorphous) - Inhalable particles.     | TWA           | 10 mg/m3 | Canada. Ontario OELs. (Control of Exposure to Biological or Chemical Agents), as amended (01 2020)  |
| Silicon dioxide (amorphous) - Inhalable fraction.      | TWA           | 10 mg/m3 | Canada. Ontario OELs. (Control of Exposure to Biological or Chemical Agents), as amended (01 2020)  |
| Silicon dioxide (amorphous) - Respirable particles.    | TWA           | 3 mg/m3  | Canada. Ontario OELs. (Control of Exposure to Biological or Chemical Agents), as amended (01 2020)  |
| Silicon dioxide (amorphous) - Inhalable fraction.      | 15 MIN<br>ACL | 20 mg/m3 | Canada. Saskatchewan OELs (Occupational Health and Safety Regulations, 1996, Table 21), as amended (06 2016)                                  |
| Silicon dioxide (amorphous) - Respirable fraction.     | 15 MIN<br>ACL | 6 mg/m3  | Canada. Saskatchewan OELs (Occupational Health and Safety Regulations, 1996, Table 21), as amended (06 2016)                                  |
|  | 8 HR ACL      | 3 mg/m3  | Canada. Saskatchewan OELs (Occupational Health and Safety Regulations, 1996, Table 21), as amended (06 2016)                                  |
| Silicon dioxide (amorphous) - Inhalable fraction.      | 8 HR ACL      | 10 mg/m3 | Canada. Saskatchewan OELs (Occupational Health and Safety Regulations, 1996, Table 21), as amended (06 2016)                                  |
| Silicon dioxide (amorphous) - Total dust.              | TWA           | 10 mg/m3 | Canada. Quebec OELs. (Ministry of Labor - Regulation respecting occupational health and safety), as amended (03 2020)                         |
| Silicon dioxide (amorphous) - Total                    | TWA           | 10 mg/m3 | Canada. Alberta OELs (Occupational Health & Safety Code, Schedule 1, Table 2), as amended (08 2020)   |
| Magnesium oxide - Fume.                                | TWA           | 10 mg/m3 | Canada. Alberta OELs (Occupational Health & Safety Code, Schedule 1, Table 2), as amended (07 2009)   |
| Magnesium oxide - Respirable dust and/or fume. - as Mg | STEL          | 10 mg/m3 | Canada. British Columbia OELs: Table of Exposure Limits for Chemical Biological Substances (Workers Compensation Board); as amended (07 2007) |
| Magnesium oxide - Inhalable fume.                      | TWA           | 10 mg/m3 | Canada. British Columbia OELs: Table of Exposure Limits for Chemical Biological Substances (Workers Compensation Board); as amended (07 2007) |
| Magnesium oxide - Respirable dust and/or fume. - as Mg | TWA           | 3 mg/m3  | Canada. British Columbia OELs: Table of Exposure Limits for Chemical Biological Substances (Workers Compensation Board); as amended (07 2007) |
| Magnesium oxide - Inhalable fraction.                  | TWA           | 10 mg/m3 | Canada. Manitoba OELs (Reg. 217/2006, The Workplace Safety And Health Act), as amended (03 2011)  |
|  | TWA           | 10 mg/m3 | Canada. Ontario OELs. (Control of Exposure to Biological or Chemical Agents), as amended (11 2010)  |
|  | 8 HR ACL      | 10 mg/m3 | Canada. Saskatchewan OELs (Occupational Health and Safety Regulations, 1996, Table 21), as amended (05 2009)                                  |
|  | 15 MIN<br>ACL | 20 mg/m3 | Canada. Saskatchewan OELs (Occupational Health and Safety Regulations, 1996, Table 21), as amended (05 2009)                                  |
| Magnesium oxide - Inhalable dust.                      | TWA           | 10 mg/m3 | Canada. Quebec OELs. (Ministry of Labor - Regulation respecting occupational health and safety), as amended (03 2020)                         |
| Aluminum oxide   | TWA           | 10 mg/m3 | Canada. Alberta OELs (Occupational Health & Safety Code, Schedule 1, Table 2), as amended (07 2009)   |
| Aluminum oxide - Respirable fraction.                  | TWA           | 1 mg/m3  | Canada. Manitoba OELs (Reg. 217/2006, The Workplace Safety And Health Act), as  |

|  |            |            |   |
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|  |            |            | amended (03 2011)   |
|  | TWA        | 3 mg/m3    | Canada. Ontario OELs. (Control of Exposure to Biological or Chemical Agents), as amended (06 2015)  |
|  | TWA        | 1 mg/m3    | Canada. Ontario OELs. (Control of Exposure to Biological or Chemical Agents), as amended (11 2010)  |
| Aluminum oxide - Inhalable fraction.     | TWA        | 10 mg/m3   | Canada. Ontario OELs. (Control of Exposure to Biological or Chemical Agents), as amended (06 2015)  |
| Aluminum oxide                           | 8 HR ACL   | 10 mg/m3   | Canada. Saskatchewan OELs (Occupational Health and Safety Regulations, 1996, Table 21), as amended (05 2009)                                  |
|  | 15 MIN ACL | 20 mg/m3   | Canada. Saskatchewan OELs (Occupational Health and Safety Regulations, 1996, Table 21), as amended (05 2009)                                  |
| Aluminum oxide - Total dust.             | TWA        | 10 mg/m3   | Canada. British Columbia OELs: Table of Exposure Limits for Chemical Biological Substances (Workers Compensation Board); as amended (06 2020) |
| Aluminum oxide - Respirable fraction.    | TWA        | 3 mg/m3    | Canada. British Columbia OELs: Table of Exposure Limits for Chemical Biological Substances (Workers Compensation Board); as amended (06 2020) |
| Aluminum oxide - Inhalable particles.    | TWA        | 10 mg/m3   | Canada. Manitoba OELs (Reg. 217/2006, The Workplace Safety And Health Act), as amended (01 2021)  |
| Aluminum oxide - Respirable particles.   | TWA        | 3 mg/m3    | Canada. Manitoba OELs (Reg. 217/2006, The Workplace Safety And Health Act), as amended (01 2021)  |
|  | TWA        | 3 mg/m3    | Canada. Ontario OELs. (Control of Exposure to Biological or Chemical Agents), as amended (01 2020)  |
| Aluminum oxide - Inhalable particles.    | TWA        | 10 mg/m3   | Canada. Ontario OELs. (Control of Exposure to Biological or Chemical Agents), as amended (01 2020)  |
| Aluminum oxide - Respirable.             | TWA        | 1.0 mg/m3  | Canada. British Columbia OELs: Table of Exposure Limits for Chemical Biological Substances (Workers Compensation Board); as amended (06 2022) |
| Aluminum oxide - Total dust.             | TWA        | 10 mg/m3   | Canada. Quebec OELs. (Ministry of Labor - Regulation respecting occupational health and safety), as amended (04 2022)                         |
| Aluminum oxide - Respirable dust.        | TWA        | 5 mg/m3    | Canada. Quebec OELs. (Ministry of Labor - Regulation respecting occupational health and safety), as amended (04 2022)                         |
| Wollastonite - fibers, total dust        | TWA        | 10 mg/m3   | Canada. Quebec OELs. (Ministry of Labor - Regulation respecting occupational health and safety), as amended (09 2017)                         |
| Wollastonite - Fiber.                    | TWA        | 5 mg/m3    | Canada. Quebec OELs. (Ministry of Labor - Regulation respecting occupational health and safety), as amended (09 2017)                         |
| Manganese - as Mn                        | 8 HR ACL   | 0.2 mg/m3  | Canada. Saskatchewan OELs (Occupational Health and Safety Regulations, 1996, Table 21), as amended (05 2009)                                  |
|  | 15 MIN ACL | 0.6 mg/m3  | Canada. Saskatchewan OELs (Occupational Health and Safety Regulations, 1996, Table 21), as amended (05 2009)                                  |
| Manganese - Respirable fraction. - as Mn | TWA        | 0.02 mg/m3 | Canada. Manitoba OELs (Reg. 217/2006, The Workplace Safety And Health Act), as amended (03 2014)  |
| Manganese - Inhalable fraction. - as Mn  | TWA        | 0.1 mg/m3  | Canada. Manitoba OELs (Reg. 217/2006, The Workplace Safety And Health Act), as amended (03 2014)  |
| Manganese - as Mn                        | TWA        | 0.2 mg/m3  | Canada. Ontario OELs. (Control of Exposure to Biological or Chemical Agents), as amended (06 2015)  |

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|---|------------|------------|---|
| Manganese - Fume, total dust. - as Mn   | TWA        | 0.2 mg/m3  | Canada. Quebec OELs. (Ministry of Labor - Regulation respecting occupational health and safety), as amended (09 2017)                         |
| Manganese - as Mn                       | TWA        | 0.2 mg/m3  | Canada. Alberta OELs (Occupational Health & Safety Code, Schedule 1, Table 2), as amended (08 2020)   |
| Manganese - Respirable. - as Mn         | TWA        | 0.02 mg/m3 | Canada. British Columbia OELs: Table of Exposure Limits for Chemical Biological Substances (Workers Compensation Board); as amended (06 2022) |
| Manganese - Total - as Mn               | TWA        | 0.2 mg/m3  | Canada. British Columbia OELs: Table of Exposure Limits for Chemical Biological Substances (Workers Compensation Board); as amended (06 2022) |
| Calcium oxide                           | TWA        | 2 mg/m3    | Canada. Alberta OELs (Occupational Health & Safety Code, Schedule 1, Table 2), as amended (07 2009)   |
|   | TWA        | 2 mg/m3    | Canada. British Columbia OELs: Table of Exposure Limits for Chemical Biological Substances (Workers Compensation Board); as amended (07 2007) |
|   | TWA        | 2 mg/m3    | Canada. Manitoba OELs (Reg. 217/2006, The Workplace Safety And Health Act), as amended (03 2011)  |
|   | TWA        | 2 mg/m3    | Canada. Ontario OELs. (Control of Exposure to Biological or Chemical Agents), as amended (07 2010)  |
|   | 15 MIN ACL | 4 mg/m3    | Canada. Saskatchewan OELs (Occupational Health and Safety Regulations, 1996, Table 21), as amended (05 2009)                                  |
|   | 8 HR ACL   | 2 mg/m3    | Canada. Saskatchewan OELs (Occupational Health and Safety Regulations, 1996, Table 21), as amended (05 2009)                                  |
|   | TWA        | 2 mg/m3    | Canada. Quebec OELs. (Ministry of Labor - Regulation respecting occupational health and safety), as amended (09 2017)                         |
| Zirconium oxide - as Zr                 | STEL       | 10 mg/m3   | Canada. Manitoba OELs (Reg. 217/2006, The Workplace Safety And Health Act), as amended (03 2011)  |
|   | TWA        | 5 mg/m3    | Canada. Manitoba OELs (Reg. 217/2006, The Workplace Safety And Health Act), as amended (03 2011)  |
|   | TWA        | 5 mg/m3    | Canada. Ontario OELs. (Control of Exposure to Biological or Chemical Agents), as amended (11 2010)  |
|   | STEL       | 10 mg/m3   | Canada. Ontario OELs. (Control of Exposure to Biological or Chemical Agents), as amended (11 2010)  |
|   | 8 HR ACL   | 5 mg/m3    | Canada. Saskatchewan OELs (Occupational Health and Safety Regulations, 1996, Table 21), as amended (05 2009)                                  |
|   | 15 MIN ACL | 10 mg/m3   | Canada. Saskatchewan OELs (Occupational Health and Safety Regulations, 1996, Table 21), as amended (05 2009)                                  |
|   | TWA        | 5 mg/m3    | Canada. Quebec OELs. (Ministry of Labor - Regulation respecting occupational health and safety), as amended (09 2017)                         |
|   | STEL       | 10 mg/m3   | Canada. Quebec OELs. (Ministry of Labor - Regulation respecting occupational health and safety), as amended (09 2017)                         |
| Zirconium oxide - Respirable particles. | TWA        | 3 mg/m3    | Canada. Alberta OELs (Occupational Health & Safety Code, Schedule 1, Table 2), as amended (01 2019)   |
| Zirconium oxide - Respirable fraction.  | TWA        | 3 mg/m3    | Canada. British Columbia OELs: Table of Exposure Limits for Chemical Biological Substances (Workers Compensation Board); as amended (06 2020) |

|   |               |             |   |
|---|---------------|-------------|---|
| Zirconium oxide - Total dust.           | TWA           | 10 mg/m3    | Canada. British Columbia OELs: Table of Exposure Limits for Chemical Biological Substances (Workers Compensation Board); as amended (06 2020) |
| Zirconium oxide - Respirable particles. | TWA           | 3 mg/m3     | Canada. Manitoba OELs (Reg. 217/2006, The Workplace Safety And Health Act), as amended (01 2021)  |
| Zirconium oxide - Inhalable particles.  | TWA           | 10 mg/m3    | Canada. Manitoba OELs (Reg. 217/2006, The Workplace Safety And Health Act), as amended (01 2021)  |
| Zirconium oxide - Respirable fraction.  | TWA           | 3 mg/m3     | Canada. Ontario OELs. (Control of Exposure to Biological or Chemical Agents), as amended (01 2020)  |
| Zirconium oxide - Inhalable particles.  | TWA           | 10 mg/m3    | Canada. Ontario OELs. (Control of Exposure to Biological or Chemical Agents), as amended (01 2020)  |
| Zirconium oxide - Respirable particles. | TWA           | 3 mg/m3     | Canada. Ontario OELs. (Control of Exposure to Biological or Chemical Agents), as amended (01 2020)  |
| Zirconium oxide - Inhalable fraction.   | TWA           | 10 mg/m3    | Canada. Ontario OELs. (Control of Exposure to Biological or Chemical Agents), as amended (01 2020)  |
|   | 15 MIN<br>ACL | 20 mg/m3    | Canada. Saskatchewan OELs (Occupational Health and Safety Regulations, 1996, Table 21), as amended (06 2016)                                  |
| Zirconium oxide - Respirable fraction.  | 8 HR ACL      | 3 mg/m3     | Canada. Saskatchewan OELs (Occupational Health and Safety Regulations, 1996, Table 21), as amended (06 2016)                                  |
| Zirconium oxide - Inhalable fraction.   | 8 HR ACL      | 10 mg/m3    | Canada. Saskatchewan OELs (Occupational Health and Safety Regulations, 1996, Table 21), as amended (06 2016)                                  |
| Zirconium oxide - Respirable fraction.  | 15 MIN<br>ACL | 6 mg/m3     | Canada. Saskatchewan OELs (Occupational Health and Safety Regulations, 1996, Table 21), as amended (06 2016)                                  |
| Zirconium oxide - Total dust.           | TWA           | 10 mg/m3    | Canada. Quebec OELs. (Ministry of Labor - Regulation respecting occupational health and safety), as amended (04 2019)                         |
| Zirconium oxide - Total                 | TWA           | 10 mg/m3    | Canada. Alberta OELs (Occupational Health & Safety Code, Schedule 1, Table 2), as amended (08 2020)   |
| Zirconium oxide - as Zr                 | TWA           | 5 mg/m3     | Canada. Alberta OELs (Occupational Health & Safety Code, Schedule 1, Table 2), as amended (08 2020)   |
|   | STEL          | 10 mg/m3    | Canada. Alberta OELs (Occupational Health & Safety Code, Schedule 1, Table 2), as amended (08 2020)   |
|   | TWA           | 5 mg/m3     | Canada. British Columbia OELs: Table of Exposure Limits for Chemical Biological Substances (Workers Compensation Board); as amended (06 2022) |
|   | STEL          | 10 mg/m3    | Canada. British Columbia OELs: Table of Exposure Limits for Chemical Biological Substances (Workers Compensation Board); as amended (06 2022) |
| Quartz - Respirable particles.          | TWA           | 0.025 mg/m3 | Canada. Alberta OELs (Occupational Health & Safety Code, Schedule 1, Table 2), as amended (07 2009)   |
| Quartz - Respirable fraction.           | 8 HR ACL      | 0.05 mg/m3  | Canada. Saskatchewan OELs (Occupational Health and Safety Regulations, 1996, Table 21), as amended (05 2009)                                  |
|   | TWA           | 0.10 mg/m3  | Canada. Ontario OELs. (Control of Exposure to Biological or Chemical Agents), as amended (06 2015)  |
| Quartz - Respirable dust.               | TWA           | 0.1 mg/m3   | Canada. Quebec OELs. (Ministry of Labor - Regulation respecting occupational health and safety), as amended (09 2017)                         |

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|--|------------|-------------|---|
| Quartz - Respirable fraction.                | TWA        | 0.025 mg/m3 | Canada. British Columbia OELs: Table of Exposure Limits for Chemical Biological Substances (Workers Compensation Board); as amended (06 2020) |
|  | TWA        | 0.025 mg/m3 | Canada. Manitoba OELs (Reg. 217/2006, The Workplace Safety And Health Act), as amended (01 2021)  |
| Barium and soluble compounds (as Ba) - as Ba | TWA        | 0.5 mg/m3   | Canada. Alberta OELs (Occupational Health & Safety Code, Schedule 1, Table 2), as amended (07 2009)   |
|  | TWA        | 0.5 mg/m3   | Canada. Manitoba OELs (Reg. 217/2006, The Workplace Safety And Health Act), as amended (03 2011)  |
|  | TWA        | 0.5 mg/m3   | Canada. Ontario OELs. (Control of Exposure to Biological or Chemical Agents), as amended (11 2010)  |
|  | 8 HR ACL   | 0.5 mg/m3   | Canada. Saskatchewan OELs (Occupational Health and Safety Regulations, 1996, Table 21), as amended (05 2009)                                  |
|  | 15 MIN ACL | 1.5 mg/m3   | Canada. Saskatchewan OELs (Occupational Health and Safety Regulations, 1996, Table 21), as amended (05 2009)                                  |
|  | TWA        | 0.5 mg/m3   | Canada. British Columbia OELs: Table of Exposure Limits for Chemical Biological Substances (Workers Compensation Board); as amended (06 2022) |

**Occupational Exposure Limits: Mexico**

| Chemical Identity                                  | Type    | Exposure Limit Values | Source   |
|--|---------|-----------------------|--|
| Manganese oxide (MnO <sub>2</sub> ) - as Mn        | VLE-PPT | 0.2 mg/m3             | Mexico. OELs. (NOM-010-STPS-2014 Chemical Pollutants at the Workplace; Assessment and Control), as amended (04 2014) |
| Calcium fluoride - as F                            | VLE-PPT | 2.5 mg/m3             | Mexico. OELs. (NOM-010-STPS-2014 Chemical Pollutants at the Workplace; Assessment and Control), as amended (04 2014) |
| Titanium dioxide (naturally occurring)             | VLE-PPT | 10 mg/m3              | Mexico. OELs. (NOM-010-STPS-2014 Chemical Pollutants at the Workplace; Assessment and Control), as amended (04 2014) |
| Iron oxide - Respirable fraction.                  | VLE-PPT | 5 mg/m3               | Mexico. OELs. (NOM-010-STPS-2014 Chemical Pollutants at the Workplace; Assessment and Control), as amended (04 2014) |
| Silicon - Inhalable fraction.                      | VLE-PPT | 10 mg/m3              | Mexico. OELs. (NOM-010-STPS-2014 Chemical Pollutants at the Workplace; Assessment and Control), as amended (04 2014) |
| Silicon - Respirable fraction.                     | VLE-PPT | 3 mg/m3               | Mexico. OELs. (NOM-010-STPS-2014 Chemical Pollutants at the Workplace; Assessment and Control), as amended (04 2014) |
| Silicon dioxide (amorphous) - Inhalable fraction.  | VLE-PPT | 10 mg/m3              | Mexico. OELs. (NOM-010-STPS-2014 Chemical Pollutants at the Workplace; Assessment and Control), as amended (04 2014) |
| Silicon dioxide (amorphous) - Respirable fraction. | VLE-PPT | 3 mg/m3               | Mexico. OELs. (NOM-010-STPS-2014 Chemical Pollutants at the Workplace; Assessment and Control), as amended (04 2014) |
| Iron - as Fe                                       | VLE-PPT | 1 mg/m3               | Mexico. OELs. (NOM-010-STPS-2014 Chemical Pollutants at the Workplace; Assessment and Control), as amended (04 2014) |
| Magnesium oxide - Inhalable fraction.              | VLE-PPT | 10 mg/m3              | Mexico. OELs. (NOM-010-STPS-2014 Chemical Pollutants at the Workplace; Assessment and Control), as amended           |

|  |         |             |  |
|--|---------|-------------|--|
|  |         |             | (04 2014)  |
| Aluminum oxide                               | VLE-PPT | 10 mg/m3    | Mexico. OELs. (NOM-010-STPS-2014 Chemical Pollutants at the Workplace; Assessment and Control), as amended (04 2014) |
| Manganese - as Mn                            | VLE-PPT | 0.2 mg/m3   | Mexico. OELs. (NOM-010-STPS-2014 Chemical Pollutants at the Workplace; Assessment and Control), as amended (04 2014) |
| Calcium oxide                                | VLE-PPT | 2 mg/m3     | Mexico. OELs. (NOM-010-STPS-2014 Chemical Pollutants at the Workplace; Assessment and Control), as amended (04 2014) |
| Zirconium oxide - as Zr                      | VLE-PPT | 5 mg/m3     | Mexico. OELs. (NOM-010-STPS-2014 Chemical Pollutants at the Workplace; Assessment and Control), as amended (04 2014) |
|  | VLE-CT  | 10 mg/m3    | Mexico. OELs. (NOM-010-STPS-2014 Chemical Pollutants at the Workplace; Assessment and Control), as amended (04 2014) |
| Zirconium oxide - Respirable fraction.       | VLE-PPT | 3 mg/m3     | Mexico. OELs. (NOM-010-STPS-2014 Chemical Pollutants at the Workplace; Assessment and Control), as amended (04 2014) |
| Zirconium oxide - Inhalable fraction.        | VLE-PPT | 10 mg/m3    | Mexico. OELs. (NOM-010-STPS-2014 Chemical Pollutants at the Workplace; Assessment and Control), as amended (04 2014) |
| Quartz - Respirable fraction.                | VLE-PPT | 0.025 mg/m3 | Mexico. OELs. (NOM-010-STPS-2014 Chemical Pollutants at the Workplace; Assessment and Control), as amended (04 2014) |
| Barium and soluble compounds (as Ba) - as Ba | VLE-PPT | 0.5 mg/m3   | Mexico. OELs. (NOM-010-STPS-2014 Chemical Pollutants at the Workplace; Assessment and Control), as amended (04 2014) |

**Biological Limit Values: Mexico**

| Chemical Identity  | Exposure Limit Values         | Source           |
|--|-------------------------------|------------------|
| Calcium fluoride (fluorides: Sampling time: End of shift.)   | 10 mg/g (Creatinine in urine) | MX IBE (06 2012) |
| Calcium fluoride (fluorides: Sampling time: Prior to shift.) | 3 mg/g (Creatinine in urine)  | MX IBE (06 2012) |

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

| Chemical Identity | Type | Exposure Limit Values   | Source  |
|-------------------|------|-------------------------|---|
| Carbon dioxide    | TWA  | 5,000 ppm               | US. ACGIH Threshold Limit Values (12 2010)                                  |
|                   | STEL | 30,000 ppm              | US. ACGIH Threshold Limit Values (12 2010)                                  |
|                   | PEL  | 5,000 ppm 9,000 mg/m3   | US. OSHA Table Z-1 Limits for Air Contaminants (29 CFR 1910.1000) (02 2006) |
| Carbon monoxide   | STEL | 30,000 ppm 54,000 mg/m3 | US. NIOSH: Pocket Guide to Chemical Hazards, as amended (2005)              |
|                   | REL  | 5,000 ppm 9,000 mg/m3   | US. NIOSH: Pocket Guide to Chemical Hazards, as amended (2005)              |
|                   | IDLH | 40,000 ppm              | US. NIOSH. Immediately Dangerous to Life or Health (IDLH) Values (10 2017)  |
| Carbon monoxide   | TWA  | 25 ppm                  | US. ACGIH Threshold Limit Values (12 2010)                                  |
|                   | PEL  | 50 ppm 55 mg/m3         | US. OSHA Table Z-1 Limits for Air Contaminants (29 CFR 1910.1000) (02 2006) |
|                   | REL  | 35 ppm 40 mg/m3         | US. NIOSH: Pocket Guide to Chemical Hazards, as amended (2005)              |



|                  |           |           |           |   |
|------------------|-----------|-----------|-----------|---|
|                  | Ceil_Time | 200 ppm   | 229 mg/m3 | US. NIOSH: Pocket Guide to Chemical Hazards, as amended (2005)              |
|                  | IDLH      | 1,200 ppm |           | US. NIOSH. Immediately Dangerous to Life or Health (IDLH) Values (10 2017)  |
| Nitrogen dioxide | TWA       | 0.2 ppm   |           | US. ACGIH Threshold Limit Values (02 2012)                                  |
|                  | Ceiling   | 5 ppm     | 9 mg/m3   | US. OSHA Table Z-1 Limits for Air Contaminants (29 CFR 1910.1000) (02 2006) |
|                  | STEL      | 1 ppm     | 1.8 mg/m3 | US. NIOSH: Pocket Guide to Chemical Hazards, as amended (2005)              |
|                  | IDLH      | 20 ppm    |           | US. NIOSH. Immediately Dangerous to Life or Health (IDLH) Values (10 2017)  |
|                  | IDLH      | 13 ppm    |           | US. NIOSH. Immediately Dangerous to Life or Health (IDLH) Values (10 2017)  |
| Ozone            | PEL       | 0.1 ppm   | 0.2 mg/m3 | US. OSHA Table Z-1 Limits for Air Contaminants (29 CFR 1910.1000) (02 2006) |
|                  | Ceil_Time | 0.1 ppm   | 0.2 mg/m3 | US. NIOSH: Pocket Guide to Chemical Hazards, as amended (2005)              |
|                  | TWA       | 0.05 ppm  |           | US. ACGIH Threshold Limit Values (03 2014)                                  |
|                  | TWA       | 0.10 ppm  |           | US. ACGIH Threshold Limit Values (03 2014)                                  |
|                  | TWA       | 0.08 ppm  |           | US. ACGIH Threshold Limit Values (03 2014)                                  |
|                  | IDLH      | 5 ppm     |           | US. NIOSH. Immediately Dangerous to Life or Health (IDLH) Values (10 2017)  |
|                  | TWA       | 0.20 ppm  |           | US. ACGIH Threshold Limit Values (02 2020)                                  |

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

| Chemical Identity | Type       | Exposure Limit Values |              | Source  |
|-------------------|------------|-----------------------|--------------|---|
| Carbon dioxide    | STEL       | 30,000 ppm            | 54,000 mg/m3 | Canada. Alberta OELs (Occupational Health & Safety Code, Schedule 1, Table 2), as amended (07 2009)   |
|                   | TWA        | 5,000 ppm             | 9,000 mg/m3  | Canada. Alberta OELs (Occupational Health & Safety Code, Schedule 1, Table 2), as amended (07 2009)   |
|                   | TWA        | 5,000 ppm             |              | Canada. British Columbia OELs: Table of Exposure Limits for Chemical Biological Substances (Workers Compensation Board); as amended (07 2007) |
|                   | STEL       | 15,000 ppm            |              | Canada. British Columbia OELs: Table of Exposure Limits for Chemical Biological Substances (Workers Compensation Board); as amended (07 2007) |
|                   | TWA        | 5,000 ppm             |              | Canada. Manitoba OELs (Reg. 217/2006, The Workplace Safety And Health Act), as amended (03 2011)  |
|                   | STEL       | 30,000 ppm            |              | Canada. Manitoba OELs (Reg. 217/2006, The Workplace Safety And Health Act), as amended (03 2011)  |
|                   | STEL       | 30,000 ppm            |              | Canada. Ontario OELs. (Control of Exposure to Biological or Chemical Agents), as amended (11 2010)  |
|                   | TWA        | 5,000 ppm             |              | Canada. Ontario OELs. (Control of Exposure to Biological or Chemical Agents), as amended (11 2010)  |
|                   | 8 HR ACL   | 5,000 ppm             |              | Canada. Saskatchewan OELs (Occupational Health and Safety Regulations, 1996, Table 21), as amended (05 2009)                                  |
|                   | 15 MIN ACL | 30,000 ppm            |              | Canada. Saskatchewan OELs (Occupational Health and Safety Regulations, 1996, Table 21), as amended (05 2009)                                  |
|                   | TWA        | 5,000 ppm             | 9,000 mg/m3  | Canada. Quebec OELs. (Ministry of Labor - Regulation respecting occupational  |

|                  |            |            |              |   |
|------------------|------------|------------|--------------|---|
|                  |            |            |              | health and safety), as amended (09 2017)  |
|                  | STEL       | 30,000 ppm | 54,000 mg/m3 | Canada. Quebec OELs. (Ministry of Labor - Regulation respecting occupational health and safety), as amended (09 2017)                         |
| Carbon monoxide  | TWA        | 25 ppm     | 29 mg/m3     | Canada. Alberta OELs (Occupational Health & Safety Code, Schedule 1, Table 2), as amended (07 2009)   |
|                  | TWA        | 25 ppm     |              | Canada. British Columbia OELs: Table of Exposure Limits for Chemical Biological Substances (Workers Compensation Board); as amended (07 2007) |
|                  | STEL       | 100 ppm    |              | Canada. British Columbia OELs: Table of Exposure Limits for Chemical Biological Substances (Workers Compensation Board); as amended (07 2007) |
|                  | TWA        | 25 ppm     |              | Canada. Manitoba OELs (Reg. 217/2006, The Workplace Safety And Health Act), as amended (03 2011)  |
|                  | TWA        | 25 ppm     |              | Canada. Ontario OELs. (Control of Exposure to Biological or Chemical Agents), as amended (07 2010)  |
|                  | 8 HR ACL   | 25 ppm     |              | Canada. Saskatchewan OELs (Occupational Health and Safety Regulations, 1996, Table 21), as amended (05 2009)                                  |
|                  | 15 MIN ACL | 190 ppm    |              | Canada. Saskatchewan OELs (Occupational Health and Safety Regulations, 1996, Table 21), as amended (05 2009)                                  |
|                  | TWA        | 35 ppm     |              | Canada. Quebec OELs. (Ministry of Labor - Regulation respecting occupational health and safety), as amended (04 2022)                         |
|                  | STEL       | 175 ppm    |              | Canada. Quebec OELs. (Ministry of Labor - Regulation respecting occupational health and safety), as amended (04 2022)                         |
| Nitrogen dioxide | STEL       | 5 ppm      | 9.4 mg/m3    | Canada. Alberta OELs (Occupational Health & Safety Code, Schedule 1, Table 2), as amended (07 2009)   |
|                  | TWA        | 3 ppm      | 5.6 mg/m3    | Canada. Alberta OELs (Occupational Health & Safety Code, Schedule 1, Table 2), as amended (07 2009)   |
|                  | CEILING    | 1 ppm      |              | Canada. British Columbia OELs: Table of Exposure Limits for Chemical Biological Substances (Workers Compensation Board); as amended (07 2007) |
|                  | TWA        | 0.2 ppm    |              | Canada. Manitoba OELs (Reg. 217/2006, The Workplace Safety And Health Act), as amended (03 2012)  |
|                  | STEL       | 5 ppm      |              | Canada. Ontario OELs. (Control of Exposure to Biological or Chemical Agents), as amended (11 2010)  |
|                  | TWA        | 3 ppm      |              | Canada. Ontario OELs. (Control of Exposure to Biological or Chemical Agents), as amended (11 2010)  |
|                  | 8 HR ACL   | 3 ppm      |              | Canada. Saskatchewan OELs (Occupational Health and Safety Regulations, 1996, Table 21), as amended (05 2009)                                  |
|                  | 15 MIN ACL | 5 ppm      |              | Canada. Saskatchewan OELs (Occupational Health and Safety Regulations, 1996, Table 21), as amended (05 2009)                                  |
|                  | TWA        | 3 ppm      | 5 mg/m3      | Canada. Quebec OELs. (Ministry of Labor - Regulation respecting occupational health and safety), as amended (04 2022)                         |
| Ozone            | STEL       | 0.3 ppm    | 0.6 mg/m3    | Canada. Alberta OELs (Occupational Health & Safety Code, Schedule 1, Table 2), as amended (07 2009)   |
|                  | TWA        | 0.1 ppm    | 0.2 mg/m3    | Canada. Alberta OELs (Occupational Health & Safety Code, Schedule 1, Table 2), as amended (07 2009)   |

|  |               |                        |   |
|--|---------------|------------------------|---|
|  | TWA           | 0.05 ppm               | Canada. British Columbia OELs: Table of Exposure Limits for Chemical Biological Substances (Workers Compensation Board); as amended (07 2007) |
|  | TWA           | 0.1 ppm                | Canada. British Columbia OELs: Table of Exposure Limits for Chemical Biological Substances (Workers Compensation Board); as amended (07 2007) |
|  | TWA           | 0.08 ppm               | Canada. British Columbia OELs: Table of Exposure Limits for Chemical Biological Substances (Workers Compensation Board); as amended (07 2007) |
|  | TWA           | 0.2 ppm                | Canada. British Columbia OELs: Table of Exposure Limits for Chemical Biological Substances (Workers Compensation Board); as amended (07 2007) |
|  | TWA           | 0.1 ppm      0.2 mg/m3 | Canada. Ontario OELs. (Control of Exposure to Biological or Chemical Agents), as amended (07 2010)  |
|  | STEL          | 0.3 ppm      0.6 mg/m3 | Canada. Ontario OELs. (Control of Exposure to Biological or Chemical Agents), as amended (07 2010)  |
|  | 15 MIN<br>ACL | 0.15 ppm               | Canada. Saskatchewan OELs (Occupational Health and Safety Regulations, 1996, Table 21), as amended (05 2009)                                  |
|  | 8 HR ACL      | 0.05 ppm               | Canada. Saskatchewan OELs (Occupational Health and Safety Regulations, 1996, Table 21), as amended (05 2009)                                  |
|  | CEILING       | 0.1 ppm      0.2 mg/m3 | Canada. Quebec OELs. (Ministry of Labor - Regulation respecting occupational health and safety), as amended (12 2008)                         |
|  | TWA           | 0.05 ppm               | Canada. Manitoba OELs (Reg. 217/2006, The Workplace Safety And Health Act), as amended (03 2014)  |
|  | TWA           | 0.08 ppm               | Canada. Manitoba OELs (Reg. 217/2006, The Workplace Safety And Health Act), as amended (03 2014)  |
|  | TWA           | 0.10 ppm               | Canada. Manitoba OELs (Reg. 217/2006, The Workplace Safety And Health Act), as amended (03 2014)  |
|  | TWA           | 0.20 ppm               | Canada. Manitoba OELs (Reg. 217/2006, The Workplace Safety And Health Act), as amended (02 2020)  |

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

| Chemical Identity | Type    | Exposure Limit Values | Source   |
|-------------------|---------|-----------------------|--|
| Carbon dioxide    | VLE-CT  | 30,000 ppm            | Mexico. OELs. (NOM-010-STPS-2014 Chemical Pollutants at the Workplace; Assessment and Control), as amended (04 2014) |
|                   | VLE-PPT | 5,000 ppm             | Mexico. OELs. (NOM-010-STPS-2014 Chemical Pollutants at the Workplace; Assessment and Control), as amended (04 2014) |
| Carbon monoxide   | VLE-PPT | 25 ppm                | Mexico. OELs. (NOM-010-STPS-2014 Chemical Pollutants at the Workplace; Assessment and Control), as amended (04 2014) |
| Nitrogen dioxide  | VLE-PPT | 0.2 ppm               | Mexico. OELs. (NOM-010-STPS-2014 Chemical Pollutants at the Workplace; Assessment and Control), as amended (04 2014) |
| Ozone             | VLE-P   | 0.1 ppm               | Mexico. OELs. (NOM-010-STPS-2014 Chemical Pollutants at the Workplace; Assessment and Control), as amended (04 2014) |

**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****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/m<sup>3</sup>) to 0.2 µg/m<sup>3</sup>. 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.

**Maximum Dust Exposure Guideline™(MDEG)™** for this product (based on content of Manganese oxide (MnO<sub>2</sub>)) is 0.1 mg/m<sup>3</sup>. This exposure guideline is calculated using the most conservative value of the ACGIH TLV or OSHA PEL for the stated substance. Handle to minimize generation of airborne dust. Use adequate ventilation and dust collection. Use respiratory protection, if required, to keep exposure below limits. If your local applicable exposure limits are lower than the ACGIH TLV or OSHA PEL for any of the substances listed in Section 3 of this SDS, you must take that into consideration before utilizing or applying this guideline.

**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, 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. 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.
- 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 ANSI/AWS F1.1, F1.2, F1.3 and F1.5, available from the American Welding Society, [www.aws.org](http://www.aws.org). Observe good industrial hygiene practices. Wash hands before breaks and immediately after handling the product.

**9. PHYSICAL AND CHEMICAL PROPERTIES**

|  |                        |
|--|------------------------|
| <b>Appearance:</b>   | Granular welding flux. |
| <b>Physical state:</b>                                       | Solid                  |
| <b>Form:</b>   | Granular               |
| <b>Color:</b>  | Grey                   |
| <b>Odor:</b>   | No data available.     |
| <b>Odor threshold:</b>                                       | No data available.     |
| <b>pH:</b>   | Not applicable         |
| <b>Melting point/freezing point:</b>                         | No data available.     |
| <b>Initial boiling point and boiling range:</b>              | No data available.     |
| <b>Flash Point:</b>  | No data available.     |
| <b>Evaporation rate:</b>                                     | No data available.     |
| <b>Flammability (solid, gas):</b>                            | No data available.     |
| <b>Upper/lower limit on flammability or explosive limits</b> |                        |
| <b>Flammability limit - upper (%):</b>                       | No data available.     |
| <b>Flammability limit - lower (%):</b>                       | No data available.     |
| <b>Explosive limit - upper:</b>                              | No data available.     |
| <b>Explosive limit - lower:</b>                              | No data available.     |
| <b>Vapor pressure:</b>                                       | No data available.     |
| <b>Vapor density:</b>  | No data available.     |
| <b>Density:</b>  | 2.0 g/cm <sup>3</sup>  |
| <b>Relative density:</b>                                     | No data available.     |

**Solubility(ies)**

|   |                    |
|---|--------------------|
| <b>Solubility in water:</b>                     | No data available. |
| <b>Solubility (other):</b>                      | No data available. |
| <b>Partition coefficient (n-octanol/water):</b> | No data available. |
| <b>Auto-ignition temperature:</b>               | No data available. |
| <b>Decomposition temperature:</b>               | No data available. |
| <b>Viscosity:</b>                               | No data available. |

**10. STABILITY AND REACTIVITY**

|  |  |
|--|--|
| <b>Reactivity:</b>                         | The product is non-reactive under normal conditions of use, storage and transport.   |
| <b>Chemical Stability:</b>                 | Material is stable under normal conditions.  |
| <b>Possibility of hazardous reactions:</b> | None under normal conditions.  |
| <b>Conditions to avoid:</b>                | Avoid heat or contamination.   |
| <b>Incompatible Materials:</b>             | Strong acids. Strong oxidizing substances. Strong bases.   |
| <b>Hazardous Decomposition Products:</b>   | <p>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.)</p> <p>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.</p> |

**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:** Overexposure to respirable crystalline silica, which may be present in dust created from the processing, handling or use of this product, can cause severe lung damage (silicosis). 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, or listing it in Section 3 of the SDS when concentrations are less than 1%. 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.

**Information on toxicological effects****Acute toxicity (list all possible routes of exposure)****Oral**

**Product:** ATEmix: 2,760.38 mg/kg

**Specified substance(s):**

Manganese oxide LD 50 (Rat): > 3,480 mg/kg  
(MnO<sub>2</sub>)

Sodium silicate LD 50 (Rat): 1.1 g/kg

**Dermal**

**Product:** Not classified for acute toxicity based on available data.

**Inhalation**

**Product:** ATEmix: 8.91 mg/l

**Repeated dose toxicity**

**Product:** No data available.

**Skin Corrosion/Irritation****Product:** Not classified**Serious Eye Damage/Eye Irritation****Product:** Not classified**Respiratory or Skin Sensitization****Product:** Respiratory Sensitization: Not classified  
Skin Sensitization: Not classified**Carcinogenicity****Product:** Suspected of causing cancer.**IARC Monographs on the Evaluation of Carcinogenic Risks to Humans:**

|   |  |
|---|--|
| Titanium dioxide<br>(naturally occurring) | Overall evaluation: 2B. Possibly carcinogenic to humans. |
| Quartz                                    | Overall evaluation: 1. Carcinogenic to humans.           |

**US. National Toxicology Program (NTP) Report on Carcinogens:**

|        |                               |
|--------|-------------------------------|
| Quartz | Known To Be Human Carcinogen. |
|--------|-------------------------------|

**US. OSHA Specifically Regulated Substances (29 CFR 1910.1001-1053), as amended:**

|        |        |
|--------|--------|
| Quartz | Cancer |
|--------|--------|

**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:** No data available.**Specific Target Organ Toxicity - Repeated Exposure****Product:** Repeated overexposure to airborne manganese may affect the brain and central nervous system, resulting in poor coordination, difficulty speaking, and arm or leg tremor. This condition can be irreversible.**Aspiration Hazard****Product:** Not applicable**Other effects:** 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****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 |

**12. ECOLOGICAL INFORMATION****Ecotoxicity****Acute hazards to the aquatic environment:****Fish****Product:** Not classified**Specified substance(s):**Sodium silicate LC 50 (Western mosquitofish (*Gambusia affinis*), 96 h): 1,800 mg/l**Aquatic Invertebrates****Product:** Not classified**Specified substance(s):**Sodium silicate EC 50 (Water flea (*Ceriodaphnia dubia*), 48 h): 22.94 - 49.01 mg/l**Chronic hazards to the aquatic environment:****Fish****Product:** No data available.**Aquatic Invertebrates****Product:** No data available.**Toxicity to Aquatic Plants****Product:** No data available.**Persistence and Degradability****Biodegradation****Product:** No data available.**Bioaccumulative potential****Bioconcentration Factor (BCF)****Product:** No data available.**Mobility in soil:**

No data available.

**13. Disposal considerations****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. Minerals such as Florida Zircon Sand are used as one of the components in the manufacturing of welding fluxes contain trace levels of

Naturally Occurring Radioactive Material (NORM). Based on the radiological status of these materials, the scrap flux and waste slag generated in welding processes should be acceptable for disposal in RCRA Title D landfills. Flux materials containing sufficiently low concentrations of NORM are not subject to federal radiation control regulations. The regulation for classifying the flux material (zircon sand) is Title 10, Code of Federal Regulations, Part 40 Section 40.13 (10CFR40.13). **Materials which contain less than 0.05% (0,05%) by weight of uranium and/or thorium, are exempt from regulation.** The concentrations in the flux and slag are considerably lower than 0.05% (0,05%). Note: Many states are developing regulations pertaining to Naturally Occurring Radioactive Materials (NORM) above background levels. Consult with the applicable regulations and the authority with jurisdiction.

**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 US EPA's Toxicity Characteristic Leaching Procedure (TCLP) 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. Discharge, treatment, or disposal may be subject to national, state, or local laws.

**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.

**14. TRANSPORT INFORMATION****DOT**

UN number or ID number:  
UN Proper Shipping Name: NOT DG REGULATED  
Transport Hazard Class(es)  
Class: NR  
Label(s): –  
Packing Group: –  
Marine Pollutant: No

**IMDG**

UN number or ID number:  
UN Proper Shipping Name: NOT DG REGULATED  
Transport Hazard Class(es)  
Class: NR  
Label(s): –  
EmS No.:  
Packing Group: –  
Marine Pollutant: No

**IATA**

UN number or ID number:  
Proper Shipping Name: NOT DG REGULATED  
Transport Hazard Class(es):  
Class: NR  
Label(s): –  
Packing Group: –  
Marine Pollutant: No

Cargo aircraft only: Allowed.

**TDG**

UN number or ID number:  
UN Proper Shipping Name: NOT DG REGULATED  
Transport Hazard Class(es)  
Class: NR  
Label(s): –  
Packing Group: –  
Marine Pollutant: No

**15. REGULATORY INFORMATION****US Federal Regulations****TSCA Section 12(b) Export Notification (40 CFR 707, Subpt. D)**

None present or none present in regulated quantities.

**US. OSHA Specifically Regulated Substances (29 CFR 1910.1001-1053), as amended****Chemical Identity**

Quartz

**OSHA hazard(s)**

kidney effects  
lung effects  
immune system effects  
Cancer

**CERCLA Hazardous Substance List (40 CFR 302.4):****Chemical Identity**

Manganese

**Reportable quantity**

Included in the regulation but with no data values. See regulation for further details.

**Superfund Amendments and Reauthorization Act of 1986 (SARA)****Hazard categories**

Delayed (Chronic) Health Hazard  
Carcinogenicity

**SARA 302 Extremely Hazardous Substance**

None present or none present in regulated quantities.

**SARA 304 Emergency Release Notification**

None present or none present in regulated quantities.

**SARA 311/312 Hazardous Chemical****Chemical Identity****Threshold Planning Quantity****SARA 313 (TRI Reporting)****Chemical Identity**

Manganese oxide (MnO<sub>2</sub>)

**Reporting threshold  
for other users**

10000 lbs

**Reporting threshold for****manufacturing and processing**

25000 lbs.

**Clean Water Act Section 311 Hazardous Substances (40 CFR 117.3)**

None present or none present in regulated quantities.

**Clean Air Act (CAA) Section 112(r) Accidental Release Prevention (40 CFR 68.130):**

None present or none present in regulated quantities.

**US State Regulations****US. California Proposition 65**



**WARNING:** This product can expose you to chemicals including, Titanium dioxide (naturally occurring), Quartz, which is [are] known to the State of California to cause cancer.

For more information go to [www.P65Warnings.ca.gov](http://www.P65Warnings.ca.gov).

**WARNING:** This product contains or produces a chemical known to the State of California to cause cancer and birth defects (or other reproductive harm). (California Health & Safety Code Section 25249.5 et seq.)

**WARNING:** Cancer and Reproductive Harm – [www.P65Warnings.ca.gov](http://www.P65Warnings.ca.gov)

**US. New Jersey Worker and Community Right-to-Know Act**

**Chemical Identity**

Calcined bauxite  
Manganese oxide (MnO<sub>2</sub>)  
Calcium fluoride  
Titanium dioxide (naturally occurring)  
Iron oxide

**US. Massachusetts RTK - Substance List**

**Chemical Identity**

Titanium dioxide (naturally occurring)  
Iron oxide  
Silicon  
Silicon dioxide (amorphous)  
Magnesium oxide  
Aluminum oxide  
Quartz

**US. Pennsylvania RTK - Hazardous Substances**

**Chemical Identity**

Manganese oxide (MnO<sub>2</sub>)  
Calcium fluoride  
Titanium dioxide (naturally occurring)  
Iron oxide  
Silicon  
Silicon dioxide (amorphous)  
Magnesium oxide  
Aluminum oxide

**US. Rhode Island RTK**

**Chemical Identity**

Calcium fluoride  
Titanium dioxide (naturally occurring)  
Silicon dioxide (amorphous)  
Aluminum oxide

**Canada Federal Regulations**

**List of Toxic Substances (CEPA, Schedule 1)**

Not Regulated

**Export Control List (CEPA 1999, Schedule 3)**

Not Regulated

**National Pollutant Release Inventory (NPRI)**

**Canada. National Pollutant Release Inventory (NPRI) Substances, Part 5, VOCs with Additional Reporting Requirements**

NPRI PT5 Not Regulated

**Canada. National Pollutant Release Inventory (NPRI) (Schedule 1, Parts 1-4)**





exposure to individual airborne dust constituents in accordance with recommended industrial hygiene practice.

**Combustible Dust Hazard Rating:**

This material will not burn and has the Lincoln Electric Combustible Dust Hazard Rating: 0-CS. For additional information contact the Lincoln Electric EHS Department (216) 383-2669.

**Combustible Dust Hazard Rating Information:**

**Lincoln Electric's Combustible Dust Rating System is as follows:**

- 3: Fine solid powders or dusts which can ignite with contact with air, or have a Kst value  $\geq 300$ , and/or would have an ignition flame front faster than the speed of sound.
- 2: Fine solid powders or dusts which can ignite with contact with air, have an MIE  $< 3$  mJ, or have a Kst value  $> 200$  &  $\leq 299$ , and/or would have an ignition flame front faster than the speed of sound.
- 1.3: Fine solid powders or dusts which have an MIE  $> 3$  mJ  $< 500$  mJ, and a Kst  $\geq 25$   $< 200$  mJ.
- 1.2: Fine solid powders or dusts which have an MIE  $> 3$  mJ  $< 500$  mJ, and a Kst  $< 25$ , or MIE  $> 500$  mJ and Kst  $\geq 25$  but  $< 200$  mJ.
- 1.1: Fine solid powders or dusts which have an MIE  $> 10$  J and a positive Kst value  $< 25$ .
- 0-CS: Materials that will not burn.

**Revision Date:**

03/31/2024

**Further Information:**

Additional information is available by request.

**Disclaimer:**

The Lincoln Electric Company urges each end user and recipient of this SDS to study it carefully. See also [www.lincolnelectric.com/safety](http://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.

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