



SAFETY DATA SHEET

SECTION 1: IDENTIFICATION

Material Name: WROUGHT ALUMINUM PRODUCTS, 6xxx SERIES ALLOYS
Chemical Formula: Mixture
Recommended Restrictions: Does not include alloys: 6012, 6018, 6042, 6064, 6064A, 6068, 6262; 6012A, 6020, 6021, 6023, 6028, 6040, 6041, 6262A
Product Use: Various fabricated aluminum parts and products
Synonym(s): 6xxx series alloys *

Manufacturer Information:

Pennex Aluminum Company, LLC.
50 Community Street
Wellsville, PA 17365
(717) 432-9647

Emergency Information: Professional Emergency Resources Services (PERS)
800-633-8253

Website: For a current Safety Data Sheet, refer to Pennex website:
www.Pennexaluminum.com

SECTION 2: HAZARDS IDENTIFICATION

DANGER



General Hazard Statement: solid metallic products are generally classified as “articles” and do not constitute a hazardous materials in solid form under definitions of the OSHA Hazard Communication Standard (29 CFR 1910.1200). Any articles manufactured from these solid products would be generally classified as non-hazardous. However some hazardous elements contained in these products can be emitted under certain processing conditions such as but not limited to: burning, melting, cutting, brazing, grinding, machining, milling and welding. Products in the solid state present no fire or explosion hazard. Small chips, fines and dust may ignite readily, though. The following classification information is for the hazardous elements which may be released during processing.

Solid. Silver colored. Odorless. Non-combustible as supplied. Small chips, fine turnings and dust from processing may be readily ignitable. Explosion/fire hazards may be present when (See Sections 5, 7 and 10 for additional information):

- Dust or fines are dispersed in air.

Emergency Overview:

- Chips, dust or fines are in contact with water.
- Dust and fines are in contact with certain metal oxides (e.g., rust, copper oxide).

- Molten metal in contact with water/moisture or certain metal oxides (e.g., rust, copper oxide).

Dust and fume from processing: Can cause irritation of the eyes, skin and respiratory tract.

Potential Health Effects:

The health effects listed below are not likely to occur unless processing of this product generates dusts or fumes. The following statements summarize the health effects generally expected in cases of overexposures. User specific situations should be assessed by a qualified individual. Additional health information can be found in Section 11.

Eyes: Dust and fumes from processing: Can cause irritation.

Skin: Contact with residual oil/oil coating: Can cause irritation. Prolonged or repeated skin contact may cause dermatitis. Dust and fumes from processing: Can cause irritation. Prolonged or repeated skin contact may cause sensitization and allergic contact dermatitis.

Health effects from mechanical processing (e.g., cutting, grinding):

Dust: Can cause irritation of the upper respiratory tract. Chronic overexposures: Can cause reduction in the number of red blood cells (anemia), skin abnormalities (pigmentation changes), central nervous system damage, secondary Parkinson's disease and reproduction harm.

Additional health effects from elevated temperature processing (e.g., welding, melting):

Dust and fumes: Can cause irritation of the respiratory tract. Acute overexposures: Can cause metal fever (nausea, chills, fever, shortness of breath and malaise), reduced ability of the blood to carry oxygen (methemaglobin) and the accumulation of fluid in the lungs (pulmonary edema). Chronic overexposures: Can cause respiratory sensitization and lung cancer.

Carcinogenicity and Reproductive Hazard:

Product as shipped: Does not present any cancer or reproductive hazards.

Dust from mechanical processing: Can present a cancer hazard (Nickel, Lead). Can present a reproductive hazard (Lead, Manganese).

Dust and fumes from processing: Can present a cancer hazard (Hexavalent chromium compounds, Nickel compounds, Lead compounds, Welding fumes). Can present a reproductive hazard (Lead compounds, Manganese compounds).

**Medical Contitions
aggravated by exposure to
product:**

Dust and fumes from processing: Asthma, chronic lung disease,
Secondary Parkinson's disease and skin rashes.

GHS Classification:

Flammable Solid – category 1
Eye Damage Sensitizer – category 2B
Skin Sensitizer – Category 1
Germ Cell Mutagenicity – Category 2
Carcinogenicity – category 1B
Specific Target Organ Toxicity (Repeated Exposure) – category 1
Hazardous to the Aquatic Environment – Acute hazard – category 1
Hazardous to the Aquatic Environment – Chronic hazard – category 2

GHS Label Elements

Symbols: **Flammable, Health hazard, Dangerous for the environment**

Signal Word: **DANGER**

Hazard Statements:

Flammable solid
Causes eye irritation
May cause allergy or asthma symptoms or breathing difficulties if inhaled
May cause an allergic skin reaction
Suspected of causing genetic defects
May cause cancer
Causes damage to respiratory system through prolonged or repeated exposure
Very toxic to aquatic life

Precautionary Statements:

Keep away from heat/sparks/open flames/hot surfaces – no smoking
Use explosion proof electrical/ventilation/lighting equipment
Wear protective gloves/protective clothing/eye protection/face protection
Do not breathe dust/fume
In case if inadequate ventilation wear respiratory protection

Prevention:

Containment work clothing should not be allowed out of the workplace
Obtained special instructions before use
Do not handle until all safety precautions have been read and understood
Wash thoroughly after handling
Do not eat, drink, or smoke when using this product
Avoid releases to the environment

SECTION 3: COMPOSITION / INFORMATION ON INGREDIENTS

Composition Comments: Complete composition is provided below and may include some components classified as non-hazardous.

COMPONENTS	CAS #	%
Aluminum	7429-90-5	>90
Magnesium	7439-95-4	<3.1
Silicon	7440-21-3	<1.9
Manganese	7439-96-5	<1.5
Copper	7440-50-8	<1.4
Iron	7439-89-6	<1.2
Zinc	7440-66-6	<1.1
Chromium	7440-47-3	<0.5
Lead †	7439-92-1	0 - 0.4
Nickel ‡	7440-02-0	0 - 0.2

Additional Information:

† - Present as impurity. While Lead is not intentionally added to this mixture, it could potentially enter through the recycle stream. ‡ - Present as impurity. While Nickel is not intentionally added to this mixture, it could potentially enter through the recycle stream. Additional compounds which may be formed during processing are listed in Section 8.

SECTION 4: FIRST AID MEASURES

Eye Contact: Dust and fumes from processing: Rinse eyes with plenty of water or saline for at least 15 minutes. Consult a physician.

Skin Contact: Dust and fumes from processing: Wash with soap and water for at least 15 minutes. Get medical attention if irritation develops or persists

Inhalation: Dust and fumes from processing: Remove to fresh air. Check for clear airway, breathing, and presence of pulse. Provide cardiopulmonary resuscitation for persons without pulse or respirations. Consult a physician.

Ingestion: Do not induce vomiting. Call a physician or Poison Control Center immediately. Drink plenty of water. Never give anything by mouth to an unconscious person.

SECTION 5: FIRE-FIGHTING MEASURES

Flammable/Combustible This product does not present fire or explosion hazards as shipped. Small chips, fine turnings, and **Properties** dust from processing may be readily ignitable.

Fire / Explosion Hazards:

May be a potential hazard under the following conditions:

Dust clouds may be explosive. Even a minor dust cloud can explode violently. Dust accumulation on the floor, ledges and beams can present a risk of ignition, flame propagation and secondary explosions.

Chips, fines and dust in contact with water can generate flammable/explosive hydrogen gas. These gases could present an explosion hazard in confined or poorly ventilated spaces.

Dust and fines in contact with certain metal oxides (e.g., rust, copper oxide). A thermite reaction, with considerable heat generation, can be initiated by a weak ignition source.

Molten metal in contact with water/moisture or certain metal oxides (e.g., rust, copper oxide). Moisture entrapped by molten metal can be explosive. Contact of molten aluminum with certain metal oxides can initiate a thermite reaction. Finely divided metals (e.g., powders or wire) may have enough surface oxide to produce thermite reactions/explosions.

Suitable Extinguishing Media:

Use Class D extinguishing agents on fines, dust or molten metal. Use coarse water spray on chips **media** and turnings.

Unsuitable Extinguishing Media:

DO NOT USE halogenated extinguishing agents on small chips/fines. **media** DO NOT USE water in fighting fires around molten metal. These fire extinguishing agents will react with the burning material.

Protection of Firefighters

Protective Equipment for Firefighters:

Fire fighters should wear NIOSH approved, positive pressure, self-contained breathing apparatus **firefighters** and full protective clothing when appropriate.

SECTION 6: ACCIDENTAL RELEASE MEASURES

Spill or Leak Procedure:

Collect scrap for recycling. If molten: Contain the flow using dry sand or salt flux as a dam. All tooling (e.g., shovels or hand tools) and containers which come in contact with molten metal must be preheated or specially coated, rust free and approved for such use. Allow the spill to cool before remelting as scrap.

Recovery and Neutralization:

Avoid dust formation. Collect scrap for recycling

Materials and Methods for Clean-up:

If product is molten, contain the flow using dry sand or salt flux as a dam. All tools and containers which come in contact with molten metal must be preheated or specially coated and rust free. Allow the spill to cool before remelting as scrap.

Emergency Measures:

Keep people away from and upwind of spill/leak

Personal Precautions and Protective Equipment:

Wear appropriate protective clothing and respiratory protection for the situation

Environmental Precautions:

Prevent further leakage or spillage if safe to do so. Prevent product from entering drains.
Do not flush into surface water or sanitary sewer system

SECTION 7: HANDLING AND STORAGE

Handling:

Keep material dry. Avoid generating dust. Avoid contact with sharp edges or heated metal. Hot and cold aluminum are not visually different. Hot aluminum does not necessarily glow red.

Requirements for Processes:

If processing of this product generates dust or if extremely fine particulate is generated, obtain **Which Generate Dusts** or and follow the safety procedures and equipment guides contained in Aluminum Association Bulletin **Fines** F-1 and National Fire Protection Association (NFPA) brochures listed in Section 16.

Use non-sparking handling equipment, tools and natural bristle brush. Cover and reseal partially empty containers. Provide grounding and bonding where necessary to prevent accumulation of static charges during metal dust handling and transfer operations (See Section 15).

Local ventilation and vacuum systems must be designed to handle explosive dusts. Dry vacuums and electrostatic precipitators must not be used, unless specifically approved for use with flammable/explosive dusts. Dust collection systems must be dedicated to aluminum dust only and should be clearly labeled as such. Do not co-mingle fines of aluminum with fines of iron, iron oxide (rust) or other metal oxides.

Do not allow chips, fines or dust to contact water, particularly in enclosed areas.

Avoid all ignition sources. Good housekeeping practices must be maintained. Dust accumulation on the floor, ledges and beams can present a risk of ignition, flame propagation and secondary explosions. Do not use compressed air to remove settled material from floors, beams or equipment.

Requirements for Remelting of Scrap Material or Ingot

Molten metal and water can be an explosive combination. The risk is greatest when there is sufficient molten metal to entrap or seal off the water. Water and other forms of contamination on or contained in scrap or remelt ingot are known to have caused explosions in melting operations. While the products may have minimal surface roughness and internal voids, there remains the possibility of moisture contamination or entrapment. If confined, even a few drops of water can lead to violent explosions.

All tooling, containers, molds and ladles which come in contact with molten metal must be preheated or specially coated, rust free and approved for such use. Any surfaces that may contact molten metal (e.g., concrete) should be specially coated.

Drops of molten metal in water (e.g. from plasma arc cutting), while not normally an explosion hazard, can generate enough flammable hydrogen gas to present an explosion hazard. Vigorous circulation of the water and removal of the particles minimize the hazards.

During melting operations, the following minimum guidelines should be observed:

- Inspect all materials prior to furnace charging and completely remove surface contamination such as water, ice, snow, deposits of grease and oil or other surface contamination resulting from weather exposure, shipment, or storage.
- Store materials in dry, heated areas with any cracks or cavities pointed downwards.
- Preheat and dry large items adequately before charging into a furnace containing molten metal. This is typically done by use of a drying oven or homogenizing furnace. The drying cycle should bring the metal temperature of the coldest item of the batch to 400°F (200°C) and then hold at that temperature for 6 hours.

Thermite explosions have been reported when aluminum alloys were melted in furnaces used for alloying with lead, bismuth or other metals with low melting temperatures. These metals, when added as high purity ingots, can seep through cracks in furnace liners and become oxidized. During subsequent melts in the furnace, molten aluminum can contact these metal oxides resulting in a thermite explosion.

SECTION 8: EXPOSURE CONTROL / PERSONAL PROTECTION

ENGINEERING CONTROLS

Dust and fumes from processing: Use with adequate explosion-proof ventilation designed to handle particulates to meet the limits listed in Section 8, Exposure Guidelines.

PERSONAL PROTECTIVE EQUIPMENT

Eye / Face Protection: Wear safety glasses with side shields.

Skin Protection: Wear impervious gloves to avoid repeated or prolonged skin contact with residual oils and to avoid any skin injury.

Respiratory Protection: Dust and fumes from processing: Use NIOSH-approved respiratory protection as specified by an Industrial Hygienist or other qualified professional if concentrations exceed the limits listed in Section 8. Suggested respiratory protection: P95, P100 for Lead.

Personnel who handle and work with molten metal should utilize primary protective clothing like polycarbonate face shields, fire resistant tapper's jackets, neck shades (snoods), leggings, spats and similar equipment to prevent burn injuries. In addition to primary protection, secondary or day-to-day work clothing that is fire resistant and sheds metal splash is recommended for use with molten metal. Synthetic materials should never be worn even as secondary clothing (undergarments).

General:

Minimize breathing oil vapors and mist. Remove oil contaminated clothing; launder or dry-clean before reuse. Remove oil contaminated shoes and thoroughly clean and dry before reuse. Cleanse skin thoroughly after contact, before breaks and meals, and at the end of the work period. Oil coating is readily removed from skin with waterless hand cleaners followed by a thorough washing with soap and water.

Sampling to establish lead level exposure is advised where exposure to airborne particulate or fumes is possible. Consult OSHA Lead Standard 29 CFR 1910.1025 for specific health/industrial hygiene precautions and requirements to follow when handling lead compounds.

Exposure Data

Components

U.S. - OSHA - Specifically Regulated Chemicals

Lead† (7439-92-1) 50 µg/m3 TWA (as Pb); 30 µg/m3 Action Level (as Pb, Poison - see 29 CFR 1910.1025)

Compounds Formed During Processing

U.S. - OSHA - Specifically Regulated Chemicals

Chromium (VI) compounds (18540-29-9) 2.5 µg/m3 Action Level (as Cr.); 5 µg/m3 TWA (as Cr, Cancer hazard - see 29 CFR 1910.1026)

Lead compounds, inorganic (CASNo. Not available) 50 µg/m3 TWA (as Pb); 30 µg/m3 Action Level (as Pb, Poison - see 29 CFR 1910.1025)

Occupational exposure limits

U.S. - OSHA Components Type Value Form

COMPONENT	CAS #	TWA	CEILING	FORM
Aluminum	7429-90-5	5 mg/m3		respirable fraction
		15 mg/m3		total dust
Chromium	7440-47-3	1 mg/m3		
Copper	7440-50-8	1 mg/m3		dust & mist
		0.1 mg/m3		fume
Lead †	7439-92-1	50 ug/m3		
Manganese	7439-96-5		5 mg/m3	fume
Nickel ‡	7440-02-0	1 mg/m3		
Silicon	7440-21-3	5 mg/m3		respirable fraction
		15 mg/m3		total dust

COMPOUNDS FORMED DURING PROCESSING

COMPONENT	Action	TWA	Ceiling	FORM
Aluminum oxide (non-fibrous) (1344-28-1)		5 mg/m ³		respirable fraction
		15 mg/m ³		total dust
Chromium (II) compounds (CAS No. not available)		0.5 mg/m ³		as Cr
Chromium III compounds (CAS No. not available)		0.5 mg/m ³		as Cr
Chromium (VI) compounds (18540-29-9)	2.5 ug/m ³	5 ug/m ³		as Cr
Iron oxide (1309-37-1)		10 mg/m ³		fume
Lead compounds, inorganic (CASNo. Not available)		50 ug/m ³		as Pb
Magnesium oxide (1309-48-4)		15 mg/m ³		fume, total particulate
Manganese compounds, inorganic (CAS No. not available)			5 mg/m ³	as Mn
Nickel compounds, insoluble (CASNo. Not available)		1 mg/m ³		as Ni
Nitric oxide (10102-43-9)		25 ppm		
		30 mg/m ³		
Nitrogen dioxide (10102-44-0)			5 ppm	
			9 mg/m ³	
Oil mist, mineral (8012-95-1)		5 mg/m ³		
Ozone (10028-15-6)		0.1 ppm		
Zinc oxide (1314-13-2)		5 mg/m ³		respirable fraction
		5 mg/m ³		fume
		15 mg/m ³		total dust

ACGIH COMPONENTS

COMPONENT	CAS #	TWA (mg/m ³)	CEILING (mg/m ³)	FORM
Aluminum	7429-90-5	1		respirable fraction
Chromium	7440-47-3	0.5		
Copper	7440-50-8	1		dust and mist, as Cu
		0.2		fume
Lead †	7439-92-1	0.05		

Manganese	7439-96-5	0.2		
Nickel ‡	7440-02-0	1.5		inhalable fraction

COMPOUNDS FORMED DURING PROCESSING

COMPONENT	CAS #	TWA (mg/m3)	CEILING (mg/m3)	FORM
Aluminum Oxide (non fibrous)	1344-28-1	1		respirable fraction
Chromium (III) compounds	CAS No. not available	0.5		as Cr
Chromium (VI) compounds, certain water insoluble forms	CAS No. not available	0.01		as Cr
Chromium (VI) compounds, certain water soluble forms	CAS No. not available	0.05		as Cr
Iron Oxide	1309-37-1	5		respirable fraction
Lead Compounds, inorganic	CAS No. not available	0.05		as Pb
Magnesium oxide	1309-48-4	10		inhalable fraction
Manganese compounds, inorganic	CAS No. not available	0.2		as Mn
Nickel compounds, insoluble	CAS No. not available	0.2		inhalable fraction

SECTION 9: PHYSICAL AND CHEMICAL PROPERTIES

Form:	Solid
Appearance:	Silver color
Boiling Point:	Not determined
Melting Point:	1030 - 1210 °F (554.4 - 654.4 °C)
Flash Point:	Not applicable
Autoignition Temperature:	Not applicable
Flammability limits in air:	Not applicable
Lower % by volume Flammability limits in air:	Not applicable
Lower % by volume Vapor pressure:	Not applicable
Vapor Density:	Not applicable
Solubility (water):	Insoluble

Density:	2.69 - 2.72 g/cm ³
pH:	Not applicable
Odor:	Odorless
Partition Coefficient (n-octanol/water):	Not applicable

SECTION 10: STABILITY AND REACTIVITY

Chemical Stability: Stable under normal conditions of use, storage, and transportation as shipped.

Conditions to Avoid: Chips, fines, dust and molten metal are considerably more reactive with the following:

Water: Slowly generates flammable/explosive hydrogen gas and heat. Generation rate is greatly increased with smaller particles (e.g., fines and dusts). Molten metal can react violently/explosively with water or moisture, particularly when the water is entrapped.

Heat: Oxidizes at a rate dependent upon temperature and particle size.

Strong Oxidizers: Violent reaction with considerable heat generation. Can react explosively with nitrates (e.g., ammonium nitrate and fertilizers containing nitrate) when heated or molten.

Acids and Alkalis: Reacts to generate flammable/explosive hydrogen gas. Generation rate is greatly increased with smaller particles (e.g., fines and dusts).

Halogenated Compounds: Many halogenated hydrocarbons, including halogenated fire extinguishing agents, can react violently with finely divided or molten aluminum.

Iron Oxide (rust) and Other Metal Oxides (e.g., copper and lead oxides): Iron oxide (rust) and other metal oxides (e.g., copper and lead oxides): A violent thermite reaction generating considerable heat can occur. Reaction with aluminum fines and dusts requires only very weak ignition sources for initiation. Molten aluminum can react violently with iron oxide.

SECTION 11: TOXICOLOGICAL INFORMATION

Health Effects Associated With Ingredients:

Aluminum dust/fines and fumes: Low health risk by inhalation. Generally considered to be biologically inert (milling, cutting, grinding).

Silicon (inert dusts): Chronic overexposures: Can cause chronic bronchitis and narrowing of airways.

Manganese dust or fumes: Chronic overexposures: Can cause inflammation of the lung tissues, scarring of the lungs (pulmonary fibrosis), central nervous system damage, Secondary Parkinson's Disease and reproductive harm in males.

Copper dust/mists: Can cause irritation of the eyes, mucous membranes, skin, and respiratory tract. Chronic overexposures: Can cause reduction in the number of red blood cells (anemia), skin abnormalities (pigmentation changes) and hair discoloration.

Chromium dust and fumes: Can cause irritation of eye, skin and respiratory tract. Metallic chromium and trivalent chromium: Not classifiable as to their carcinogenicity to humans by IARC.

Nickel dust and fume: Can cause irritation of eyes, skin and respiratory tract. Eye contact: Can cause inflammation of the eyes and eyelids (conjunctivitis). Skin contact: Can cause sensitization and allergic contact dermatitis. Chronic overexposures: Can cause perforation of the nasal septum, inflammation of the nasal passages (sinusitis), respiratory sensitization, asthma and scarring of the lungs (pulmonary fibrosis). Nickel alloys IARC/NTP: Reviewed and not recommended for listing by NTP. Listed as possibly carcinogenic to humans by IARC (Group 2B).

Lead dust or fume: Can cause irritation of eyes and upper respiratory tract. Acute overexposures: Can cause nausea and muscle cramps. Chronic overexposures: Can cause weakness in the extremities (peripheral neuropathy), abdominal cramps, gastrointestinal tract effects, kidney damage, liver damage, central nervous system damage, damage to the blood forming organs, blood cell damage and reproductive harm. Can cause reduced fertility and fetal toxicity in pregnant women. IARC/NTP: Listed as "reasonably anticipated to be a human carcinogen" by the NTP. Listed as possibly carcinogenic to humans by IARC (Group 2B).

Some products are supplied with an oil coating or have residual oil from the manufacturing process. Oil: Can cause irritation of skin. Skin contact (prolonged or repeated): Can cause dermatitis.

Health effects associated with compounds formed during processing

The following could be expected if welded, remelted or otherwise processed at elevated temperatures:

Alumina (aluminum oxide): Low health risk by inhalation. Generally considered to be biologically inert.

Magnesium oxide fumes: Can cause irritation of the eyes and respiratory tract. Acute overexposures: Can cause metal fume fever (nausea, fever, chills, shortness of breath and malaise).

Silica, amorphous: Acute overexposures: Can cause dryness of eyes, nose and upper respiratory tract.

Manganese oxide fumes: Can cause irritation of the eyes, skin, and respiratory tract. Acute overexposures: Can cause metal fume fever (nausea, fever, chills, shortness of breath and malaise).

Copper fume: Can cause irritation of the eyes, mucous membranes, and respiratory tract. Acute overexposures: Can cause metal fume fever (nausea, fever, chills, shortness of breath and malaise).

Iron oxide: Chronic overexposures: Can cause benign lung disease (siderosis). Ingestion: Can cause irritation of gastrointestinal tract, bleeding, changes in the pH of the body fluids (metabolic acidosis) and liver damage.

Zinc oxide fumes: Can cause irritation of upper respiratory tract. Acute overexposures: Can cause metal fume fever (nausea, fever, chills, shortness of breath and malaise).

Hexavalent chromium compounds (chromium VI): Can cause irritation of eye, skin and respiratory tract. Skin contact: Can cause irritant dermatitis, allergic reactions and skin ulcers. Chronic overexposures: Can cause perforation of the nasal septum, respiratory sensitization, asthma, the accumulation of fluid in the lungs (pulmonary edema), lung damage, kidney damage, lung cancer, nasal cancer and cancer of the gastrointestinal tract. IARC/NTP: Listed as "known to be a human carcinogen" by the NTP. Listed as carcinogenic to humans by IARC (Group 1).

Nickel compounds: Associated with lung cancer, cancer of the vocal cords and nasal cancer. IARC/NTP: Listed as "known to be a human carcinogen" by the NTP. Listed as carcinogenic to humans by IARC (Group 1).

Lead (inorganic compounds): IARC/NTP: Listed as "reasonably anticipated to be a human carcinogen" by the NTP. Listed as probably carcinogenic to humans by IARC (Group 2A).

If the product is heated well above ambient temperatures or machined, oil vapor or mist may be generated. Oil vapor or mist: Can cause irritation of respiratory tract. Acute overexposures: Can cause bronchitis, headache, central nervous system effects (nausea, dizziness and loss of coordination) and drowsiness (narcosis).

Welding, plasma arc cutting, and arc spray metalizing can generate ozone. Ozone: Can cause irritation of eyes, nose and upper respiratory tract. Acute overexposures: Can cause shortness of breath, tightness of chest, headache, cough, nausea and narrowing of airways. Effects are reversible on cessation of exposure. Acute overexposures (high concentrations): Can cause respiratory distress, respiratory tract damage, bleeding and the accumulation of fluid in the lungs (pulmonary edema). Effects can be delayed up to 1-2 hours. Additional information: Studies (inhalation) with experimental animals have found genetic damage, reproductive harm, blood cell damage, lung damage and death.

Welding fumes: IARC/NTP: Listed as possibly carcinogenic to humans by IARC (Group 2B). Additional information: In one study, occupational asthma was associated with exposures to fumes from aluminum welding.

Plasma arc cutting of aluminum can generate oxides of nitrogen. Oxides of nitrogen (NO and NO₂): Can cause irritation of eyes, skin and respiratory tract. Acute overexposures: Can cause reduced ability of the blood to carry oxygen (methemaglobin). Can cause cough, shortness of breath, accumulation of fluid in the lungs (pulmonary edema) and death. Effects can be delayed up to 2-3 weeks. Nitrogen dioxide (NO₂): Chronic overexposures: Can cause scarring of the lungs (pulmonary fibrosis).

Component Analysis LD50: No information available for product.

Components:

Compounds Formed During Processing:

Iron (7439-89-6)	Oral LD50 Rat:	984 mg/Kg
Magnesium (7439-95-7)	Oral LD50 Rat:	230 mg/Kg
Manganese (7439-96-5)	Oral LD50 Rat:	9 g/Kg
Nickel ‡ (7440-02-0)	Oral LD50 Rat:	>9000 mg/Kg
Silicon (7440-21-3)	Oral LD50 Rat:	3160 mg/Kg

Toxicology Data - Selected LD50s and LC50s

Aluminum oxide (non-fibrous) (1344-28-1)	Oral LD50 Rat: >5000 mg/kg
Iron oxide (1309-37-1)	Oral LD50 Rat: >10000 mg/kg
Nitric oxide (10102-43-9)	Inhalation LC50 Rat: 1068 mg/m ³ /4H
Nitrogen dioxide (10102-44-0)	Inhalation LC50 Rat: 88 ppm/4H; Inhalation LC50 Rat: 165 mg/m ³ /4H; Inhalation LC50 Rat: 220 mg/m ³ /1H
Oil mist, mineral (8012-95-1)	Oral LD50 Mouse: 22 g/kg
Ozone (10028-15-6)	Inhalation LC50 Rat: 4800 ppb/4H
Zinc oxide (1314-13-2)	Oral LD50 Rat: >5000 mg/kg

Carcinogenicity: No information available for product.

Components:

ACGIH - Threshold Limit Values - Carcinogens

Aluminum (7429-90-5)	A4	Not Classifiable as a Human Carcinogen
Chromium (7440-47-3)	A4	Not Classifiable as a Human Carcinogen
Lead† (7439-92-1)	A3	Confirmed Animal Carcinogen with Unknown Relevance to Humans
Nickel (7440-02-0)	A5	Not Suspected as a Human Carcinogen

IARC Group 2B (Possibly Carcinogenic to Humans)

Nickel (7440-02-0)	Monograph 49 [1990]; Supplement 7 [1987]
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NTP (National Toxicology Program) - Report on Carcinogens - Reasonably Anticipated to be Human Carcinogens

Lead† (7439-92-1)	Reasonably Anticipated To Be A Human Carcinogen
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Compounds Formed During Processing

ACGIH - Threshold Limit Values - Carcinogens

Aluminum oxide (non-fibrous) (1344-28-1) A4 - Not Classifiable as a Human Carcinogen
Chromium (III) compounds (CASNo. Not available) A4 - Not Classifiable as a Human Carcinogen
Chromium (VI) compounds, certain water insoluble A1 - Confirmed Human Carcinogen forms (CASNo. Not available)
Chromium (VI) compounds, water soluble forms A1 - Confirmed Human Carcinogen (CASNo. Not available)
Iron oxide (1309-37-1) A4 - Not Classifiable as a Human Carcinogen
Lead compounds, inorganic (CASNo. Not available) A3 - Confirmed Animal Carcinogen with Unknown Relevance to Humans
Magnesium oxide (1309-48-4) A4 - Not Classifiable as a Human Carcinogen
Nickel compounds, insoluble (CASNo. Not available) A1 - Confirmed Human Carcinogen
Nitrogen dioxide (10102-44-0) A4 - Not Classifiable as a Human Carcinogen
Ozone (10028-15-6) A4 - Not Classifiable as a Human Carcinogen

IARC - Group 1 (Carcinogenic to Humans)

Chromium (VI) compounds (18540-29-9) Monograph 49 [1990] (evaluated as a group)
Nickel compounds, insoluble (CASNo. Not available) Monograph 49 [1990] (evaluated as a group)

IARC - Group 2A (Probably Carcinogenic to Humans)

Lead compounds, inorganic (CASNo. Not available) Monograph 87 [2006], Supplement 7 [1987] (Lead & inorganic lead cmpds evaluated as Group 2B on Suppl 7. Now as Group 2A on Monograph 87.)

NTP (National Toxicology Program) - Report on Carcinogens - Known Human Carcinogens

Chromium (VI) compounds (18540-29-9) Known Human Carcinogen
Nickel compounds, insoluble (CASNo. Not available) Known Human Carcinogen

U.S. - OSHA - Specifically Regulated Carcinogens (1910.1001 to 1910.1096)

Chromium (VI) compounds (18540-29-9) Workers exposed to Cr(VI) are at an increased risk of developing lung cancer - see 29 CFR 1910.1026

SECTION 12: ECOLOGICAL INFORMATION

Ecotoxicity

Components

Ecotoxicity - Freshwater Algae Data

Copper (7440-50-8)	72 Hr EC50 Scenedesmus subspicatus: 120 µg/L
Nickel‡ (7440-02-0)	72 Hr EC50 freshwater algae (4 species): 0.1 mg/L; 72 Hr EC50 Selenastrum capricornutum: 0.18 mg/L
Zinc (7440-66-6)	96 Hr EC50 Selenastrum capricornutum: 30 µg/L

Ecotoxicity

Components

Copper (7440-50-8)	96 Hr LC50 Pimephales promelas: 0.0068-0.0156 mg/L; 96 Hr LC50 Pimephales promelas:<0.3 mg/L [static]; 96 Hr LC50 Pimephales promelas:~0.2 mg/L [flow-through]; 96 Hr LC50 Oncorhynchus mykiss:0.052 mg/L [flow-through]; 96 Hr LC50 Lepomis macrochirus:1.25 mg/L [static]; 96 Hr LC50 Cyprinus carpio:0.3 mg/L [semi-static]; 96 Hr LC50 Cyprinus carpio:0.8 mg/L [static]; 96 Hr LC50 Poecilia reticulata:0.112 mg/L [flow-through]
Iron (7439-89-6)	96 Hr LC50 Morone saxatilis: 13.6 mg/L [static]; 96 Hr LC50 Cyprinus carpio:0.56 mg/L [semi-static]
Lead† (7439-92-1)	96 Hr LC50 Cyprinus carpio: 0.44 mg/L [semi-static]; 96 Hr LC50 Oncorhynchus mykiss:1.17 mg/L [flow-through]; 96 Hr LC50 Oncorhynchus mykiss:1.32 mg/L [static]
Nickel‡ (7440-02-0)	96 Hr LC50 Brachydanio rerio: >100 mg/L; 96 Hr LC50 Cyprinus carpio:1.3 mg/L [semi-static]; 96 Hr LC50 Cyprinus carpio:10.4 mg/L [static]
Zinc (7440-66-6)	96 Hr LC50 Pimephales promelas: 2.16-3.05 mg/L [flow-through]; 96 Hr LC50 Pimephales promelas:0.211-0.269 mg/L [semi-static]; 96 Hr LC50 Pimephales promelas:2.66 mg/L [static]; 96 Hr LC50 Cyprinus carpio:30 mg/L; 96 Hr LC50 Cyprinus carpio:0.45 mg/L [semi-static]; 96 Hr LC50 Cyprinus carpio:7.8 mg/L [static]; 96 Hr LC50 Lepomis macrochirus:3.5 mg/L [static]; 96 Hr LC50 Oncorhynchus mykiss:0.24 mg/L [flow-through]; 96 Hr LC50 Oncorhynchus mykiss:0.59 mg/L [semi-static]; 96 Hr LC50 Oncorhynchus mykiss:0.

Ecotoxicity Water Flea Data

Copper (7440-50-8)	96 Hr EC50 water flea: 10 µg/L; 96 Hr EC50 water flea: 200 µg/L
Lead† (7439-92-1)	48 Hr EC50 water flea: 600 µg/L
Nickel‡ (7440-02-0)	96 Hr EC50 water flea: 510 µg/L
Zinc (7440-66-6)	72 Hr EC50 water flea: 5 µg/L

Compounds Formed During Processing

Ecotoxicity Freshwater Fish Species Data

Chromium (VI) compounds (18540-29-9) 96 Hr LC50 Pimephales promelas: 36.2 mg/L; 96 Hr LC50 Oncorhynchus mykiss: 7.6 mg/L

Ecotoxicity Water Flea Data

Chromium (VI) compounds (18540-29-9) 24 Hr EC50 water flea: 435 µg/L

Environmental Fate No data available for product.

SECTION 13: DISPOSAL CONSIDERATIONS

Disposal Instructions:	Reuse or recycle material whenever possible. If reuse or recycling is not possible, disposal must be made according to local or governmental regulations.
Waste Codes:	RCRA Status: Must be determined at the point of waste generation. If material is disposed as a waste, it must be characterized under RCRA according to 40 CFR, Part 261, or state equivalent in the U.S.

SECTION 14: TRANSPORT INFORMATION

Shipping Information

Basic Shipping Description: Not Regulated

UN Number:

Proper Shipping Name:

Hazard Class:

Packing Group:

Notes: When "Not regulated", enter the proper freight classification, MSDS Number and Product Name onto the shipping paperwork.

SECTION 15: REGULATORY INFORMATION

U.S. Federal Regulations: In reference to Title VI of the Clean Air Act of 1990, this material does not contain nor was it manufactured using ozone-depleting chemicals. All electrical equipment must be suitable for use in hazardous atmospheres involving aluminum powder in accordance with 29 CFR 1910.307. The National Electrical Code, NFPA 70, contains guidelines for determining the type and design of equipment and installation which will meet this requirement.

Components:

U.S. CERCLA / SARA Hazardous Substances and their Reportable Quantities (RQs)

Chromium (7440-47-3) 5000 lb final RQ (no reporting of releases of this hazardous substance is required if the diameter of the pieces of the solid metal released is larger than 100 micrometers); 2270 kg final RQ (no reporting of releases of this hazardous substance is required if the diameter of the pieces of the solid metal released is larger than 100 micrometers)

Copper (7440-50-8) 5000 lb final RQ (no reporting of releases of this hazardous substance is required if the diameter of the pieces of the solid metal released is larger than 100 micrometers); 2270 kg final RQ (no reporting of releases of this hazardous substance is required if the diameter of the pieces of the solid metal released is larger than 100 micrometers)

Lead† (7439-92-1)	10 lb final RQ (no reporting of releases of this hazardous substance is required if the diameter of the pieces of the solid metal released is larger than 100 micrometers); 4.54 kg final RQ (no reporting of releases of this hazardous substance is required if the diameter of the pieces of the solid metal released is larger than 100 micrometers)
Nickel‡ (7440-02-0)	100 lb final RQ (no reporting of releases of this hazardous substance is required if the diameter of the pieces of the solid metal released is larger than 100 micrometers); 45.4 kg final RQ (no reporting of releases of this hazardous substance is required if the diameter of the pieces of the solid metal released is larger than 100 micrometers)
Zinc (7440-66-6)	1000 lb final RQ (no reporting of releases of this hazardous substance is required if the diameter of the pieces of the solid metal released is larger than 100 micrometers); 454 kg final RQ (no reporting of releases of this hazardous substance is required if the diameter of the solid metal released is larger than 100 micrometers)

U.S. CERCLA / SARA Section 313 - Emissions Reporting

Aluminum (7429-90-5) 1.0 % de minimis concentration (dust or fume only) Chromium (7440-47-3) 1.0 % de minimis concentration Copper (7440-50-8) 1.0 % de minimis concentration Lead† (7439-92-1) 0.1 % Supplier notification limit; 0.1 % de minimis concentration (when contained in stainless steel, brass, or bronze) Manganese (7439-96-5) 1.0 % de minimis concentration Nickel‡ (7440-02-0) 0.1 % de minimis concentration Zinc (7440-66-6) 1.0 % de minimis concentration (dust or fume only)

U.S. - CERCLA/SARA - Section 313 - PBT Chemical Listing

Lead† (7439-92-1) 100 lb RT (this lower threshold does not apply to lead when it is contained in stainless steel, brass or bronze alloy)

State Regulations

Components:

U.S. -California -8 CCR Section 339 -Director's List of Hazardous Substances

Aluminum (7429-90-5) Present Chromium (7440-47-3) Present Copper (7440-50-8) Present Iron (7439-89-6) Present Lead† (7439-92-1) Present Magnesium (7439-95-4) Present Manganese (7439-96-5) Present Nickel‡ (7440-02-0) Present Zinc (7440-66-6) Present

U.S. -California -Proposition 65 -Carcinogens List

Lead† (7439-92-1) carcinogen, initial date 10/1/92 Nickel‡ (7440-02-0) carcinogen, initial date 10/1/89

U.S. - California - Proposition 65 - Developmental Toxicity

Lead† (7439-92-1) developmental toxicity, initial date 2/27/87

U.S. - California - Proposition 65 - Reproductive Toxicity - Female

Lead† (7439-92-1) female reproductive toxicity, initial date 2/27/87

U.S. - California - Proposition 65 - Reproductive Toxicity - Male

Lead† (7439-92-1) male reproductive toxicity, initial date 2/27/87

U.S. - Massachusetts - Right To Know List

Aluminum (7429-90-5) Present Chromium (7440-47-3) Carcinogen; Extraordinarily hazardous Copper (7440-50-8) Present Lead† (7439-92-1) Teratogen Magnesium (7439-95-4) Present

U.S. - Massachusetts - Right To Know List

Manganese (7439-96-5) Present Nickel‡ (7440-02-0) Carcinogen; Extraordinarily hazardous Silicon (7440-21-3) Present (dust, exempt when encapsulated or if particulates are not present and cannot be substantially generated through use of the product) Zinc (7440-66-6) Present

U.S. - Minnesota - Hazardous Substance List

Aluminum (7429-90-5) Present (dust) Chromium (7440-47-3) Present Copper (7440-50-8) Present (dust, fume, and mist) Lead† (7439-92-1) Carcinogen (elemental, fume, and dust) Manganese (7439-96-5) Present Nickel‡ (7440-02-0) Carcinogen Silicon (7440-21-3) Present (dust)

U.S. - New Jersey - Right to Know Hazardous Substance List

Aluminum (7429-90-5) sn 0054 Chromium (7440-47-3) sn 0432 Copper (7440-50-8) sn 0528 Lead† (7439-92-1) sn 1096 Magnesium (7439-95-4) sn 1136 Manganese (7439-96-5) sn 1155 (dust and fume) Nickel‡ (7440-02-0) sn 1341 (dust and fume) Silicon (7440-21-3) sn 3125 (powder) Zinc (7440-66-6) sn 2021 (dust and fume)

U.S. - Pennsylvania - RTK (Right to Know) - Special Hazardous Substances

Chromium (7440-47-3) Present Nickel‡ (7440-02-0) Present

U.S. - Pennsylvania - RTK (Right to Know) List

Aluminum (7429-90-5) Environmental hazard Chromium (7440-47-3) Environmental hazard; Special hazardous substance Copper (7440-50-8) Environmental hazard Lead† (7439-92-1) Environmental hazard Magnesium (7439-95-4) Present Manganese (7439-96-5) Environmental hazard Nickel‡ (7440-02-0) Environmental hazard; Special hazardous substance Silicon (7440-21-3) Present Zinc (7440-66-6) Environmental hazard

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

Immediate Hazard - Yes, If particulates/fumes generated during processing
Delayed Hazard - Yes, If particulates/fumes generated during processing

Pressure Hazard: No

Reactivity Hazard: Yes, If molten

Inventory Status

Country(ies) or Region	Inventory Name	On Inventory? (yes/no)*
Australia	Australian Inventory of Chemical Substances (AICS)	Yes
Canada	Domestic Substances List (DSL)	Yes
Canada	Non-Domestic Substances List (NDSL)	No
China	Inventory of Existing Chemical Substances in China (IECSC)	Yes
Europe	European Inventory of New and Existing Chemicals (EINECS)	Yes
Europe	European List of Notified Chemical Substances (ELINCS)	No
Japan	Inventory of Existing Chemical Substances (ENCS)	No
Korea	Existing Chemicals List (ECL)	Yes
New Zealand	New Zealand Inventory	No
Philippines	Philippine Inventory of Chemicals and Chemical Substances (PICCS)	Yes

Country(s) or region Inventory name On inventory (yes/no)*

United States & Puerto Rico	Toxic Substances Control Act (TSCA) Inventory	Yes
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* A "Yes" indicates that all components of this product comply with the inventory requirements administered by the governing country(s)

Japan - ENCS Inventory: Pure metals are not specifically listed by CAS or ENCS number. The class of compounds for each of these metals is listed on the ENCS inventory.

SECTION 16: OTHER INFORMATION

SDS History

Origination Date:

Supercedes: 10/26/2010

Revision Date: 2/27/2015

MSDS Status:

December 1, 2009; December 2012; Reviewed on a periodic basis in accordance with Pennex policy.

SDS Status:

Prepared By:

Pennex Aluminum Company, LLC.

SDS System Number:

Other Information:

Guide to Occupational Exposure Values 2009, Compiled by the American Conference of Governmental Industrial Hygienists (ACGIH).

Documentation of the Threshold Limit Values and Biological Exposure Indices, Sixth Edition, 1991, Compiled by the American Conference of Governmental Industrial Hygienists, Inc. (ACGIH).

NIOSH Pocket Guide to Chemical Hazards, U.S. Department of Health and Human Services, February 2004.

Dangerous Properties of Industrial Materials, Sax, N. Irving, Van Nostrand Reinhold Co., Inc., 1984.

Patty's Industrial Hygiene and Toxicology: Volume II: Toxicology, 4th ed., 1994, Patty, F. A.; edited by Clayton, G. D. and Clayton, F. E.: New York: John Wiley & Sons, Inc.

expub, Expert Publishing, LLC., www.expub.com

Aluminum Association's Bulletin F-1, "Guidelines for Handling Aluminum Fines Generated During Various Aluminum Fabricating Operations." The Aluminum Association, 1525 Wilson Boulevard, Suite 600, Arlington, Virginia 22209, www.aluminum.org.

NFPA 65, Standard for Processing and Finishing of Aluminum (NFPA phone: 800-344-3555)

NFPA 651, Standard for Manufacture of Aluminum and Magnesium Powder

NFPA 70, Standard for National Electrical Code (Electrical Equipment, Grounding and Bonding)

NFPA 77, Standard for Static Electricity

Key / Legend

ACGIH American Conference of Governmental Industrial Hygienists

AICS Australian Inventory of Chemical Substances

CAS Chemical Abstract Services

CERCLA Comprehensive Environmental Response, Compensation, and Liability Act

CFR Code of Federal Regulations

DOT Department of Transportation

DSL Domestic Substances List (Canada)

EC Effective Concentration

ED Effective Dose

EINECS European Inventory of Existing Commercial Chemical Substances

ENCS Japan - Existing and New Chemical Substances

EWG European Waste Catalogue

EPA Environmental Protective Agency

IARC International Agency for Research on Cancer

LC Lethal Concentration

LD Lethal Dose

MAK Maximum Workplace Concentration (Germany) "maximale Arbeitsplatz-Konzentration"

NDSL Non-Domestic Substances List (Canada)

NIOSH National Institute for Occupational Safety and Health

NTP National Toxicology Program

OEL Occupational Exposure Limit
OSHA Occupational Safety and Health Administration
PIN Product Identification Number
PMCC Pensky Marten Closed Cup
RCRA Resource Conservation and Recovery Act
SARA Superfund Amendments and Reauthorization Act

STEL Short Term Exposure Limit TCLP Toxic Chemicals Leachate Program TDG
Transportation of Dangerous Goods TLV Threshold Limit Value TSCA Toxic Substances
Control Act TWA Time Weighted Average WHMIS Workplace Hazardous Materials
Information System m meter, cm centimeter, mm millimeter, in inch, g gram, kg kilogram,
lb pound, µg microgram, ppm parts per million, ft feet

***** END OF SDS *****

Disclaimer

The information in the sheet was written based on the best knowledge and experience currently available.