

SAFETY DATA SHEET

1. PRODUCT AND COMPANY IDENTIFICATION

Product Name: Repaircore® B2

Product Size: 1.2 mm (3/64")

Other means of identification

SDS number: 200000022320

Recommended use and restriction on use

Recommended use: FCAW-G (Gas Shielded Flux Cored Arc Welding)

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

Manufacturer/Importer/Supplier/Distributor Information

Company Name: Lincoln Electric do Brasil Industria e Comercio Lt

Address: Av. Papa João Paulo I Nº 1818

Guarulhos - SP CEP: 07170-350

Brazil

Telephone: +55 11 2431-4700

Contact Person: Safety Data Sheet Questions: www.lincolnelectric.com/sds

Arc Welding Safety Information: 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.

Hazard Classification Not classified as hazardous according to applicable GHS hazard classification criteria.

Label Elements

Hazard Symbol: No symbol

Signal Word: No signal word.

Hazard Statement: Not applicable

Precautionary Statements: Not applicable

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
Manganese	7439-96-5
Chromium (VI)	18540-29-9
Chromium oxide	1308-38-9
Fluorides (as F)	16984-48-8

3. COMPOSITION / INFORMATION ON INGREDIENTS

Reportable Hazardous Ingredients Mixtures

Chemical Identity	CAS number	Content in percent (%)*
Iron	7439-89-6	50 - <100%
Titanium dioxide (naturally occurring)	13463-67-7	5 - <10%
Manganese	7439-96-5	1 - <5%
Chromium and chromium alloys or compounds (as Cr)	7440-47-3	1 - <5%
Magnesium	7439-95-4	0.1 - <1%
Feldspar	68476-25-5	0.1 - <1%
Molybdenum	7439-98-7	0.1 - <1%
Silicon	7440-21-3	0.1 - <1%
Sodium fluorosilicate	16893-85-9	0.1 - <1%
Quartz	14808-60-7	0.1 - <1%
Iron oxide	1309-37-1	0.1 - <1%
Sodium oxide	1313-59-3	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 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.

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, 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.

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.

8. EXPOSURE CONTROLS / PERSONAL PROTECTION**Control Parameters**

Occupational Exposure Limits: US

Chemical Identity	Type	Exposure Limit Values	Source
Titanium dioxide (naturally occurring)	IDLH	5,000 mg/m3	US. NIOSH. Immediately Dangerous to Life or Health (IDLH) Values (10 2017)
Titanium dioxide (naturally occurring) - Total dust.	PEL	15 mg/m3	US. OSHA Table Z-1 Limits for Air Contaminants (29 CFR 1910.1000) (02 2006)
Titanium dioxide (naturally occurring) - Respirable fraction.	TWA	5 mg/m3	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/m3	US. OSHA Table Z-3 (29 CFR 1910.1000) (03 2016)
Titanium dioxide (naturally occurring) - Respirable finescale particles	TWA	2.5 mg/m3	US. ACGIH Threshold Limit Values (01 2022)
Titanium dioxide (naturally occurring) - Respirable nanoscale particles	TWA	0.2 mg/m3	US. ACGIH Threshold Limit Values (01 2022)
Manganese - Fume. - as Mn	Ceiling	5 mg/m3	US. OSHA Table Z-1 Limits for Air Contaminants (29 CFR 1910.1000) (02 2006)
	REL	1 mg/m3	US. NIOSH: Pocket Guide to Chemical Hazards, as amended (2005)
	STEL	3 mg/m3	US. NIOSH: Pocket Guide to Chemical Hazards, as amended (2005)
Manganese - Inhalable fraction. - as Mn	TWA	0.1 mg/m3	US. ACGIH Threshold Limit Values (03 2014)
Manganese - Respirable fraction. - as Mn	TWA	0.02 mg/m3	US. ACGIH Threshold Limit Values (03 2014)
Manganese	IDLH	500 mg/m3	US. NIOSH. Immediately Dangerous to Life or Health (IDLH) Values (10 2017)
Chromium and chromium alloys or compounds (as Cr) - as Cr	PEL	1 mg/m3	US. OSHA Table Z-1 Limits for Air Contaminants (29 CFR 1910.1000) (02 2006)
	REL	0.5 mg/m3	US. NIOSH: Pocket Guide to Chemical Hazards, as amended (2005)
Chromium and chromium alloys or compounds (as Cr) - Inhalable fraction. - as Cr(0)	TWA	0.5 mg/m3	US. ACGIH Threshold Limit Values (03 2018)
Chromium and chromium alloys or compounds (as Cr)	IDLH	250 mg/m3	US. NIOSH. Immediately Dangerous to Life or Health (IDLH) Values (10 2017)
Molybdenum - Total dust. - as Mo	PEL	15 mg/m3	US. OSHA Table Z-1 Limits for Air Contaminants (29 CFR 1910.1000) (02 2006)
Molybdenum - Inhalable fraction. - as Mo	TWA	10 mg/m3	US. ACGIH Threshold Limit Values (03 2014)
Molybdenum - Respirable fraction. - as Mo	TWA	3 mg/m3	US. ACGIH Threshold Limit Values (03 2014)
Molybdenum	IDLH	5,000 mg/m3	US. NIOSH. Immediately Dangerous to Life or Health (IDLH) Values (10 2017)
Molybdenum - Respirable particles.	TWA	3 mg/m3	US. ACGIH Threshold Limit Values (01 2021)
Molybdenum - Inhalable particles.	TWA	10 mg/m3	US. ACGIH Threshold Limit Values (01 2021)
Molybdenum - Respirable fraction.	TWA	5 mg/m3	US. OSHA Table Z-3 (29 CFR 1910.1000) (09 2016)
	TWA	15 millions of particles per cubic foot of air	US. OSHA Table Z-3 (29 CFR 1910.1000) (09 2016)
Molybdenum - Total dust.	TWA	15 mg/m3	US. OSHA Table Z-3 (29 CFR 1910.1000) (09 2016)
	TWA	50 millions of particles per cubic	US. OSHA Table Z-3 (29 CFR 1910.1000) (09 2016)

		foot of air	
Silicon - Respirable.	REL	5 mg/m3	US. NIOSH: Pocket Guide to Chemical Hazards, as amended (2005)
Silicon - Total	REL	10 mg/m3	US. NIOSH: Pocket Guide to Chemical Hazards, as amended (2005)
Silicon - Total dust.	PEL	15 mg/m3	US. OSHA Table Z-1 Limits for Air Contaminants (29 CFR 1910.1000) (02 2006)
Silicon - Respirable fraction.	PEL	5 mg/m3	US. OSHA Table Z-1 Limits for Air Contaminants (29 CFR 1910.1000) (02 2006)
Silicon - Respirable particles.	TWA	3 mg/m3	US. ACGIH Threshold Limit Values (01 2021)
Silicon - Inhalable particles.	TWA	10 mg/m3	US. ACGIH Threshold Limit Values (01 2021)
Silicon - Respirable fraction.	TWA	5 mg/m3	US. OSHA Table Z-3 (29 CFR 1910.1000) (09 2016)
Silicon - Total dust.	TWA	50 millions of particles per cubic foot of air	US. OSHA Table Z-3 (29 CFR 1910.1000) (09 2016)
	TWA	15 mg/m3	US. OSHA Table Z-3 (29 CFR 1910.1000) (09 2016)
Silicon - Respirable fraction.	TWA	15 millions of particles per cubic foot of air	US. OSHA Table Z-3 (29 CFR 1910.1000) (09 2016)
Sodium fluorosilicate - as F	REL	2.5 mg/m3	US. NIOSH: Pocket Guide to Chemical Hazards, as amended (2005)
Sodium fluorosilicate	IDLH	250 mg/m3	US. NIOSH. Immediately Dangerous to Life or Health (IDLH) Values (10 2019)
Sodium fluorosilicate - as F	TWA	2.5 mg/m3	US. ACGIH Threshold Limit Values (01 2021)
	PEL	2.5 mg/m3	US. OSHA Table Z-1 Limits for Air Contaminants (29 CFR 1910.1000) (01 2017)
Sodium fluorosilicate	IDLH	250 mg/m3	US. NIOSH. Immediately Dangerous to Life or Health (IDLH) Values (10 2019)
Sodium fluorosilicate - Dust.	TWA	2.5 mg/m3	US. OSHA Table Z-2 (29 CFR 1910.1000) (01 2017)
Quartz - Respirable.	TWA	2.4 millions of particles per cubic foot of air	US. OSHA Table Z-3 (29 CFR 1910.1000) (2000)
	TWA	0.1 mg/m3	US. OSHA Table Z-3 (29 CFR 1910.1000) (2000)
Quartz - Respirable dust.	REL	0.05 mg/m3	US. NIOSH: Pocket Guide to Chemical Hazards, as amended (2005)
Quartz - Respirable dust.	TWA	0.05 mg/m3	US. OSHA Specifically Regulated Substances (29 CFR 1910.1001-1050) (03 2016)
	OSHA_ACT	0.025 mg/m3	US. OSHA Specifically Regulated Substances (29 CFR 1910.1001-1050) (03 2016)
Quartz - Respirable dust.	PEL	0.05 mg/m3	US. OSHA Table Z-1 Limits for Air Contaminants (29 CFR 1910.1000) (03 2016)
Quartz	IDLH	50 mg/m3	US. NIOSH. Immediately Dangerous to Life or Health (IDLH) Values (10 2017)
Quartz - Respirable fraction.	TWA	0.025 mg/m3	US. ACGIH Threshold Limit Values (02 2020)
Iron oxide - Dust and fume. - as Fe	REL	5 mg/m3	US. NIOSH: Pocket Guide to Chemical Hazards, as amended (2005)
Iron oxide - Fume.	PEL	10 mg/m3	US. OSHA Table Z-1 Limits for Air Contaminants (29 CFR 1910.1000) (02 2006)
Iron oxide - Respirable fraction.	TWA	5 mg/m3	US. ACGIH Threshold Limit Values (01 2010)
Iron oxide - Total dust.	TWA	50 millions of particles per cubic foot of air	US. OSHA Table Z-3 (29 CFR 1910.1000) (03 2016)
Iron oxide - Respirable fraction.	TWA	5 mg/m3	US. OSHA Table Z-3 (29 CFR 1910.1000) (03 2016)

	TWA	15 millions of particles per cubic foot of air	US. OSHA Table Z-3 (29 CFR 1910.1000) (03 2016)
Iron oxide - Total dust.	TWA	15 mg/m3	US. OSHA Table Z-3 (29 CFR 1910.1000) (03 2016)
Iron oxide	IDLH	2,500 mg/m3	US. NIOSH. Immediately Dangerous to Life or Health (IDLH) Values (10 2017)

Occupational Exposure Limits: Canada

Chemical Identity	Type	Exposure Limit Values	Source
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)
Titanium dioxide (naturally occurring)	8 HR ACL	10 mg/m3	Canada. Saskatchewan OELs (Occupational Health and Safety Regulations, 1996, Table 21), as amended (04 2021)
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)
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	TWA	0.02 mg/m3	Canada. British Columbia OELs: Table of

Mn			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)
Manganese - as Mn	8 HR ACL	0.2 mg/m3	Canada. Saskatchewan OELs (Occupational Health and Safety Regulations, 1996, Table 21), as amended (04 2021)
Chromium and chromium alloys or compounds (as Cr) - as Cr	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)
Chromium and chromium alloys or compounds (as Cr)	TWA	0.5 mg/m3	Canada. Quebec OELs. (Ministry of Labor - Regulation respecting occupational health and safety), as amended (09 2017)
Chromium and chromium alloys or compounds (as Cr) - Inhalable fraction. - as Cr(0)	TWA	0.5 mg/m3	Canada. Manitoba OELs (Reg. 217/2006, The Workplace Safety And Health Act), as amended (03 2018)
Chromium and chromium alloys or compounds (as Cr) - as Cr	TWA	0.5 mg/m3	Canada. Alberta OELs (Occupational Health & Safety Code, Schedule 1, Table 2), as amended (08 2020)
Chromium and chromium alloys or compounds (as Cr) - Total - as Cr(0)	TWA	0.5 mg/m3	Canada. British Columbia OELs: Table of Exposure Limits for Chemical Biological Substances (Workers Compensation Board); as amended (06 2022)
Chromium and chromium alloys or compounds (as Cr) - as Cr	8 HR ACL	0.5 mg/m3	Canada. Saskatchewan OELs (Occupational Health and Safety Regulations, 1996, Table 21), as amended (04 2021)
Molybdenum - Inhalable fraction. - as Mo	15 MIN ACL	20 mg/m3	Canada. Saskatchewan OELs (Occupational Health and Safety Regulations, 1996, Table 21), as amended (05 2009)
Molybdenum - Respirable fraction. - as Mo	15 MIN ACL	6 mg/m3	Canada. Saskatchewan OELs (Occupational Health and Safety Regulations, 1996, Table 21), as amended (05 2009)
	TWA	3 mg/m3	Canada. Manitoba OELs (Reg. 217/2006, The Workplace Safety And Health Act), as amended (03 2014)
Molybdenum - Inhalable fraction. - as Mo	TWA	10 mg/m3	Canada. Manitoba OELs (Reg. 217/2006, The Workplace Safety And Health Act), as amended (03 2014)
	TWA	10 mg/m3	Canada. Ontario OELs. (Control of Exposure to Biological or Chemical Agents), as amended (01 2020)
Molybdenum - Respirable fraction. - as Mo	TWA	3 mg/m3	Canada. Ontario OELs. (Control of Exposure to Biological or Chemical Agents), as amended (01 2020)
Molybdenum - Respirable dust. - as Mo	TWA	3 mg/m3	Canada. Quebec OELs. (Ministry of Labor - Regulation respecting occupational health and safety), as amended (03 2020)
Molybdenum - Inhalable dust. - as Mo	TWA	10 mg/m3	Canada. Quebec OELs. (Ministry of Labor - Regulation respecting occupational health and safety), as amended (03 2020)
Molybdenum - Respirable particles.	TWA	3 mg/m3	Canada. Alberta OELs (Occupational Health & Safety Code, Schedule 1, Table 2), as amended (01 2019)
Molybdenum - Inhalable particles.	TWA	10 mg/m3	Canada. Ontario OELs. (Control of Exposure to Biological or Chemical Agents), as amended (01 2020)

Molybdenum - Respirable fraction.	TWA	3 mg/m3	Canada. Ontario OELs. (Control of Exposure to Biological or Chemical Agents), as amended (01 2020)
Molybdenum - Inhalable fraction.	TWA	10 mg/m3	Canada. Ontario OELs. (Control of Exposure to Biological or Chemical Agents), as amended (01 2020)
Molybdenum - Respirable particles.	TWA	3 mg/m3	Canada. Ontario OELs. (Control of Exposure to Biological or Chemical Agents), as amended (01 2020)
	TWA	3 mg/m3	Canada. Manitoba OELs (Reg. 217/2006, The Workplace Safety And Health Act), as amended (01 2021)
Molybdenum - Inhalable particles.	TWA	10 mg/m3	Canada. Manitoba OELs (Reg. 217/2006, The Workplace Safety And Health Act), as amended (01 2021)
Molybdenum - Total	TWA	10 mg/m3	Canada. Alberta OELs (Occupational Health & Safety Code, Schedule 1, Table 2), as amended (08 2020)
Molybdenum - Respirable. - as Mo	TWA	3 mg/m3	Canada. Alberta OELs (Occupational Health & Safety Code, Schedule 1, Table 2), as amended (08 2020)
Molybdenum - Total - as Mo	TWA	10 mg/m3	Canada. Alberta OELs (Occupational Health & Safety Code, Schedule 1, Table 2), as amended (08 2020)
Molybdenum - Inhalable - as Mo	TWA	10 mg/m3	Canada. British Columbia OELs: Table of Exposure Limits for Chemical Biological Substances (Workers Compensation Board); as amended (06 2022)
Molybdenum - Respirable. - as Mo	TWA	3 mg/m3	Canada. British Columbia OELs: Table of Exposure Limits for Chemical Biological Substances (Workers Compensation Board); as amended (06 2022)
Molybdenum - Total dust.	TWA	10 mg/m3	Canada. British Columbia OELs: Table of Exposure Limits for Chemical Biological Substances (Workers Compensation Board); as amended (06 2022)
Molybdenum - Respirable fraction.	TWA	3 mg/m3	Canada. British Columbia OELs: Table of Exposure Limits for Chemical Biological Substances (Workers Compensation Board); as amended (06 2022)
Molybdenum - Respirable fraction. - as Mo	8 HR ACL	3 mg/m3	Canada. Saskatchewan OELs (Occupational Health and Safety Regulations, 1996, Table 21), as amended (04 2021)
Molybdenum - Inhalable fraction. - as Mo	8 HR ACL	10 mg/m3	Canada. Saskatchewan OELs (Occupational Health and Safety Regulations, 1996, Table 21), as amended (04 2021)
Silicon	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 - 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 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 - Total	TWA	10 mg/m3	Canada. Alberta OELs (Occupational Health & Safety Code, Schedule 1, Table 2), as amended (08 2020)
Silicon	8 HR ACL	10 mg/m3	Canada. Saskatchewan OELs (Occupational Health and Safety Regulations, 1996, Table 21), as amended (04 2021)
Sodium fluorosilicate - as F	TWA	2.5 mg/m3	Canada. Alberta OELs (Occupational Health & Safety Code, Schedule 1, Table 2), as amended (01 2019)
	TWA	2.5 mg/m3	Canada. Manitoba OELs (Reg. 217/2006, The Workplace Safety And Health Act), as amended (01 2021)
	TWA	2.5 mg/m3	Canada. Alberta OELs (Occupational Health & Safety Code, Schedule 1, Table 2), as amended (01 2019)
	TWA	2.5 mg/m3	Canada. Ontario OELs. (Control of Exposure to Biological or Chemical Agents), as amended (01 2020)
	TWA	2.5 mg/m3	Canada. Quebec OELs. (Ministry of Labor - Regulation respecting occupational health and safety), as amended (03 2020)
	15 MIN ACL	5 mg/m3	Canada. Saskatchewan OELs (Occupational Health and Safety Regulations, 1996, Table 21), as amended (06 2016)
	TWA	2.5 mg/m3	Canada. British Columbia OELs: Table of Exposure Limits for Chemical Biological Substances (Workers Compensation Board); as amended (06 2022)
	8 HR ACL	2.5 mg/m3	Canada. Saskatchewan OELs (Occupational Health and Safety Regulations, 1996, Table 21), as amended (04 2021)
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)
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)
	8 HR ACL	0.05 mg/m3	Canada. Saskatchewan OELs (Occupational Health and Safety Regulations, 1996, Table 21), as amended (04 2021)

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	15 MIN ACL	20 mg/m3	Canada. Saskatchewan OELs (Occupational Health and Safety Regulations, 1996, Table 21), as amended (05 2009)
Iron oxide - Respirable fraction.	TWA	5 mg/m3	Canada. Manitoba OELs (Reg. 217/2006, The Workplace Safety And Health Act), as amended (03 2011)
Iron oxide - Dust and fume. - as Fe	TWA	5 mg/m3	Canada. Quebec OELs. (Ministry of Labor - Regulation respecting occupational health and safety), as amended (09 2017)
Iron oxide - Respirable fraction.	TWA	5 mg/m3	Canada. Ontario OELs. (Control of Exposure to Biological or Chemical Agents), as amended (01 2020)
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 (04 2021)
Iron oxide - Respirable.	TWA	5 mg/m3	Canada. Alberta OELs (Occupational Health & Safety Code, Schedule 1, Table 2), as amended (08 2020)
Iron oxide - Dust and fume. - as Fe	8 HR ACL	5 mg/m3	Canada. Saskatchewan OELs (Occupational Health and Safety Regulations, 1996, Table 21), as amended (04 2021)
Iron oxide	8 HR ACL	10 mg/m3	Canada. Saskatchewan OELs (Occupational Health and Safety Regulations, 1996, Table 21), as amended (04 2021)

Occupational Exposure Limits: Mexico

Chemical Identity	Type	Exposure Limit Values	Source
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)
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)
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)
Chromium and chromium alloys or compounds (as Cr)	VLE-PPT	0.5 mg/m3	Mexico. OELs. (NOM-010-STPS-2014 Chemical Pollutants at the Workplace; Assessment and Control), as amended (04 2014)
	VLE-PPT	0.05 mg/m3	Mexico. OELs. (NOM-010-STPS-2014 Chemical Pollutants at the Workplace; Assessment and Control), as amended (04 2014)
	VLE-PPT	0.01 mg/m3	Mexico. OELs. (NOM-010-STPS-2014 Chemical Pollutants at the Workplace; Assessment and Control), as amended (04 2014)
Molybdenum - Respirable fraction. - as Mo	VLE-PPT	0.5 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)
Sodium fluorosilicate - 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)
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)
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)

Biological Limit Values: US

Chemical Identity	Exposure Limit Values	Source
Chromium and chromium alloys or compounds (as Cr) (Total chromium: Sampling time: End of shift at end of work week.)	0.7 µg/l (Urine)	ACGIH BEI (01 2021)
Sodium fluorosilicate (Fluoride: Sampling time: End of shift.)	3 mg/l (Urine)	ACGIH BEI (01 2021)
Sodium fluorosilicate (Fluoride: Sampling time: Prior to shift.)	2 mg/l (Urine)	ACGIH BEI (01 2021)

Biological Limit Values: Mexico

Chemical Identity	Exposure Limit Values	Source
Sodium fluorosilicate (fluorides: Sampling time: Prior to shift.)	3 mg/g (Creatinine in urine)	MX IBE (06 2012)
Sodium fluorosilicate (fluorides: Sampling time: End of shift.)	10 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)
	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)
Manganese - Fume. - as Mn	Ceiling		5 mg/m3	US. OSHA Table Z-1 Limits for Air Contaminants (29 CFR 1910.1000) (02 2006)
	REL		1 mg/m3	US. NIOSH: Pocket Guide to Chemical Hazards, as amended (2005)
	STEL		3 mg/m3	US. NIOSH: Pocket Guide to Chemical Hazards, as amended (2005)
Manganese - Inhalable fraction. - as Mn	TWA		0.1 mg/m3	US. ACGIH Threshold Limit Values (03 2014)
Manganese - Respirable fraction. - as Mn	TWA		0.02 mg/m3	US. ACGIH Threshold Limit Values (03 2014)
Manganese	IDLH		500 mg/m3	US. NIOSH. Immediately Dangerous to Life or Health (IDLH) Values (10 2017)
Chromium (VI)	TWA		0.005 mg/m3	US. OSHA Specifically Regulated Substances (29 CFR 1910.1001-1050) (02 2006)
	OSHA_ACT		0.0025 mg/m3	US. OSHA Specifically Regulated Substances (29 CFR 1910.1001-1050) (02 2006)
Chromium (VI) - Inhalable fraction. - as Cr(VI)	TWA		0.0002 mg/m3	US. ACGIH Threshold Limit Values (03 2018)
	STEL		0.0005 mg/m3	US. ACGIH Threshold Limit Values (03 2018)
Chromium (VI)	IDLH		15 mg/m3	US. NIOSH. Immediately Dangerous to Life or Health (IDLH) Values (2018)
Chromium oxide - as Cr	PEL		0.5 mg/m3	US. OSHA Table Z-1 Limits for Air Contaminants (29 CFR 1910.1000) (02 2006)
Chromium oxide - Inhalable fraction. - as Cr(III)	TWA		0.003 mg/m3	US. ACGIH Threshold Limit Values (03 2018)
Chromium oxide - as Cr(III)	REL		0.5 mg/m3	US. NIOSH: Pocket Guide to Chemical Hazards, as amended (2016)
Chromium oxide	IDLH		25 mg/m3	US. NIOSH. Immediately Dangerous to Life or Health (IDLH) Values (10 2017)
Chromium oxide - Inhalable fraction. - as Cr(III)	TWA		0.003 mg/m3	US. ACGIH Threshold Limit Values (01 2021)
Fluorides (as F) - as F	TWA		2.5 mg/m3	US. ACGIH Threshold Limit Values (12 2010)

	PEL	2.5 mg/m3	US. OSHA Table Z-1 Limits for Air Contaminants (29 CFR 1910.1000) (02 2006)
Fluorides (as F) - Dust.	TWA	2.5 mg/m3	US. OSHA Table Z-2 (29 CFR 1910.1000) (02 2006)
Fluorides (as F)	IDLH	250 mg/m3	US. NIOSH. Immediately Dangerous to Life or Health (IDLH) Values (10 2017)

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	0.15 ppm	Canada. Saskatchewan OELs

	ACL		(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)
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)
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)
Manganese - as Mn	8 HR ACL	0.2 mg/m3	Canada. Saskatchewan OELs (Occupational Health and Safety Regulations, 1996, Table 21), as amended (04 2021)
Chromium (VI) - as Cr	TWA	0.01 mg/m3	Canada. Alberta OELs (Occupational Health & Safety Code, Schedule 1, Table 2), as amended (07 2009)
	TWA	0.05 mg/m3	Canada. Ontario OELs. (Control of Exposure to Biological or Chemical Agents), as amended (11 2010)
	15 MIN ACL	0.03 mg/m3	Canada. Saskatchewan OELs (Occupational Health and Safety Regulations, 1996, Table 21), as amended (05 2009)
	8 HR ACL	0.01 mg/m3	Canada. Saskatchewan OELs (Occupational Health and Safety Regulations, 1996, Table 21), as amended (05 2009)

	8 HR ACL	0.05 mg/m3	Canada. Saskatchewan OELs (Occupational Health and Safety Regulations, 1996, Table 21), as amended (05 2009)
	TWA	0.05 mg/m3	Canada. Quebec OELs. (Ministry of Labor - Regulation respecting occupational health and safety), as amended (09 2017)
	TWA	0.01 mg/m3	Canada. Quebec OELs. (Ministry of Labor - Regulation respecting occupational health and safety), as amended (09 2017)
Chromium (VI) - Inhalable fraction. - as Cr(VI)	STEL	0.0005 mg/m3	Canada. Manitoba OELs (Reg. 217/2006, The Workplace Safety And Health Act), as amended (03 2018)
	TWA	0.0002 mg/m3	Canada. Manitoba OELs (Reg. 217/2006, The Workplace Safety And Health Act), as amended (03 2018)
Chromium (VI) - Total - as Cr	TWA	0.025 mg/m3	Canada. British Columbia OELs: Table of Exposure Limits for Chemical Biological Substances (Workers Compensation Board); as amended (06 2022)
	TWA	0.01 mg/m3	Canada. British Columbia OELs: Table of Exposure Limits for Chemical Biological Substances (Workers Compensation Board); as amended (06 2022)
	CEILING	0.1 mg/m3	Canada. British Columbia OELs: Table of Exposure Limits for Chemical Biological Substances (Workers Compensation Board); as amended (06 2022)
Chromium (VI) - as Cr	8 HR ACL	0.05 mg/m3	Canada. Saskatchewan OELs (Occupational Health and Safety Regulations, 1996, Table 21), as amended (04 2021)
	8 HR ACL	0.01 mg/m3	Canada. Saskatchewan OELs (Occupational Health and Safety Regulations, 1996, Table 21), as amended (04 2021)
Chromium oxide - as Cr	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. Quebec OELs. (Ministry of Labor - Regulation respecting occupational health and safety), as amended (09 2017)
Chromium oxide - Inhalable fraction. - as Cr(III)	TWA	0.003 mg/m3	Canada. Manitoba OELs (Reg. 217/2006, The Workplace Safety And Health Act), as amended (03 2018)
	TWA	0.003 mg/m3	Canada. Manitoba OELs (Reg. 217/2006, The Workplace Safety And Health Act), as amended (01 2021)
Chromium oxide - as Cr	TWA	0.5 mg/m3	Canada. Alberta OELs (Occupational Health & Safety Code, Schedule 1, Table 2), as amended (08 2020)
Chromium oxide - Total - as Cr(III)	TWA	0.5 mg/m3	Canada. British Columbia OELs: Table of Exposure Limits for Chemical Biological Substances (Workers Compensation Board); as amended (06 2022)
Chromium oxide - as Cr	8 HR ACL	0.5 mg/m3	Canada. Saskatchewan OELs (Occupational Health and Safety Regulations, 1996, Table 21), as amended (04 2021)
Fluorides (as F) - as F	TWA	2.5 mg/m3	Canada. Alberta OELs (Occupational Health & Safety Code, Schedule 1, Table 2), as amended (07 2009)
	TWA	2.5 mg/m3	Canada. Alberta OELs (Occupational

			Health & Safety Code, Schedule 1, Table 2), as amended (07 2009)
	TWA	2.5 mg/m3	Canada. British Columbia OELs: Table of Exposure Limits for Chemical Biological Substances (Workers Compensation Board); as amended (07 2007)
	TWA	2.5 mg/m3	Canada. Manitoba OELs (Reg. 217/2006, The Workplace Safety And Health Act), as amended (03 2011)
	TWA	2.5 mg/m3	Canada. Ontario OELs. (Control of Exposure to Biological or Chemical Agents), as amended (11 2010)
	8 HR ACL	2.5 mg/m3	Canada. Saskatchewan OELs (Occupational Health and Safety Regulations, 1996, Table 21), as amended (05 2009)
	15 MIN ACL	5 mg/m3	Canada. Saskatchewan OELs (Occupational Health and Safety Regulations, 1996, Table 21), as amended (05 2009)
	TWA	2.5 mg/m3	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)
	8 HR ACL	2.5 mg/m3	Canada. Saskatchewan OELs (Occupational Health and Safety Regulations, 1996, Table 21), as amended (04 2021)

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)
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)
Chromium (VI)	VLE-PPT	0.05 mg/m3	Mexico. OELs. (NOM-010-STPS-2014 Chemical Pollutants at the Workplace; Assessment and Control), as amended (04 2014)
Chromium oxide	VLE-PPT	0.5 mg/m3	Mexico. OELs. (NOM-010-STPS-2014 Chemical Pollutants at the Workplace; Assessment and Control), as amended (04 2014)
Fluorides (as F) - 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)

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.

9. PHYSICAL AND CHEMICAL PROPERTIES

Appearance:	Cored welding wire.
Physical state:	Solid
Form:	Solid
Color:	No data available.
Odor:	No data available.
Odor threshold:	No data available.
pH:	No data available.
Melting point/freezing point:	No data available.
Initial boiling point and boiling range:	No data available.
Flash Point:	No data available.
Evaporation rate:	No data available.
Flammability (solid, gas):	No data available.
Upper/lower limit on flammability or explosive limits	
Flammability limit - upper (%):	No data available.
Flammability limit - lower (%):	No data available.
Explosive limit - upper:	No data available.
Explosive limit - lower:	No data available.
Vapor pressure:	No data available.
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.
Viscosity:	No data available.

10. STABILITY AND REACTIVITY

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

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

- Product:** Not classified
- Specified substance(s):**
- | | |
|-----------------------|------------------------|
| Iron | LD 50 (Rat): 98.6 g/kg |
| Sodium fluorosilicate | LD 50 (Rat): 125 mg/kg |

Dermal

- Product:** Not classified

Inhalation

- Product:** Not classified
- Specified substance(s):**
- | | |
|-----------------------|------------------------------|
| Sodium fluorosilicate | LC 50 (Rat, 4 h): 1.673 mg/l |
|-----------------------|------------------------------|

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	Skin sensitization:, in vivo (Guinea pig): Not sensitising
(naturally occurring)	Skin sensitization:, in vivo (Guinea pig): Not Classified
Chromium and chromium alloys or compounds (as Cr)	Skin sensitization:, in vivo (Guinea pig): Not Classified
Magnesium	Skin sensitization:, in vivo (Guinea pig): Not sensitising
Molybdenum	Skin sensitization:, in vivo (Guinea pig): Not sensitising
	Skin sensitization:, in vivo (Guinea pig): Not Classified
Iron oxide	Skin sensitization:, in vivo (Guinea pig): Not sensitising
	Skin sensitization:, in vivo: Not sensitising

Carcinogenicity**Product:** Arc rays: Skin cancer has been reported.**IARC Monographs on the Evaluation of Carcinogenic Risks to Humans:**

Titanium dioxide	Overall evaluation: 2B. Possibly carcinogenic to humans.
(naturally occurring)	
Quartz	Overall evaluation: 1. Carcinogenic to humans.

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

Quartz	Known To Be Human Carcinogen.
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US. OSHA Specifically Regulated Substances (29 CFR 1910.1001-1053), as amended:

Quartz	Cancer
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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

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**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.

Chromium (VI)

Chromates may cause ulceration, perforation of the nasal septum, and severe irritation of the bronchial tubes and lungs. Liver damage and allergic reactions, including skin rash, have been reported. Asthma has been reported in some sensitized individuals. Skin contact may result in irritation, ulceration, sensitization, and contact dermatitis. Chromates contain the hexavalent form of chromium. Hexavalent chromium and its compounds are on the IARC (International Agency for Research on Cancer) and NTP (National Toxicology Program) lists as posing a cancer risk to humans.

Additional toxicological Information under the conditions of use:**Acute toxicity****Oral****Specified substance(s):**

Chromium (VI)

LD 50 (Rat): 27 - 59 mg/kg

Fluorides (as F)

LD 50 (Rat): 4,250 mg/kg

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

Chromium (VI)

LC 50 (Rat, 4 h): 33 - 70 mg/m3

IARC Monographs on the Evaluation of Carcinogenic Risks to Humans:**Specified substance(s):**

Chromium (VI)

Overall evaluation: 1. Carcinogenic to humans.

Chromium oxide

Overall evaluation: 3. Not classifiable as to carcinogenicity to humans.

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

Chromium (VI)

Known To Be Human Carcinogen.

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

Chromium (VI)

Cancer

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

Carbon dioxide

Asphyxia

Carbon monoxide
Nitrogen dioxide

Carboxyhemoglobinemia
Lower respiratory tract irritation

12. ECOLOGICAL INFORMATION

Ecotoxicity

Acute hazards to the aquatic environment:

Fish

Product: Not classified.

Specified substance(s):

Molybdenum LC 50 (Rainbow trout,donaldson trout (Oncorhynchus mykiss), 96 h): 800 mg/l
Sodium fluorosilicate LC 50 (Bluegill (Lepomis macrochirus), 96 h): 49 mg/l

Aquatic Invertebrates

Product: Not classified.

Specified substance(s):

Manganese EC 50 (Water flea (Daphnia magna), 48 h): 40 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 NOEC (Daphnia magna): 30 mg/l NOEC (Lumbriculus variegatus): >= 100 mg/l
(naturally occurring) 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
Magnesium NOEC (Daphnid): 110.378 mg/l NOEC (Mysid shrimp): 4,288.534 mg/l
Molybdenum NOEC (Daphnia magna): 112 mg/l NOEC (Hyalella azteca): >= 345.1 mg/l
NOEC (Daphnia magna): 368.3 mg/l NOEC (Hyalella azteca): 103.6 mg/l
NOEC (Chironomus riparius): > 1,564 mg/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

Toxicity to Aquatic Plants

Product: Not classified.

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.

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.

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.
5000lbs.

Chromium and chromium alloys or compounds (as Cr)

Superfund Amendments and Reauthorization Act of 1986 (SARA)

Hazard categories

Not classified

Not classified

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

Chromium and chromium alloys or compounds (as Cr)

Reporting threshold for other users

10000 lbs

10000 lbs

Reporting threshold for manufacturing and processing

25000 lbs.

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, Vanadium pentoxide, which is [are] known to the State of California to cause cancer.

For more information go to 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

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

No ingredient regulated by NJ Right-to-Know Law present.

US. Massachusetts RTK - Substance List

Chemical Identity

Chromium and chromium alloys or compounds (as Cr)

Quartz

Vanadium pentoxide

Chromium oxide

Phosphorus

US. Pennsylvania RTK - Hazardous Substances

Chemical Identity

Titanium dioxide (naturally occurring)

Manganese

Chromium and chromium alloys or compounds (as Cr)

US. Rhode Island RTK

No ingredient regulated by RI Right-to-Know Law present.

Canada Federal Regulations

List of Toxic Substances (CEPA, Schedule 1)

Chemical Identity

Molybdenum

Silicon

Sodium fluorosilicate

Iron oxide

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)

NPRI

Not Regulated

Greenhouse Gases

Not Regulated

Controlled Drugs and Substances Act

CA CDSI Not Regulated

CA CDSII Not Regulated

CA CDSIII Not Regulated

CA CDSIV	Not Regulated
CA CDSV	Not Regulated
CA CDSVII	Not Regulated
CA CDSVIII	Not Regulated

Precursor Control Regulations
Not Regulated

Mexico. Substances subject to reporting for the pollutant release and transfer registry (PRTR): Not applicable

Inventory Status:

Australia Industrial Chem. Act (AIC):	On or in compliance with the inventory
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:	On or in compliance with the inventory
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:	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.
EINECS, ELINCS or NLP:	On or in compliance with the inventory
Vietnam National Chemical Inventory:	On or in compliance with the inventory

16. OTHER INFORMATION

Definitions:

Revision Date: 03/26/2025

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. 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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