

CHEMICAL PRODUCT SAFETY DATA SHEET

Prepared in accordance with GB/T 16483 and GB/T 17519.

1. PRODUCT AND COMPANY IDENTIFICATION

Product Name: PRIMALLOY® JS-316L**Product Size:** 5.0 mm**Other means of identification****SDS number:** 200000015244**Issue Date:** 19.05.2020**Revision Date:** 19.05.2020**Version #:** 1.0**Recommended use and restriction on use****Recommended use:** SMAW (Shielded Metal Arc Welding)**Restrictions on use:** Not known. Read this SDS before using this product.**Manufacturer/Importer/Supplier/Distributor Information****Company Name:** The Shanghai Lincoln Electric Co., Ltd.**Address:** No. 195, Lane 5008, Hu Tai Road
Shanghai 201907
China**Telephone:** +86 21 6673 4530**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).

Emergency Overview**Form:** Solid**Physical state:** Solid**Hazard Statement(s):** Welding arc and sparks can ignite combustible and flammable products.
Arc rays can injure eyes and burn skin. Electric shock can kill.**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
Nickel	7440-02-0
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	20 - <50%
Chromium and chromium alloys or compounds (as Cr)	7440-47-3	10 - <20%
Titanium dioxide	13463-67-7	5 - <10%
Nickel	7440-02-0	5 - <10%
Limestone	1317-65-3	1 - <5%
Manganese	7439-96-5	1 - <5%
Potassium silicate	1312-76-1	1 - <5%
Calcium fluoride	7789-75-5	1 - <5%
Feldspar	68476-25-5	1 - <5%
Aluminum oxide	1344-28-1	1 - <5%
Sodium silicate	1344-09-8	0.1 - <1%
Potassium oxide	12136-45-7	0.1 - <1%
Quartz	14808-60-7	0.1 - <1%

Kaolin	1332-58-7	0.1 - <1%
Iron oxide	1309-37-1	0.1 - <1%
Hydroxyethyl cellulose	9004-62-0	0.1 - <1%
Molybdenum	7439-98-7	0.1 - <1%
Copper and/or copper alloys and compounds (as Cu)	7440-50-8	0.1 - <1%
Silicon	7440-21-3	0.1 - <1%
Silicon dioxide (amorphous)	7631-86-9	0.1 - <1%
Zirconium oxide	1314-23-4	0.1 - <1%
Magnesite	546-93-0	0.1 - <1%
Vanadium alloys (as V)	7440-62-2	0.1 - <1%
Cobalt and compounds (as Co)	7440-48-4	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 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 firefighters

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. 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.

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: China

Chemical Identity	Type	Exposure Limit Values	Source
Chromium and chromium alloys or compounds (as Cr) - as Cr	PC-TWA	0.05 mg/m ³	China. OELs (Occupational Exposure Limits for Hazardous Agents in the Workplace) (GBZ 2.1), as amended (03 2008)
Titanium dioxide - Total dust.	PC-TWA	8 mg/m ³	China. OELs (Occupational Exposure Limits for Hazardous Agents in the Workplace) (GBZ 2.1), as amended (03 2008)
Nickel	PC-TWA	1 mg/m ³	China. OELs (Occupational Exposure Limits for Hazardous Agents in the Workplace) (GBZ 2.1), as amended (03 2008)
Limestone - Respirable dust.	PC-TWA	4 mg/m ³	China. OELs (Occupational Exposure Limits for Hazardous Agents in the Workplace) (GBZ 2.1), as amended (03 2008)
Limestone - Total dust.	PC-TWA	8 mg/m ³	China. OELs (Occupational Exposure Limits for Hazardous Agents in the Workplace) (GBZ 2.1), as amended (03 2008)
Manganese - as MnO ₂	PC-TWA	0.15 mg/m ³	China. OELs (Occupational Exposure Limits for Hazardous Agents in the Workplace) (GBZ 2.1), as amended (03 2008)
Calcium fluoride - Total dust.	PC-TWA	1 mg/m ³	China. OELs (Occupational Exposure Limits for Hazardous Agents in the Workplace) (GBZ 2.1), as amended (03 2008)
Calcium fluoride - as F	PC-TWA	2 mg/m ³	China. OELs (Occupational Exposure Limits for Hazardous Agents in the Workplace) (GBZ 2.1), as amended (03 2008)
Calcium fluoride - Respirable dust.	PC-TWA	0.7 mg/m ³	China. OELs (Occupational Exposure Limits for Hazardous Agents in the Workplace) (GBZ 2.1), as amended (03 2008)
Aluminum oxide - Total dust.	PC-TWA	4 mg/m ³	China. OELs (Occupational Exposure Limits for Hazardous Agents in the Workplace) (GBZ 2.1), as amended (03 2008)
Quartz - Total dust.	PC-TWA	0.7 mg/m ³	China. OELs (Occupational Exposure Limits for Hazardous Agents in the Workplace) (GBZ 2.1), as amended (03 2008)
	PC-TWA	1 mg/m ³	China. OELs (Occupational Exposure Limits for Hazardous Agents in the Workplace) (GBZ 2.1), as amended (03 2008)
Quartz - Respirable dust.	PC-TWA	0.3 mg/m ³	China. OELs (Occupational Exposure Limits for Hazardous Agents in the Workplace) (GBZ 2.1), as amended (03 2008)
	PC-TWA	0.7 mg/m ³	China. OELs (Occupational Exposure Limits for Hazardous Agents in the Workplace) (GBZ 2.1), as amended (03 2008)
Quartz - Total dust.	PC-TWA	0.5 mg/m ³	China. OELs (Occupational Exposure Limits for Hazardous Agents in the Workplace) (GBZ 2.1), as amended (03 2008)
Quartz - Respirable dust.	PC-TWA	0.2 mg/m ³	China. OELs (Occupational Exposure Limits for Hazardous Agents in the Workplace) (GBZ 2.1), as amended (03 2008)

Molybdenum - as Mo	PC-TWA	6 mg/m3	2.1), as amended (03 2008) China. OELs (Occupational Exposure Limits for Hazardous Agents in the Workplace) (GBZ 2.1), as amended (03 2008)
Copper and/or copper alloys and compounds (as Cu) - Dust. - as Cu	PC-TWA	1 mg/m3	China. OELs (Occupational Exposure Limits for Hazardous Agents in the Workplace) (GBZ 2.1), as amended (03 2008)
Copper and/or copper alloys and compounds (as Cu) - Fume. - as Cu	PC-TWA	0.2 mg/m3	China. OELs (Occupational Exposure Limits for Hazardous Agents in the Workplace) (GBZ 2.1), as amended (03 2008)
Zirconium oxide - as Zr	PC-STEL	10 mg/m3	China. OELs (Occupational Exposure Limits for Hazardous Agents in the Workplace) (GBZ 2.1), as amended (03 2008)
	PC-TWA	5 mg/m3	China. OELs (Occupational Exposure Limits for Hazardous Agents in the Workplace) (GBZ 2.1), as amended (03 2008)
Cobalt and compounds (as Co) - as Co	PC-TWA	0.05 mg/m3	China. OELs (Occupational Exposure Limits for Hazardous Agents in the Workplace) (GBZ 2.1), as amended (03 2008)
	PC-STEL	0.1 mg/m3	China. OELs (Occupational Exposure Limits for Hazardous Agents in the Workplace) (GBZ 2.1), as amended (03 2008)

Occupational Exposure Limits: US

Chemical Identity	Type	Exposure Limit Values	Source
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)
Chromium and chromium alloys or compounds (as Cr) - Inhalable fraction. - as Cr(0)	TWA	0.5 mg/m3	US. ACGIH Threshold Limit Values, as amended (03 2018)
Titanium dioxide	TWA	10 mg/m3	US. ACGIH Threshold Limit Values, as amended (12 2010)
Titanium dioxide - Total dust.	PEL	15 mg/m3	US. OSHA Table Z-1 Limits for Air Contaminants (29 CFR 1910.1000) (02 2006)
Nickel - Inhalable fraction.	TWA	1.5 mg/m3	US. ACGIH Threshold Limit Values, as amended (12 2010)
Nickel - as Ni	PEL	1 mg/m3	US. OSHA Table Z-1 Limits for Air Contaminants (29 CFR 1910.1000) (02 2006)
Limestone - Total dust.	PEL	15 mg/m3	US. OSHA Table Z-1 Limits for Air Contaminants (29 CFR 1910.1000) (02 2006)
Limestone - Respirable fraction.	PEL	5 mg/m3	US. OSHA Table Z-1 Limits for Air Contaminants (29 CFR 1910.1000) (02 2006)
Manganese - Fume. - as Mn	Ceiling	5 mg/m3	US. OSHA Table Z-1 Limits for Air Contaminants (29 CFR 1910.1000) (02 2006)
Manganese - Inhalable fraction. - as Mn	TWA	0.1 mg/m3	US. ACGIH Threshold Limit Values, as amended (03 2014)
Manganese - Respirable fraction. - as Mn	TWA	0.02 mg/m3	US. ACGIH Threshold Limit Values, as amended (03 2014)
Calcium fluoride - as F	TWA	2.5 mg/m3	US. ACGIH Threshold Limit Values, as amended (12 2010)
	PEL	2.5 mg/m3	US. OSHA Table Z-1 Limits for Air Contaminants (29 CFR 1910.1000) (02 2006)
Calcium fluoride - Dust.	TWA	2.5 mg/m3	US. OSHA Table Z-2 (29 CFR 1910.1000) (02 2006)
Aluminum oxide - Respirable fraction.	TWA	1 mg/m3	US. ACGIH Threshold Limit Values, as amended (12 2010)
	PEL	5 mg/m3	US. OSHA Table Z-1 Limits for Air Contaminants (29 CFR 1910.1000) (02 2006)
Aluminum oxide - Total dust.	PEL	15 mg/m3	US. OSHA Table Z-1 Limits for Air Contaminants (29 CFR 1910.1000) (02 2006)
Aluminum oxide - Respirable fraction.	TWA	15 millions of particles per cubic foot of air	US. OSHA Table Z-3 (29 CFR 1910.1000) (03 2016)
	TWA	5 mg/m3	US. OSHA Table Z-3 (29 CFR 1910.1000) (03 2016)
Aluminum oxide - Total dust.	TWA	15 mg/m3	US. OSHA Table Z-3 (29 CFR 1910.1000) (03 2016)

	TWA	50 millions of particles per cubic foot of air	US. OSHA Table Z-3 (29 CFR 1910.1000) (03 2016)
Quartz - Respirable fraction.	TWA	0.025 mg/m3	US. ACGIH Threshold Limit Values, as amended (12 2010)
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.	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)
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, as amended (03 2014)
Molybdenum - Respirable fraction. - as Mo	TWA	3 mg/m3	US. ACGIH Threshold Limit Values, as amended (03 2014)
Copper and/or copper alloys and compounds (as Cu) - Dust and mist. - as Cu	TWA	1 mg/m3	US. ACGIH Threshold Limit Values, as amended (03 2014)
Copper and/or copper alloys and compounds (as Cu) - Fume. - as Cu	TWA	0.2 mg/m3	US. ACGIH Threshold Limit Values, as amended (03 2014)
	PEL	0.1 mg/m3	US. OSHA Table Z-1 Limits for Air Contaminants (29 CFR 1910.1000) (02 2006)
Copper and/or copper alloys and compounds (as Cu) - Dust and mist. - as Cu	PEL	1 mg/m3	US. OSHA Table Z-1 Limits for Air Contaminants (29 CFR 1910.1000) (02 2006)
Zirconium oxide - as Zr	STEL	10 mg/m3	US. ACGIH Threshold Limit Values, as amended (12 2010)
	TWA	5 mg/m3	US. ACGIH Threshold Limit Values, as amended (12 2010)
	PEL	5 mg/m3	US. OSHA Table Z-1 Limits for Air Contaminants (29 CFR 1910.1000) (02 2006)
Cobalt and compounds (as Co) - as Co	TWA	0.02 mg/m3	US. ACGIH Threshold Limit Values, as amended (12 2010)
Cobalt and compounds (as Co) - Dust and fume. - as Co	PEL	0.1 mg/m3	US. OSHA Table Z-1 Limits for Air Contaminants (29 CFR 1910.1000) (02 2006)

Biological Limit Values: China

None of the components have assigned exposure limits.

Biological Limit Values: ACGIH

Chemical Identity	Exposure Limit Values	Source
Calcium fluoride (Fluoride: Sampling time: Prior to shift.)	2 mg/l (Urine)	ACGIH BEI (03 2013)
Calcium fluoride (Fluoride: Sampling time: End of shift.)	3 mg/l (Urine)	ACGIH BEI (03 2013)
Cobalt and compounds (as Co) (Cobalt: Sampling time: End of shift at end of work week.)	15 µg/l (Urine)	ACGIH BEI (03 2015)

Additional exposure limits under the conditions of use: China

Chemical Identity	Type	Exposure Limit Values	Source
Carbon dioxide	PC-STEL	18,000 mg/m3	China. OELs (Occupational Exposure Limits for Hazardous Agents in the Workplace) (GBZ 2.1), as amended
	PC-TWA	9,000 mg/m3	China. OELs (Occupational Exposure Limits for Hazardous Agents in the Workplace) (GBZ 2.1), as amended

			2.1), as amended
Carbon monoxide	MAC	15 mg/m3	China. OELs (Occupational Exposure Limits for Hazardous Agents in the Workplace) (GBZ 2.1), as amended
	PC-STEL	30 mg/m3	China. OELs (Occupational Exposure Limits for Hazardous Agents in the Workplace) (GBZ 2.1), as amended
	PC-TWA	20 mg/m3	China. OELs (Occupational Exposure Limits for Hazardous Agents in the Workplace) (GBZ 2.1), as amended
	MAC	20 mg/m3	China. OELs (Occupational Exposure Limits for Hazardous Agents in the Workplace) (GBZ 2.1), as amended
Nitrogen dioxide	PC-STEL	10 mg/m3	China. OELs (Occupational Exposure Limits for Hazardous Agents in the Workplace) (GBZ 2.1), as amended
	PC-TWA	5 mg/m3	China. OELs (Occupational Exposure Limits for Hazardous Agents in the Workplace) (GBZ 2.1), as amended
Ozone	MAC	0.3 mg/m3	China. OELs (Occupational Exposure Limits for Hazardous Agents in the Workplace) (GBZ 2.1), as amended
Manganese - as MnO2	PC-TWA	0.15 mg/m3	China. OELs (Occupational Exposure Limits for Hazardous Agents in the Workplace) (GBZ 2.1), as amended
Chromium (VI) - as Cr	PC-TWA	0.05 mg/m3	China. OELs (Occupational Exposure Limits for Hazardous Agents in the Workplace) (GBZ 2.1), as amended
Nickel	PC-TWA	1 mg/m3	China. OELs (Occupational Exposure Limits for Hazardous Agents in the Workplace) (GBZ 2.1), as amended
Fluorides (as F) - as F	PC-TWA	2 mg/m3	China. OELs (Occupational Exposure Limits for Hazardous Agents in the Workplace) (GBZ 2.1), as amended

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, as amended (12 2010)
	STEL	30,000 ppm	US. ACGIH Threshold Limit Values, as amended (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	TWA	25 ppm	US. ACGIH Threshold Limit Values, as amended (12 2010)
	PEL	50 ppm 55 mg/m3	US. OSHA Table Z-1 Limits for Air Contaminants (29 CFR 1910.1000) (02 2006)
Nitrogen dioxide	TWA	0.2 ppm	US. ACGIH Threshold Limit Values, as amended (02 2012)
	Ceiling	5 ppm 9 mg/m3	US. OSHA Table Z-1 Limits for Air Contaminants (29 CFR 1910.1000) (02 2006)
Ozone	PEL	0.1 ppm 0.2 mg/m3	US. OSHA Table Z-1 Limits for Air Contaminants (29 CFR 1910.1000) (02 2006)
	TWA	0.05 ppm	US. ACGIH Threshold Limit Values, as amended (03 2014)
	TWA	0.20 ppm	US. ACGIH Threshold Limit Values, as amended (03 2014)
	TWA	0.10 ppm	US. ACGIH Threshold Limit Values, as amended (03 2014)
	TWA	0.08 ppm	US. ACGIH Threshold Limit Values, as amended (03 2014)
Manganese - Fume. - as Mn	Ceiling	5 mg/m3	US. OSHA Table Z-1 Limits for Air Contaminants (29 CFR 1910.1000) (02 2006)
Manganese - Inhalable fraction. - as Mn	TWA	0.1 mg/m3	US. ACGIH Threshold Limit Values, as amended (03 2014)
Manganese - Respirable fraction. - as Mn	TWA	0.02 mg/m3	US. ACGIH Threshold Limit Values, as amended (03 2014)

Chromium (VI)	TWA	0.005 mg/m ³	US. OSHA Specifically Regulated Substances (29 CFR 1910.1001-1050) (02 2006)
	OSHA_ACT	0.0025 mg/m ³	US. OSHA Specifically Regulated Substances (29 CFR 1910.1001-1050) (02 2006)
	Ceiling	0.1 mg/m ³	US. OSHA Table Z-2 (29 CFR 1910.1000) (02 2006)
Chromium (VI) - Inhalable fraction. - as Cr(VI)	TWA	0.0002 mg/m ³	US. ACGIH Threshold Limit Values, as amended (03 2018)
	TWA	0.0002 mg/m ³	US. ACGIH Threshold Limit Values, as amended (03 2018)
	STEL	0.0005 mg/m ³	US. ACGIH Threshold Limit Values, as amended (03 2018)
	STEL	0.0005 mg/m ³	US. ACGIH Threshold Limit Values, as amended (03 2018)
Nickel - Inhalable fraction.	TWA	1.5 mg/m ³	US. ACGIH Threshold Limit Values, as amended (12 2010)
Nickel - as Ni	PEL	1 mg/m ³	US. OSHA Table Z-1 Limits for Air Contaminants (29 CFR 1910.1000) (02 2006)
Chromium oxide - as Cr	PEL	0.5 mg/m ³	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/m ³	US. ACGIH Threshold Limit Values, as amended (03 2018)
Fluorides (as F) - as F	TWA	2.5 mg/m ³	US. ACGIH Threshold Limit Values, as amended (12 2010)
	PEL	2.5 mg/m ³	US. OSHA Table Z-1 Limits for Air Contaminants (29 CFR 1910.1000) (02 2006)
Fluorides (as F) - Dust.	TWA	2.5 mg/m ³	US. OSHA Table Z-2 (29 CFR 1910.1000) (02 2006)

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/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, 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.

9. PHYSICAL AND CHEMICAL PROPERTIES

Appearance:	Steel rod with extruded flux coating.
Physical state:	Solid
Form:	Solid
Color:	No data available.
Odor:	No data available.
Odor threshold:	No data available.
pH:	No data available.
Melting point/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</p>

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.

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 |
| Limestone | LD 50 (Rat): 6,450 mg/kg |

Calcium fluoride	LD 50 (Rat): 4,250 mg/kg
Sodium silicate	LD 50 (Rat): 1.1 g/kg
Copper and/or copper alloys and compounds (as Cu)	LD 50 (Rat): 481 mg/kg
Cobalt and compounds (as Co)	LD 50 (Rat): 550 mg/kg

Dermal**Product:** Not classified**Inhalation****Product:** Not classified**Specified substance(s):**

Aluminum oxide	LC 50 (Rat, 4 h): > 2.3 mg/l
Cobalt and compounds (as Co)	LC 50 (Rat, 4 h): ≤ 0.05 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**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.
Nickel	Overall evaluation: 2B. Possibly carcinogenic to humans.
Quartz	Overall evaluation: 1. Carcinogenic to humans.
Cobalt and compounds (as Co)	Overall evaluation: 2B. Possibly carcinogenic to humans.

Germ Cell Mutagenicity**In vitro****Product:** Not classified**In vivo****Product:** Not classified**Reproductive toxicity****Product:** Not classified**Specific Target Organ Toxicity - Single Exposure****Product:** Not classified**Specific Target Organ Toxicity - Repeated Exposure****Product:** Not classified**Aspiration Hazard****Product:** Not classified

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.

Nickel

Nickel and its compounds are on the IARC and NTP lists as posing respiratory cancer risk, and are skin sensitizers with symptoms ranging from slight itch to severe dermatitis.

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.

Nickel

Overall evaluation: 2B. Possibly carcinogenic to humans.

Chromium oxide

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

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

Carbon dioxide

Asphyxia

Carbon monoxide

Carboxyhemoglobinemia

Nitrogen dioxide

Lower respiratory tract irritation

Nickel

Dermatitis Pneumoconiosis

12. ECOLOGICAL INFORMATION**Ecotoxicity**

Acute hazards to the aquatic environment:**Fish**

Product:	Not classified.
Specified substance(s):	
Nickel	LC 50 (Fathead minnow (<i>Pimephales promelas</i>), 96 h): 2.916 mg/l
Calcium fluoride	LC 50 (48 h): 299 mg/l LC 50 (96 h): 108 mg/l LC 100 (<i>Tinca vulgaris</i> , 48 h): > 3,000 mg/l LC 50 (96 h): 340 mg/l LC 50 (96 h): 165 mg/l
Sodium silicate	LC 50 (Western mosquitofish (<i>Gambusia affinis</i>), 96 h): 1,800 mg/l
Molybdenum	LC 50 (Rainbow trout, donaldson trout (<i>Oncorhynchus mykiss</i>), 96 h): 800 mg/l
Copper and/or copper alloys and compounds (as Cu)	LC 50 (Fathead minnow (<i>Pimephales promelas</i>), 96 h): 1.6 mg/l
Cobalt and compounds (as Co)	LC 50 (Rainbow trout, donaldson trout (<i>Oncorhynchus mykiss</i>), 28 d): > 0.17 - < 15.61 mg/l

Aquatic Invertebrates

Product:	Not classified.
Specified substance(s):	
Nickel	EC 50 (Water flea (<i>Daphnia magna</i>), 48 h): 1 mg/l
Manganese	EC 50 (Water flea (<i>Daphnia magna</i>), 48 h): 40 mg/l
Calcium fluoride	EC 50 (<i>Daphnia magna</i> ; <i>Daphnia</i> sp., 120 h): 20 - 39 mg/l EC 50 (<i>Daphnia magna</i> ; <i>Daphnia</i> sp., 24 h): 352 mg/l EC 50 (<i>Daphnia magna</i> ; <i>Daphnia</i> sp., 96 h): 26 - 48 mg/l EC 50 (<i>Daphnia magna</i> ; <i>Daphnia</i> sp., 48 h): 97 mg/l EC 50 (<i>Daphnia magna</i> ; <i>Daphnia</i> sp., 48 h): 153 mg/l
Sodium silicate	EC 50 (Water flea (<i>Ceriodaphnia dubia</i>), 48 h): 22.94 - 49.01 mg/l
Copper and/or copper alloys and compounds (as Cu)	EC 50 (Water flea (<i>Daphnia magna</i>), 48 h): 0.102 mg/l

Chronic hazards to the aquatic environment:**Fish**

Product:	Not classified.
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Aquatic Invertebrates

Product:	Not classified.
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Toxicity to Aquatic Plants

Product:	Not classified.
Specified substance(s):	
Copper and/or copper alloys and compounds (as Cu)	LC 50 (Green algae (<i>Scenedesmus dimorphus</i>), 3 d): 0.0623 mg/l

Persistence and Degradability**Biodegradation**

Product:	No data available.
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Bioaccumulative potential**Bioconcentration Factor (BCF)**

Product:	No data available.
Specified substance(s):	
Nickel	Zebra mussel (<i>Dreissena polymorpha</i>), Bioconcentration Factor (BCF): 5,000 - 10,000 (Lotic) Bioconcentration factor calculated using dry weight tissue conc
Copper and/or copper alloys and compounds (as Cu)	Blue-green algae (<i>Anacystis nidulans</i>), Bioconcentration Factor (BCF): 36.01 (Static)

Cobalt and compounds
(as Co)

Brown shrimp (*Penaeus aztecus*), Bioconcentration Factor (BCF): > 2,250 -
< 2,500 (Static)

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

CNDG

UN Number:

UN Proper Shipping Name:

NOT DG REGULATED

Transport Hazard Class(es)

Class:

NR

Label(s):

—

EmS No.:

Packing Group:

—

Marine Pollutant:

No

Special precautions for user:

Not regulated.

IMDG

UN 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:

Proper Shipping Name:

NOT DG REGULATED

Transport Hazard Class(es):

Class:

NR

Label(s):

—

Packing Group: —
Marine Pollutant: No
Cargo aircraft only: Allowed.

15. REGULATORY INFORMATION

China. National Catalogue of Hazardous Wastes

Calcium fluoride Listed.

China. Highly Toxic Chemicals (Dept. of Health Notice)

Chromium and chromium alloys or compounds (as Cr) Listed.

Nickel Listed.

Manganese Listed.

Calcium fluoride Listed.

China. Very Toxic Chemicals (Public Notice No. 2)

China. Precursor Chemicals (Decree No. 445 of the PRC on Regulation for Administration of Precursor Chemicals, Appendix: Categories 1-3)

Not Regulated

China: CWC. Controlled Chemicals List (Regulations on the Administration of Controlled Chemicals, Decree No. 190, Dec. 27, 1995, as amended)

Not Regulated

China. Explosive Precursor Hazardous Chemicals (Ministry of Public Safety, 2011 version)

Not Regulated

China. National List of Ozone Depleting Substances (MEP/NDRC/MIIT Joint Notice No. 2010-72)

Not Regulated

China. Catalog of Hazardous Chemicals

Potassium oxide Listed.

Silicon Listed.

Inventory Status:

Australia AICS:	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:	One or more components are not listed or are exempt from listing.
China Inv. Existing Chemical Substances:	On or in compliance with the inventory
Japan (ENCS) List:	One or more components are not listed or are exempt from listing.
Japan ISHL Listing:	One or more components are not listed or are exempt from listing.
Japan Pharmacopoeia Listing:	One or more components are not listed or are exempt from listing.
Korea Existing Chemicals Inv. (KECI):	One or more components are not listed or are exempt from listing.
Mexico INSQ:	One or more components are not listed or are exempt from listing.
New Zealand Inventory of Chemicals:	On or in compliance with the inventory
Philippines PICCS:	On or in compliance with the inventory
Taiwan Chemical Substance Inventory:	On or in compliance with the inventory
US TSCA Inventory:	One or more components are not listed or are exempt from listing.
EINECS, ELINCS or NLP:	One or more components are not listed or are exempt from listing.

16. OTHER INFORMATION

Definitions:

Revision Date: 19.05.2020

Further Information:

Additional information is available by request.

References:

Prepared in accordance with GB/T 16483 and GB/T 17519.

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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