



SECTION 1: PRODUCT IDENTIFICATION

Product Identifier: Aluminum Alloys: 1xxx, 2xxx, 3xxx, 4xxx, 5xxx, 6xxx, 7xxx and 8xxx

MANUFACTURER:

Tri Star Metals, LLC
375 Village Drive.
Carol Stream, IL 60188

CONTACT/TELEPHONE NUMBER:

855-874-7827 (non-emergency)

SECTION 2: HAZARDS IDENTIFICATION

Hazard Classification

This product is exempt from classification according to the OSHA Hazard Communication Standard (CFR 1910.1200) since it is an article as sold. During expected conditions of use, hazards may be created.

Label Elements

Signal Word

WARNING

(This Signal Word is required by OSHA because of the potential for the formation of combustible dust concentrations in the air; see Hazards Not Otherwise Classified and Sections 5 and 7 of this SDS)

Symbols

Not applicable

Pictograms

Not applicable

Hazards Not Otherwise Classified

This product is non-combustible as supplied but small chips, fine turnings, dust, or other particulates formed during processing may be readily ignitable. May form combustible dust concentrations in the air. Prevent dust accumulation to minimize explosion hazard.

Dust or fumes generated by machining, grinding, casting, sawing, blasting, polishing, buffing, brazing, soldering, welding, thermal cutting or thermal spraying of the product may produce airborne contaminants (see Section 8) that are hazardous. Welding or thermal cutting of aluminum products may also produce ozone.

SECTION 3: COMPOSITION/INFORMATION ON INGREDIENTS

Element	CAS #	% Weight By Alloy (except for aluminum all of the listed percentages are maximum amounts)							
		1XXX	2XXX	3XXX	4XXX	5XXX	6XXX	7XXX	8XXX
Aluminum	7429-90-5	>96	>82	>94	>77	>88	>85	>82	>91
Manganese	7439-96-5	0.3	1.2	1.5	1.5	1.4	1.4	0.7	1.0

Magnesium	7439-95-4	0.3	1.9	1.3	2.0	0.2-5.6	3.0	3.7	1.3
Iron	7439-89-6	1.0	1.4	0.9	1.0	1.0	1.0	0.5	2.0
Silicon	7440-21-3	1.0	1.3	0.7	0.8-13.5	1.4	1.5	0.5	1.1
Nickel	7440-02-0	-	1.4	-	1.3	-	0.2	0.1	-
Zinc	7440-66-6	0.1	0.5	0.4	1.3	0.9	1.5	8.4	1.0
Copper	7440-50-8	0.2	6.8	0.4	1.3	0.8	1.4	2.6	1.6
Chromium	7440-47-3	0.1	0.1	0.2	0.25	0.35	0.35	0.35	0.2
Tin	7440-31-5	0.05	1.3	0.05	0.05	0.05	2.0	0.5	0.06
Lead	7439-92-1	0.05	0.99	0.1	0.05	0.05	0.99	0.05	0.06
Bismuth	7440-69-9	0.05	0.7	0.05	0.20	0.05	0.8	0.05	0.06
Titanium	7440-32-6	0.2	0.2	0.1	0.2	0.2	0.2	0.2	0.2
Boron	7440-42-8	0.05	0.1	0.05	0.05	0.05	0.06	0.05	0.06

SECTION 4: FIRST AID MEASURES

Eye Contact

No need for first aid from the product as sold. Particles generated during processing may cause eye irritation. Immediately flush eyes with plenty of water, occasionally lifting the upper and lower eyelids. Check for and remove any contact lenses. Continue to rinse with fresh water, holding the eyelids apart for at least 10 minutes. Get medical advice/attention if eye irritation persists.

Inhalation

No need for first aid is anticipated under normal use conditions. If symptoms develop following exposure to dusts or fumes released from the processing of the product (e.g. machining, grinding, casting, sawing, blasting, polishing, buffing, brazing, soldering, welding, thermal cutting or thermal spraying of the product), immediately remove person from exposure. Seek medical attention if symptoms persist.

Skin

No need for first aid from the product as sold. Dust or fumes generated by machining, grinding, casting, sawing, blasting, polishing, buffing, brazing, soldering, welding, thermal cutting or thermal spraying of the product may result in skin irritation. Wash with soap and water after handling if there is contact with dust or fumes. Seek medical attention if symptoms persist.

Ingestion

No need for first aid from the product as sold.

Most Important Symptoms and Effects, both Acute and Delayed

None from the product as sold. Dust or fumes generated by machining, grinding, casting, sawing, blasting, polishing, buffing, brazing, soldering, welding or thermal cutting or thermal spraying of the product may result in symptoms. See Section 11 for a summary of potential health effects.

Indication of Immediate Medical Attention and Special Treatment Needs

Not applicable

SECTION 5: FIRE FIGHTING MEASURES

Suitable Extinguishing Media

Use Class D extinguishing agents on fires from dust, fines, particulate or molten metal. Dry sand or other approved dry powders may be used. DO NOT use water or halogen containing extinguishers for such fires. DO NOT use water on molten metal fires.

Special Hazards Arising from the Substance

This product is non-combustible as supplied but small chips, fine turnings, dust, or other particulates formed during processing may be readily ignitable. May form combustible dust concentrations in the air. Prevent dust accumulation to minimize explosion hazard.

Explosion/fire hazards may be present when dust, fines or particulates are dispersed in air. Particles less than 420 microns (40 mesh) present the greatest potential for explosion. 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, dust fines or particulate when in contact with water can generate flammable/explosive hydrogen gas.

Dust, fines or particulates in contact with water or certain metal oxides (e.g., oxides of iron including rust, copper, bismuth and lead) may create a thermite reaction leading to heat generation and potential explosion/fire. Molten metal in contact with water/moisture or certain metal oxides (e.g., oxides of iron including rust, copper, bismuth and lead) may initiate a thermite reaction. Moisture trapped by molten metal can be explosive.

Special Protective Actions for Fire Fighters

Not applicable

SECTION 6: ACCIDENTAL RELEASE MEASURES

Personal Precautions, Protective Equipment and Emergency Procedures

No special measures required for product as sold

Environmental Precautions

Not applicable for product as sold

Methods and Material for Containment and Clean-up

Not applicable for product as sold

SECTION 7: HANDLING AND STORAGE

Precautions for Safe Handling

No special requirements for product as sold.

Conditions for Safe Storage, Including Any Incompatibilities

No special requirements for product as sold.

Requirements for Processes That Generate Dusts and Fines

General information about the hazards of combustible dusts is provided in this Section. If processing of this product generates dust, fines or particulate, obtain and follow the safety procedures and equipment guides contained in Aluminum Association Bulletin F-1 (www.aluminum.org) and National Fire Protection Association (NFPA) 484: *Standard for Combustible Metals* (latest version) (www.nfpa.org).

Use non-sparking handling equipment, tools and natural bristle brush for cleaning. 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.

Local ventilation and vacuum systems must be designed to handle combustible/explosive dust, fines or particulate. Dry vacuums and electrostatic precipitators must not be used, unless specifically approved for use with combustible/explosive dusts, fines or particulate and must be dedicated to aluminum dust only and should be



clearly labeled as such. Vacuum cleaner hoses must be conductive and nozzles/fitting must be made of conductive, non-sparking material. Do not co-mingle dust, fines or particulate of aluminum with dust, fines or particulate of steel, iron, iron oxide (rust) or other metal oxides.

Dust collection systems must be dedicated to aluminum dust only and should be clearly labeled as such. Do not co-mingle dust, fines or particulate of aluminum with dust, fines or particulate of steel, iron, iron oxide (rust) or other metal oxides. Avoid all ignition sources. Good housekeeping practices must be maintained. Do not use compressed air to remove settled material from floors, beams or equipment. Do not allow chips, dust, fines or particulate to contact water, particularly in enclosed areas.

Dust, fines or particulate accumulation on the floor, ledges and beams can present a risk of ignition, flame propagation and secondary explosions. Regularly clean building structures, equipment and machinery to avoid accumulation of dust, fines or particulate that could become airborne.

SECTION 8: EXPOSURE CONTROLS AND PERSONAL PROTECTION

Occupational Exposure Limits

Dust or fumes generated by machining, grinding, casting, sawing, blasting, polishing, buffing, brazing, soldering, welding, thermal cutting or thermal spraying of the product may produce airborne contaminants with the following Occupational Exposure Limits (OELs):

Element	CAS #	OSHA PEL (mg/m ³)*	ACGIH TLV® (mg/m ³)
Aluminum Metal & insoluble compounds	7429-90-5	15 (TWA) 5 (TWA)(R)	1 (TWA)(R)
Manganese	7439-96-5	5 (C)	0.02 (TWA)(R) 0.1 (TWA)(I)
Magnesium oxide	7439-95-4	15 (TWA) (only applies to fume)	10 (TWA)(I)
Iron oxide	7439-89-6	10 (TWA) (only applies to iron oxide fume)	5 (TWA)(R)
Silicon	7440-21-3	15 (TWA) 5 (R)(TWA) (Particle Not Otherwise Regulated)	NE
Nickel Elemental Insoluble	7440-02-0	1 (TWA) 1 (TWA)	1.5 (TWA)(I) 0.2 (TWA) (I)
Zinc Zinc oxide fume Zinc, non-fume	1314-13-2	5 (R)(TWA) 15 (TWA) (Particle Not Otherwise Regulated)	2 (TWA)(R) 10 (STEL)(R) NE
Copper Dust Fume	7440-50-8	1 (TWA) 0.1 (TWA)	1 (TWA) 0.2 (TWA)
Chromium	7440-47-3		

Metal Hexavalent, insoluble**		1 (TWA) 0.005 (TWA)	0.5 (TWA) 0.01 (TWA)
Tin	7440-31-5	2 (TWA)	2 (TWA)
Lead	7439-92-1	0.050 (TWA)	0.050 (TWA)
Bismuth	7440-69-9	NE	NE
Titanium (as titanium dioxide)	7440-32-6	15 (TWA) (Particle Not Otherwise Regulated)	10 (TWA)
Boron oxide	7440-42-8	15 (TWA)	10 (TWA)

* Some state OSHA Plans have adopted lower PELs:

Minnesota has the following applicable PELs: Aluminum welding fumes – 5 mg/m³ as a TWA; manganese fume- 1 mg/m³ as a TWA; magnesium oxide fume- 10 mg/m³ as a TWA and 5 mg/m³ as a TWA, respirable fraction.

California has the following applicable PELs: Aluminum metal- 10 mg/m³ as a TWA and 5 mg/m³ (R) as a TWA; Iron oxide fume- 5 mg/m³ as a TWA, Manganese- 0.2 mg/m³ as a TWA; Magnesium oxide fume- 10 mg/m³ as a TWA; Nickel metal- 0.5 mg/m³ as a TWA; Particles, Not Otherwise Regulated (PNOR)- 10 mg/m³ as a TWA and 5 mg/m³ (R) as a TWA, respirable fraction; Zinc oxide fume- 10 mg/m³ as a STEL.

** When chromium is heated to high temperatures such as those that occur in welding arcs or thermal cutting it can oxidize to form hexavalent chromium. In the product as sold, chromium is in the metallic form.

Exposure Limit Abbreviations

NE= None Established

ACGIH TLV= American Conference of Governmental Industrial Hygienists Threshold Limit Value[®], 2015 Edition

OSHA PEL= Occupational Health and Safety Administration Permissible Exposure Limit

TWA= Time Weighted Average

STEL= Short Term Exposure Limit

C= Ceiling Limit

mg/m³= milligram of substance per cubic meter of air

R= Respirable fraction of particulate

I= Inhalable fraction of particulate

Appropriate Engineering Controls

In the solid state, no special requirements are necessary. Dust or fumes generated by machining, grinding, casting, sawing, blasting, polishing, buffing, brazing, soldering, welding, thermal cutting or thermal spraying of the product may produce airborne contaminants (see Section 8) may require the use of local exhaust ventilation or other engineering controls to maintain concentrations of airborne hazardous ingredients below the applicable exposure limits. Generation of dust, fines and particles may present an explosion/fire hazard and require specific engineering controls-see Section 7.

Personal Protective Equipment

Eye Protection

Wear safety glasses with side-shields if there is a risk of particles getting in eyes. Welding, plasma cutting and thermal spraying of this product can generate ultraviolet and infrared radiation. Select appropriate welding shades to prevent eye injury.

Skin protection

No chemical protective clothing is required. During use of this product, other hazards such as ultraviolet radiation, infrared radiation, hot metal, sparks or sharp edges may be generated. Use appropriate protective clothing and gloves for the application.

Respiratory Protection

In the solid state, no special requirements are necessary. Dust or fumes may be generated by machining, grinding, casting, sawing, blasting, polishing, buffing, brazing, soldering, welding, thermal cutting or thermal spraying of this product. Respiratory protection may be necessary if concentrations of these hazardous ingredients exceed the applicable exposure limits. In these cases a NIOSH approved respirator should be selected based on the form and concentration of the contaminant in air.

SECTION 9: PHYSICAL AND CHEMICAL PROPERTIES

Appearance	Solid, gray colored material
Odor	Not applicable
Odor threshold	Not applicable
pH	Not applicable
Melting Point	900-1200° F (482-649° C)
Initial boiling point & boiling range	Not applicable
Flash Point	Not applicable
Evaporation Rate	Not applicable
Flammability	Not applicable
Upper/Lower flammability or explosive limits	Not applicable
Vapor Pressure	Not applicable
Vapor Density	Not applicable
Relative Density	Not applicable
Solubility in Water	Not applicable
Partition Coefficient	Not applicable
Auto-Ignition Temperature	Not applicable
Decomposition Temperature	Not applicable
Viscosity	Not applicable

SECTION 10: STABILITY AND REACTIVITY

Reactivity

Inert, not reactive as sold.

Chemical Stability

Product is stable as sold.

Possibility of Hazardous Reactions

Will not occur with the product as sold.

Conditions to avoid

None when product is in solid state. Dust, fines and particles of this product may react with water, strong oxidizers, acids, alkalis and halogenated compounds. All of these situations could create an explosion hazard See Section 7.

Incompatible Materials

None when product is in solid state.

Hazardous Decomposition Products

During heating, metal oxides may be created.

SECTION 11: TOXICOLOGICAL INFORMATION

This product as sold is an article. Dust or fumes generated by machining, grinding, casting, sawing, blasting, polishing, buffing, brazing, soldering, welding, thermal cutting or thermal spraying of the product may produce airborne contaminants (see Section 8) that are hazardous. Information about these components is supplied.

Acute Toxicity

Copper: Eye and respiratory irritation may occur. High exposure to copper dust may cause gastrointestinal effects due to oral ingestion.

Chromium: Eye and respiratory irritation may occur.

Lead: High short term exposures can cause neurological and gastrointestinal effects and anemia.

Nickel: One study showed severe lung and kidney damage following exposure to extremely high levels of nickel powder.

Skin Corrosion/Irritation

None expected

Serious Eye Damage or Irritation

None expected

Respiratory or Skin Sensitization

Nickel: Contact allergic dermatitis may occur.

Chromium, hexavalent (formed during high temperature heating of the product): Contact allergic dermatitis may occur.

Germ Cell Mutagenicity

Lead: Induction of chromosomal aberrations, micronuclei, and sister chromatid exchanges in peripheral blood cells have been found in lead workers. In vitro tests have found mostly negative results.

Nickel: Chromosomal aberrations and in vitro and in vivo testing has shown that nickel is genotoxic (ASTDR)

Zinc: Results from in vivo and in vitro studies have been inconsistent. Some in vitro studies have shown increase in the occurrence of chromosomal aberrations and sister chromatid exchange (ASTDR).

Carcinogenicity

Aluminum: Not listed by IARC, NTP or OSHA

Bismuth (metal): Not listed by IARC, NTP or OSHA

Boron (metal): Not listed by IARC, NTP or OSHA

Chromium (metal): Not listed by IARC, NTP or OSHA

When chromium is heated to high temperatures in welding arcs or plasmas or during thermal spraying it can oxidize to form hexavalent chromium. In the product as sold, chromium is in the metallic form. Hexavalent chromium is listed as a carcinogen by IARC 1 (Carcinogenic to Humans), NTP (Known to be a human carcinogen) and OSHA. It can cause lung cancer.

Copper: Not listed by IARC, NTP or OSHA

Iron: Not listed by IARC, NTP or OSHA

Lead: Listed by IARC (probably carcinogenic to humans-Group 2A) and NTP (reasonably anticipated to be a human carcinogen). Not listed by OSHA.

Manganese: Not listed by IARC, NTP or OSHA

Magnesium (metal): Not listed by IARC, NTP or OSHA

Nickel: Listed by IARC (possibly carcinogenic to humans-Group 2BA) and NTP (known to be a human carcinogen). The strongest evidence for carcinogenicity is for sulfidic nickel forms and the evidence for oxidic forms of nickel are the weakest. There is no evidence that metallic nickel is associated with nasal or lung cancer (ASTDR).

Tin: Not listed by IARC, NTP or OSHA

Titanium (metallic): Not listed by IARC, NTP or OSHA

Zinc: Not listed by IARC, NTP or OSHA

Reproductive Toxicity

Lead: Overexposure to lead can result in spontaneous miscarriage and pre-term delivery in pregnant women and alterations in sperm and decreased fertility in men. Prenatal exposure may result in reduced birth weight and impairment of bone growth.

Specific Target Organ Toxicity-Single Exposure

Copper: A few studies have shown copper to cause metal fume fever, a condition characterized by chills, fever, muscular pain, nausea, and vomiting but these are limited in number and details. Studies have reported upper respiratory tract irritation, metallic taste sensation and nausea.

Lead: High short term exposures can cause neurological and gastrointestinal effects and anemia.

Nickel: One study showed severe lung and kidney damage following exposure to extremely high levels of nickel powder.

Zinc: Overexposure to freshly formed zinc oxide fume can cause metal fume fever, a condition characterized by chills, fever, muscular pain, nausea, and vomiting. Shortness of breath and chest pains may also occur. These effects are not known to occur with overexposures to zinc dust.

Specific Target Organ Toxicity-Repeated Exposure

Aluminum: There is some evidence that aluminum may accumulate in the body with long-term exposure. Lung changes have been reported in workers exposed to high levels of aluminum dust. Some studies have indicated that there may be subtle neurological effects following long-term exposure to aluminum.

Copper: A few studies have shown copper to cause metal fume fever, a condition characterized by chills, fever, muscular pain, nausea, and vomiting but these are limited in number and details. Studies have reported upper respiratory tract irritation, metallic taste sensation and nausea.

Iron: Prolonged exposure may lead result in iron deposits in the lung, a condition known as siderosis.

Lead: Overexposure to lead can cause hematological effects (anemia), gastrointestinal effects (colic, anorexia, nausea, vomiting, cramps, constipation), musculoskeletal effects (bluish line in the gum, joint pain, muscle weakness), neurological effects (encephalopathy and neurobehavioral effects resulting in headaches, paresthesia, tremors, insomnia, irritability, poor attention span, loss of memory, hallucinations, lassitude, decreased reaction times, delirium, convulsion, paralysis, coma and death), cardiovascular effects (elevation in blood pressure) and kidney damage

Manganese: Inflammatory changes in the lung were found in monkeys exposed to manganese dioxide via inhalation for 10 months. At high exposure levels (greater than 5 mg/m³), manganism (chronic manganese poisoning) has been reported in workers. Symptoms of manganism include sleepiness, weakness in the legs, a mask-like facial appearance, emotional disturbances and a spastic gait. High levels of pneumonia have also been reported in workers inhaling large amounts of manganese dust and fume. In some studies, manganese has been associated with longer reaction times, and decreased in hand steadiness and eye-hand coordination. Effects appear to be more pronounced with exposures to respirable sized particles.

Nickel (elemental and nickel oxide): Animal studies have shown lung changes and inflammation.

Tin: Overexposure to tin may cause stannosis (deposition of stannic oxide in the lung without impairment of lung function or structure)

Aspiration Hazard

Based on the physical form, the product is not expected to be an aspiration hazard.

SECTION 12: ECOLOGICAL INFORMATION

Toxicity

Ecotoxicity is expected to be minimal since the product is a solid with low water solubility.

Persistence and Degradation

Not applicable

Bioaccumulation

Not applicable

Mobility in Soil

Not applicable

Environmental Fate

Not applicable

SECTION 13: DISPOSAL INFORMATION

This product as sold is not considered to be hazardous waste according to US RCRA and Canadian regulations. Recover or recycle if possible. Dispose of according to federal, state and local regulations. Dust collected from product processing operations (e.g. machining, grinding, casting, sawing, blasting, polishing, buffing, brazing, soldering, welding, thermal cutting or thermal spraying) may be classified as a hazardous waste. Consult federal, state and local regulations.

SECTION 14: TRANSPORTATION INFORMATION

U.S. Department of Transportation (DOT)

Product is not regulated

International Maritime Dangerous Goods (IMDG)

Product is not regulated

Transport in bulk according to Annex II of MARPOL 73/78 and the IBC Code

Product is not regulated

International Civil Aviation Org. / International Air Transport Assoc. (ICAO/IATA)

Product is not regulated

SECTION 15: REGULATORY INFORMATION

If this product is further processed, the regulatory status of the components listed in the composition section of this sheet may be different than what is listed in this Section. The following regulatory information may not be complete and should not be relied upon as the sole source of information regarding regulatory responsibilities.

Occupational Health and Safety Administration

This product is an article as sold. Dust or fumes generated by machining, grinding, casting, sawing, blasting, polishing, buffing, brazing, soldering, welding, thermal cutting or thermal spraying of the product may produce airborne contaminants that are regulated by OSHA.



TSCA Chemical Inventories

This product is an article as defined by TSCA regulations, and is exempt from TSCA Inventory listing requirements

Other Regulatory Information

Chemical	CAS #	EINECS	CERCLA RQ (lbs)	Section 313	NPRI Threshold Category	California Prop 65
Aluminum (fume or dust)	7429-90-5	231-072-3		313	1A	
Chromium	7440-47-3	231-157-5	5,000	313	1A	
Copper	7440-50-8	231-159-6	5,000	313	1A	
Lead	7439-92-1	231-100-4	10	313	1B	Carcinogen, developmental, reproductive (male & female)
Manganese	7439-96-5	231-105-1		313	1A	
Nickel	7440-02-0	231-111-4	100	313	1A	Carcinogen
Zinc (fume or dust)	7440-66-6	231-175-3	1,000	313	1A	

CAS- Chemical Abstract Service- Registry Number

EINECS - European Inventory of Existing Commercial Chemical Substances

CERCLA RQ (reportable quantity)-- if a value is listed then releases of particles, $\leq 100 \mu\text{m}$ in size, to the environment may require reporting under CERCLA Sections 102-103 (40 CFR Part 302)

Section 313 - if '313' is listed then may be subject to the reporting requirements found under EPCRA Section 313 (40 CFR Part 372)

NPRI (National Pollutant Release Inventory) Threshold Category - if 1A or 1B is listed, may be subject to reporting under the Canadian Environmental Protection Act, 1999

California Prop 65 - if listed WARNING: This product contains chemicals known to the State of California to cause cancer.

This product is not believed to contain any substances that meet the notification requirements found under EPCRA Sections 302 or 304 (40 CFR Part 355) nor subject to the accidental release prevention requirements under CAA 112(r) (40 CFR Part 68).

SECTION 16: OTHER INFORMATION

DATE PREPARED: January 25, 2016 (Rev. 1)

PREPARER: Kay Rowntree, CIH
Industrial Hygiene Sciences, LLC

This SDS is intended to be used as a guide to the appropriate handling, storage, and use of this product by an adequately trained person. TriStar Metals, LLC and Industrial Hygiene Sciences, LLC are not responsible for the misuse, mishandling or improper storage of this material by the user. TRI STAR METALS, LLC. AND INDUSTRIAL HYGIENE SCIENCES, LLC NEITHER MAKES, NOR OFFERS NOR SHALL BE HELD LIABLE FOR ANY EXPRESS OR IMPLIED WARRANTIES, INCLUDING ANY WARRANTIES OF MERCHANTABILITY AND FITNESS FOR A PARTICULAR PURPOSE WITH RESPECT TO THE USE OF THE INFORMATION PROVIDED.