



SAFETY DATA SHEET

1. Identification

Product identifier	REMELT INGOT AND CAST ALUMINUM PRODUCTS, 3xx.x SERIES ALLOYS
Other means of identification	
SDS number	684
Version #	11
Revision date	November 2, 2016.
Other means of identification	
Synonyms	3xx.x series alloys * Granulated, pebbled, aluminizing, foundry-rich alloy, rotor, remelt scrap ingot (RSI) * A356.0, A356.2, A356.A50, 2S, AC4A, AC4CH, AlSi11, AlSi7, AlSi7Cu1.5Mg, AlSi9, AS5U3G, AS5U3GBF, AS7G03, B319.1S, B356.2S, C001F, C002F, C003F, C004F, C010F, C011F, C012F, C013F, C014F, C015F, C016F, C017F, C018F, C019F, C020F, C021F, C022F, C023F, C024F, C025F, C026F, C027F, C028F, C029F, C02R, C030F, C031F, C032F, C033F, C034F, C035F, C036F, C037F, C038F, C039F, C04R, C040F, C041F, C042F, C043F, C044F, C045F, C046F, C047F, C049F, C050F, C051F, C052F, C053F, C054F, C055F, C056F, C057F, C058F, C059F, C060F, C061F, C062F, C063F, C064F, C065F, C066F, C067F, C068F, C069F, C06R, C06Z, C070F, C072F, C074F, C075F, C076F, C077F, C078F, C079F, C07R, C080F, C081F, C082F, C084F, C085F, C086F, C087F, C088F, C089F, * C08R, C090F, C091F, C092F, C093F, C094F, C095F, C096F, C099F, C100F, C101F, C102F, C103F, C104F, C105F, C106F, C107F, C108F, C109F, C10R, C110F, C111F, C112F, C114F, C116F, C117F, C118F, C119, C119F, C11R, C120F, C122F, C123F, C124F, C126F, C129F, C12R, C136F, C137F, C138F, C13R, C140F, C142F, C143F, C145F, C146F, C14R, C155F, C158F, C15R, C160F, C161F, C162F, C163F, C16R, C17R, C170H, C18R, C190F, C191F, C192F, C194F, C196F, C197F, C198F, C199F, C19R, C1A1, C1A2, C200F, C201F, C202F, C204F, C206F, C207F, C209F, C20R, C210F, C211F, C212F, C213F, C214F, C215F, C216F, C219F, C21R, C220F, C221F, C223F, C225F, C226F, C227F, C228F, C229F, C22F, C230F, C232F, C239F, C23F, C23R, C244F, C252F, C253, C253F, * C254F, C255F, C256F, C257F, C25R, C264, C26R, C279F, C27R, C280F, C281F, C283F, C285F, C286F, C28R, C292F, C293F, C294F, C295F, C296F, C297F, C298F, C29R, C3, C300F, C30R, C311F, C312F, C313F, C315F, C316F, C318F, C319F, C320F, C321F, C322F, C323F, C324F, C325F, C327F, C336F, C339F, C346F, C349F, C34R, C359F, C35R, C36R, C377, C37R, C38R, C394, C400F, C401, C401F, C402, C402F, C403F, C404F, C405F, C406F, C407F, C408F, C409F, C40R, C415F, C41R, C431F, C432F, C437, C43R, C443F, C444F, C446F, C448, C449F, C454F, C457F, C458F, C460F, C479F, C47R, C48R, C49R, C520F, C521F, C537, C560F, C561F, C562F, C565F, C579F, C57F, C585F, C587F, C599F, C600F, C601, * C60B, C60D, C60E, C60H, C60J, C60K, C60N, C60P, C60S, C60T, C611, C613, C614F, C61C, C61E, C61H, C61J, C61K, C61N, C61P, C61R, C61S, C61T, C621F, C623, C624, C625, C626, C627, C628, C629, C62C, C62P, C62R, C62T, C630, C631, C633, C634, C635, C635F, C637, C63A, C63C, C63K, C63M, C63P, C642, C643, C644, C646F, C64C, C64K, C64M, C64N, C64P, C64T, C64U, C65, C650, C656, C659, C65D, C65J, C65K, C65P, C661, C667, C66D, C66K, C66T, C67P, C67S, C686, C688, C689, C68C, C68D, C68N, C68P, C68S, C68T, C690, C691, C694, C696, C69C, C69D, C69M, C69N, C69S, C69T, C73R, C74R, C79R, C81R, C90F, C92Z, C93Z, CH62, CZ29, INAFSB-310, L2653, NA380.1
Recommended use	Various fabricated aluminum parts and products
Recommended Restrictions	Does not include alloys: C31R, C62D, C64E, C662, C66S, C677, C683, C684, C68E (See SDS Number 973)
Recommended restrictions	For industrial use only.

Manufacturer/Importer/Supplier/Distributor information

Manufacturer

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Emergency Information

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Website

For a current Safety Data Sheet, refer to Arconic websites: www.arconic.com or internally at my.arconic.com EHS Community

2. Hazard(s) identification

Classification

This product is considered hazardous under 29 CFR 1910.1200 (Hazard Communication).

Potential health effects

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.

The health effects listed below are not likely to occur unless processing of this product generates dusts or fumes.

Physical hazards

Not classified.

Health hazards

Sensitization, respiratory	Category 1
Sensitization, skin	Category 1
Carcinogenicity	Category 1A
Reproductive toxicity	Category 1A
Specific target organ toxicity, repeated exposure	Category 1

Environmental hazards

Hazardous to the ozone layer	Not applicable
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OSHA defined hazards

Combustible dust

Label elements



Signal word

Danger

Hazard statement

May cause allergy or asthma symptoms or breathing difficulties if inhaled. May cause an allergic skin reaction. May cause cancer by inhalation. May damage fertility or the unborn child by inhalation. Causes damage to organs through prolonged or repeated exposure by inhalation. May form combustible dust concentrations in air.

Precautionary statement

Prevention

Do not breathe dust/fume. In case of inadequate ventilation wear respiratory protection. Contaminated work clothing must not be allowed out of the workplace. Wear protective gloves/clothing and eye/face protection. Use personal protective equipment as required. Obtain 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.

Response	IF INHALED: If breathing is difficult, remove person to fresh air and keep comfortable for breathing. If experiencing respiratory symptoms: Call a POISON CENTER or doctor/physician. IF ON SKIN: Wash with plenty of soap and water. If skin irritation or rash occurs: Get medical advice/attention. Wash contaminated clothing before reuse. IF exposed or concerned: Get medical advice/attention. Get medical advice/attention if you feel unwell.
Storage	Store in a dry place. Keep dry.
Disposal	Dispose of contents/container in accordance with local/regional/national/international regulations.
Hazard(s) not otherwise classified (HNOC)	None known.
Supplemental information	None.
Specific hazards	<p>Non-combustible as supplied. Small chips, fine turnings, and dust from processing may be readily ignitable.</p> <p>Explosion/fire hazards may be present when:</p> <ul style="list-style-type: none"> • Dust or fines are dispersed in air. • 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). <p>Dust and fume from processing: Can cause irritation of the eyes, skin and respiratory tract. Contains nickel. May produce an allergic reaction. May cause sensitization by inhalation and skin contact. May cause sensitization by skin contact.</p> <p>Dust and fume from processing: Heating above the melting point releases metallic oxides which may cause metal fume fever by inhalation. The symptoms are shivering, fever, malaise and muscular pain.</p> <p>Contact with residual oil/oil coating: Causes skin irritation. Prolonged or repeated skin contact may cause dermatitis.</p>

3. Composition/information on ingredients

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

Mixtures

Chemical name	Common name and synonyms	CAS number	%
Aluminum		7429-90-5	≥70
Silicon		7440-21-3	≤18.1
Copper		7440-50-8	≤4.6
Nickel		7440-02-0	≤5.1
Zinc		7440-66-6	≤5.1
Iron		7439-89-6	≤1.3
Cerium		7440-45-1	≤2.1
Manganese		7439-96-5	≤1.6
Magnesium		7439-95-4	≤1.2
Cobalt		7440-48-4	≤1.1
Chromium		7440-47-3	≤0.5
Lead		7439-92-1	0 - 0.3
Cadmium		7440-43-9	0 - 0.03

Additional Information Cobalt - Alloys: C339F, C394, C401 and C402.
Lead - Present as impurity. While lead is not intentionally added to this mixture, it could potentially enter through the recycle stream.
Cadmium - Present as impurity. While cadmium 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.

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. If breathing is difficult, provide oxygen. Loosen any tight clothing on neck or chest. Provide cardiopulmonary resuscitation for persons without pulse or respirations. Consult a physician.
Ingestion	Not relevant, due to the form of the product.
Most important symptoms/effects, acute and delayed	<p>Dust and fumes from processing: Health effects from mechanical processing (e.g., cutting, grinding): Dust from processing: 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), scarring of the lungs (pulmonary fibrosis), central nervous system damage, and reproductive harm. Contains (Cobalt, Nickel). May produce an allergic reaction.</p> <p>Additional health effects from elevated temperature processing (e.g., welding, melting): Dust and fumes from processing: Acute overexposure: Can cause metal fume fever, (nausea, fever, chills, shortness of breath and malaise, the accumulation of fluid in the lungs (pulmonary edema) and reduced ability of the blood to carry oxygen (methemaglobin). Chronic overexposure: Can cause respiratory sensitization, scarring of the lungs (pulmonary fibrosis), secondary Parkinson's disease and lung cancer.</p> <p>Contact with residual oil/oil coating: Prolonged skin contact may cause skin irritation and/or dermatitis.</p>
Medical conditions aggravated by exposure	See Section 11 of the SDS for additional information on health hazards. Dust and fume from processing: Asthma, chronic lung disease, and skin rashes.
Indication of immediate medical attention and special treatment needed	If breathing is difficult, give oxygen. Effects of contact or inhalation may be delayed.
General information	IF exposed or concerned: Get medical advice/attention.
5. Fire-fighting measures	
Suitable extinguishing media	Use Class D extinguishing agents on fines, dust or molten metal. Use coarse water spray on chips and turnings.
Unsuitable extinguishing media	DO NOT USE halogenated extinguishing agents on small chips/fines. DO NOT USE water in fighting fires around molten metal. These fire extinguishing agents will react with the burning material.
Specific hazards arising from the chemical	<p>This product does not present fire or explosion hazards as shipped. Small chips, fine turnings, and dust from processing may be readily ignitable.</p> <p>May be a potential hazard under the following conditions:</p> <ul style="list-style-type: none"> • 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. <p>Thermite reactions can also occur with oxides of lead, copper, iron, bismuth and certain other metals.</p>
Hazardous combustion products	No hazardous decomposition products are known.
Special protective equipment and precautions for firefighters	Firefighters should wear NIOSH approved, positive pressure, self-contained breathing apparatus and full protective clothing when appropriate.
Fire fighting equipment/instructions	Use gentle surface application of Class D extinguishing agent or dry inert granular material (e.g., sand) to cover and ring the burning material. If impossible to extinguish, protect surroundings and allow fire to burn itself out. Apply extinguishing media carefully to avoid creating airborne dust.
General fire hazards	This product does not present fire or explosion hazards as shipped. Small chips, fine turnings, and dust from processing may be readily ignitable.

Explosion data

Sensitivity to mechanical impact	Not applicable.
Sensitivity to static discharge	Take precautionary measures against static discharges when there is a risk of dust explosion.

6. Accidental release measures

Personal precautions, protective equipment and emergency procedures Avoid generating dust. Avoid inhalation of dust. Avoid inhalation of fumes from molten product. Avoid contact with sharp edges or heated metal. Molten, heated and cold aluminum look alike; do not touch unless you know it is cold. Use personal protection recommended in Section 8 of the SDS.

Personal precautions, protective equipment and emergency procedures
For emergency responders Avoid generating dust. Avoid inhalation of dust. Avoid inhalation of fumes from molten product. Avoid contact with sharp edges or heated metal. Molten, heated and cold aluminum look alike; do not touch unless you know it is cold. Use personal protection recommended in Section 8 of the SDS.

Evacuation procedures Persons not wearing appropriate protective equipment should be excluded from area of spill until clean-up has been completed.

Methods and materials for containment and cleaning up Collect scrap for recycling.
If molten: Use dry sand to contain the flow of material. 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.

Environmental precautions Reuse or recycle material whenever possible.

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. Use personal protection recommended in Section 8 of the SDS.

Storage Store in a dry place.

Requirements for Processes Which Generate Dusts or Fines If processing of this product generates dust or if extremely fine particulate is generated, obtain and follow the safety procedures and equipment guides contained in Aluminum Association Bulletin 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 small chunks, 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.

Dross Handling

Small amounts of beryllium (<0.0002% or <2 ppm) can be present in aluminum alloys either from naturally occurring beryllium in aluminum ore or as a alloying element in the aluminum recycling stream. This beryllium does not present an health hazard during processing (grinding, cutting or welding) of aluminum products. However, beryllium may concentrate in the dross formed when aluminum scrap is remelted. Therefore, the potential for exposures to beryllium when handling dross must be considered. Control of airborne dust levels would be critical in reducing or eliminating this potential. For more information on the hazards associated with handling dross that contains beryllium, refer to Arconic SDS No. 1013, Aluminum Dross with Low Beryllium. Copies of this SDS are available on www.arconic.com or by calling +412-553-4649.

8. Exposure controls/personal protection

Occupational exposure limits

U.S. - OSHA Components

U.S. - OSHA Components	Type	Value	Form
Aluminum (CAS 7429-90-5)	TWA	5 mg/m ³ 15 mg/m ³	Respirable fraction Total dust
Chromium (CAS 7440-47-3)	TWA	1 mg/m ³	
Cobalt (CAS 7440-48-4)	TWA	0.1 mg/m ³	Dust and fume.
Copper (CAS 7440-50-8)	TWA	1 mg/m ³ 0.1 mg/m ³	Dust and mist. Fume.
Manganese (CAS 7439-96-5)	Ceiling	5 mg/m ³	Fume
Nickel (CAS 7440-02-0)	TWA	1 mg/m ³	
Silicon (CAS 7440-21-3)	TWA	5 mg/m ³ 15 mg/m ³	Respirable fraction. Total dust

Compounds Formed During Processing

Compounds Formed During Processing	Type	Value	Form
Aluminum oxide (non-fibrous) (CAS 1344-28-1)	TWA	5 mg/m ³ 15 mg/m ³	Respirable fraction. Total dust.
Chromium (II) compounds	TWA	0.5 mg/m ³	(as Cr)
Chromium (III) compounds	TWA	0.5 mg/m ³	(as Cr)
Chromium (VI) compounds (CAS 18540-29-9)	TWA	0.0025 mg/m ³	Action Level as Cr(VI)

U.S. - OSHA**Compounds Formed During Processing**

	Type	Value	Form
Cobalt compounds, inorganic	TWA	0.1 mg/m3	(for metal dust/fume)
Iron oxide (CAS 1309-37-1)	TWA	10 mg/m3	Fume.
Lead compounds, inorganic	TWA	0.05 mg/m3 0.03 mg/m3	(as Pb) Action Level (as Pb)
Manganese compounds, inorganic	Ceiling	5 mg/m3	(as Mn) Fume
Nickel compounds, insoluble	TWA	1 mg/m3	(as Ni)
Nitric oxide (CAS 10102-43-9)	TWA	30 mg/m3	
Ozone (CAS 10028-15-6)	TWA	25 ppm 0.2 mg/m3	
Silica, amorphous (CAS 112926-00-8)	TWA	0.1 ppm 20 mppcf	80 mg/m3 / %SiO2
Zinc oxide (CAS 1314-13-2)	TWA	5 mg/m3	Fume.
		5 mg/m3 5 mg/m3 15 mg/m3	Respirable fraction. Total dust.
	TWA (fume)	5 mg/m3	Fume.
	TWA (total dust)	15 mg/m3	Total dust.
Residuals	Type	Value	Form

Oil mist, mineral (CAS 8012-95-1)

TWA

5 mg/m3

Mist.

US. OSHA Specifically Regulated Substances (29 CFR 1910.1001-1050) Components

	Type	Value	Form
Cadmium (CAS 7440-43-9)	TWA	0.005 mg/m3	
Lead (CAS 7439-92-1)	TWA	0.05 mg/m3	
Compounds Formed During Processing	Type	Value	Form

Chromium (VI) compounds (CAS 18540-29-9)

TWA

0.005 mg/m3

as Cr(VI)

US. OSHA Table Z-1 Limits for Air Contaminants (29 CFR 1910.1000)

	Type	Value	Form
Cobalt compounds, inorganic	PEL	0.1 mg/m3	Dust and fume.
Magnesium oxide (CAS 1309-48-4)	PEL	15 mg/m3	Total particulate.
Manganese oxide (CAS 1344-43-0)	Ceiling	5 mg/m3	
Nitrogen dioxide (CAS 10102-44-0)	Ceiling	9 mg/m3	
Zinc oxide (CAS 1314-13-2)	PEL	5 ppm 5 mg/m3	Respirable fraction.
		5 mg/m3 15 mg/m3	Fume. Total dust.
Residuals	Type	Value	Form
Oil mist, mineral (CAS 8012-95-1)	PEL	5 mg/m3	Mist.

US. OSHA Table Z-2 (29 CFR 1910.1000)

Components	Type	Value	Form
Cadmium (CAS 7440-43-9)	Ceiling	0.6 mg/m3	Dust.
		0.3 mg/m3	Fume.
	TWA	0.2 mg/m3	Dust.
		0.1 mg/m3	Fume.

ACGIH Components	Type	Value	Form
Cadmium (CAS 7440-43-9)	TWA	0.01 mg/m3	
Copper (CAS 7440-50-8)	TWA	1 mg/m3	(Dust and Mist)
		0.2 mg/m3	Fume
Manganese (CAS 7439-96-5)	TWA (inhalable fraction)	0.2 mg/m3	(inhalable fraction)
	TWA (respirable fraction)	0.02 mg/m3	(respirable fraction)

Compounds Formed During Processing	Type	Value	Form
Aluminum oxide (non-fibrous) (CAS 1344-28-1)	TWA	1 mg/m3	Respirable fraction, as Al
Chromium (VI) compounds (CAS 18540-29-9)	TWA	0.05 mg/m3	Soluble compounds as Cr
Cobalt compounds, inorganic	TWA	0.02 mg/m3	(as Co)
		0.02 mg/m3	(as metal)
Ozone (CAS 10028-15-6)	TWA	0.2 ppm	(Heavy, moderate or light workloads (≤2 hours))

US ACGIH Threshold Limit Values: Short Term Exposure Limit (STEL): mg/m3

Compounds Formed During Processing	Type	Value	Form
Zinc oxide (CAS 1314-13-2)	STEL	10 mg/m3	Respirable fraction.

US ACGIH Threshold Limit Values: Time Weighted Average (TWA): mg/m3 & ppm

Compounds Formed During Processing	Type	Value	Form
Nitric oxide (CAS 10102-43-9)	TWA	25 ppm	
Nitrogen dioxide (CAS 10102-44-0)	TWA	0.2 ppm	

US ACGIH Threshold Limit Values: Time Weighted Average (TWA): mg/m3, non-standard units

Components	Type	Value	Form
Aluminum (CAS 7429-90-5)	TWA	1 mg/m3	Respirable fraction.
Cadmium (CAS 7440-43-9)	TWA	0.01 mg/m3	
		0.002 mg/m3	Respirable fraction.
Chromium (CAS 7440-47-3)	TWA	0.5 mg/m3	
Cobalt (CAS 7440-48-4)	TWA	0.02 mg/m3	
		1 mg/m3	Dust and mist.
Copper (CAS 7440-50-8)	TWA	0.2 mg/m3	Fume.
		0.05 mg/m3	
Lead (CAS 7439-92-1)	TWA	0.1 mg/m3	Inhalable fraction.
Manganese (CAS 7439-96-5)	TWA	0.02 mg/m3	Respirable fraction.
		1.5 mg/m3	Inhalable fraction.
Nickel (CAS 7440-02-0)	TWA	0.02 mg/m3	Respirable fraction.
		1.5 mg/m3	Inhalable fraction.
Compounds Formed During Processing	Type	Value	Form
Chromium (III) compounds	TWA	0.5 mg/m3	

US ACGIH Threshold Limit Values: Time Weighted Average (TWA): mg/m3, non-standard units

Compounds Formed During Processing	Type	Value	Form
Chromium (VI) compounds (CAS 18540-29-9)	TWA	0.01 mg/m3	Insoluble compounds as Cr
Cobalt compounds, inorganic	TWA	0.02 mg/m3	
Iron oxide (CAS 1309-37-1)	TWA	5 mg/m3	Respirable fraction.
Lead compounds, inorganic	TWA	0.05 mg/m3	
Magnesium oxide (CAS 1309-48-4)	TWA	10 mg/m3	Inhalable fraction.
Manganese compounds, inorganic	TWA	0.1 mg/m3	Inhalable fraction.
Manganese oxide (CAS 1344-43-0)	TWA	0.02 mg/m3 0.1 mg/m3	Respirable fraction. Inhalable fraction.
Nickel compounds, insoluble	TWA	0.02 mg/m3 0.2 mg/m3	Respirable fraction. Inhalable fraction.
Zinc oxide (CAS 1314-13-2)	TWA	2 mg/m3	Respirable fraction.
Residuals	Type	Value	Form
Oil mist, mineral (CAS 8012-95-1)	TWA	5 mg/m3	Inhalable fraction.
Arconic Components	Type	Value	Form
Aluminum (CAS 7429-90-5)	TWA	3 mg/m3 10 mg/m3	Respirable fraction Total dust
Cobalt (CAS 7440-48-4)	TWA	0.02 mg/m3	Inhalable fraction
Manganese (CAS 7439-96-5)	TWA	0.05 mg/m3 0.02 mg/m3	Total dust. Respirable fraction.
Nickel (CAS 7440-02-0)	TWA	1 mg/m3	
Compounds Formed During Processing	Type	Value	Form
Aluminum oxide (non-fibrous) (CAS 1344-28-1)	TWA	3 mg/m3 10 mg/m3	Respirable fraction. Total dust.
Chromium (VI) compounds (CAS 18540-29-9)	TWA	0.25 µg/m3	
Cobalt compounds, inorganic	TWA	0.02 mg/m3	(as Co)
Manganese compounds, inorganic	TWA	0.02 mg/m3 0.05 mg/m3	(as metal) Total dust, as Mn.
Nickel compounds, insoluble	TWA	0.02 mg/m3 0.1 mg/m3	Respirable fraction, as Mn. Insoluble
Residuals	Type	Value	Form
Oil mist, mineral (CAS 8012-95-1)	TWA	0.5 mg/m3	(8 Hour)

General	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).
	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. Sampling to establish lead level exposure is advised where exposure to airborne particulate or fumes is possible.
Appropriate 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.
Individual protection measures, such as personal protective equipment	
Eye/face protection	Wear safety glasses with side shields. Wear a face shield when working with molten material.
Skin protection	
Hand protection	Molten metal: Heat resistant gloves. Wear appropriate gloves to avoid any skin injury. The need for personal protective equipment (gloves) should be based upon a hazard assessment and recommendations from health / safety professionals. The most suitable glove must be chosen in consultation with the gloves supplier, who can inform about the breakthrough time of the glove material.
Other	Molten metal: Wear heat resistant gloves. Wear fire/flame resistant/retardant clothing. The need for personal protective equipment should be based upon a hazard assessment and recommendations from health / safety professionals.
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: N95, N100 for Lead.
Thermal hazards	Contact with molten material can cause thermal burns. Hot aluminum does not necessarily glow red. When material is heated, wear gloves to protect against thermal burns. Flame retardant protective clothing is recommended.
General hygiene considerations	Handle in accordance with good industrial hygiene and safety practice. Wash hands before breaks and immediately after handling the product. When using, do not eat, drink or smoke.
Control parameters	Follow standard monitoring procedures.

9. Physical and chemical properties

Form	Solid.
Color	Silver colored.
Odor	Odorless
Odor threshold	Not applicable
pH	Not applicable
Density	2.50 - 3.12 g/cm ³
Melting point/freezing point	899.6 - 1220 °F (482 - 660 °C)
Initial boiling point and boiling range	Not determined
Flash point	Not applicable
Evaporation rate	Not applicable
Flammability (solid, gas)	Not applicable.
Upper/lower flammability or explosive limits	
Flammability limit - upper (%)	Not applicable
Flammability limit - lower (%)	Not applicable
Explosive properties	Dust clouds may be explosive under certain conditions.
Dust explosion properties	
St class	Strong explosion.
Vapor pressure	Not applicable
Vapor density	Not applicable

Relative density	Not determined
Solubility(ies)	Insoluble
Partition coefficient (n-octanol/water)	Not applicable. Not applicable
Auto-ignition temperature	Not applicable
Decomposition temperature	Not applicable
Viscosity	Not applicable

10. Stability and reactivity

Reactivity	The product is stable and non-reactive under normal conditions of use, storage and transport.
Chemical stability	Stable under normal conditions of use, storage, and transportation as shipped.
Possibility of hazardous reactions	Hazardous polymerization does not occur.
Conditions to avoid	Chips, fines, dust and molten metal are considerably more reactive with the following: <ul style="list-style-type: none"> • 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.
Incompatible materials	Chips, fines, dust and molten metal are considerably more reactive with the following: <ul style="list-style-type: none"> • 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 metal. • 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 without external ignition source. • Iron powder and water: Explosive reaction forming hydrogen gas when heated above 1470°F (800°C). 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. Thermite reactions can occur with oxides of lead, copper, iron, bismuth and certain other metals.
Hazardous decomposition products	No hazardous decomposition products are known.

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.

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).

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.

Cerium: Can cause irritation of eyes and skin. Chronic overexposures: Can cause lung damage.

Cobalt: Can cause irritation of eyes, skin and respiratory tract. Skin contact: Can cause allergic reactions. Acute and chronic overexposures: Can cause respiratory sensitization, asthma, scarring of the lungs (pulmonary fibrosis) and damage to the heart muscle (cardiomyopathy). IARC/NTP: Listed as possibly carcinogenic to humans by IARC (Group 2B).

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.

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).

Cadmium dust, fumes and mist: Can cause severe irritation of respiratory tract. Acute overexposures: Can cause metal fume fever (shortness of breath and malaise), inflammation of the lung tissue and fluid in the lungs (pulmonary edema). Effects can be delayed for several hours. Chronic overexposures: Can cause lung damage, renal tube damage, placenta damage, testicular damage, liver damage, fetal malformations, reduction in the number of red blood cells (anemia), high blood pressure (hypertension), emphysema and central nervous system effects. Can accumulate in the body over time. IARC/NTP: Listed as "known to be a human carcinogen" by the NTP. Listed as carcinogenic to humans by IARC (Group 1). Cadmium and cadmium compounds: Associated with lung tumors, prostate tumors, kidney tumors and testicular tumors.

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.

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

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).

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).

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).

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).

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).

Manganese compounds: 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.

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.

Cobalt compounds: Can cause irritation of eyes, skin and respiratory tract. Skin contact: Can cause allergic reactions. Acute and chronic overexposures: Can cause respiratory sensitization, asthma, kidney damage and damage to the heart muscle (cardiomyopathy). IARC/NTP: Listed as possibly carcinogenic to humans by IARC (Group 2B).

Chromium (III) compounds: Can cause irritation of eye, skin and respiratory tract. IARC/NTP: Not classifiable as to their carcinogenicity to humans by IARC.

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).

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).

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).

Information on likely routes of exposure

Eye contact Dust in the eyes will cause irritation.

Skin contact Dust and fumes from processing: Can cause irritation. Contains (Cobalt, Nickel). May produce an allergic reaction. Prolonged or repeated skin contact may cause sensitization and allergic contact dermatitis.

Inhalation Dust and fumes from processing:
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), respiratory sensitization, scarring of the lungs (pulmonary fibrosis), central nervous system damage, secondary Parkinson's disease and reproductive harm. Contains (Cobalt, Nickel). May produce an allergic reaction.

Additional health effects from elevated temperature processing (e.g., welding, melting): Dust and fumes from processing: Can cause irritation of the respiratory tract. Acute overexposures: Can cause metal fume fever (nausea, fever, chills, shortness of breath and malaise), the accumulation of fluid in the lungs (pulmonary edema) and reduced ability of the blood to carry oxygen (methemaglobin). Chronic overexposures: Can cause respiratory sensitization, scarring of the lungs (pulmonary fibrosis), and lung cancer.

Ingestion Not relevant, due to the form of the product.

Symptoms related to the physical, chemical and toxicological characteristics Dust and fumes from processing: Contains (Cobalt, Nickel). May produce an allergic reaction. May cause sensitization of susceptible persons by skin contact or by inhalation of dust. Dust from mechanical processing: Can cause irritation of the eyes, skin and upper respiratory tract. Chronic overexposures: Can cause reduction in the number of red blood cells (anemia), skin abnormalities (pigmentation changes), respiratory sensitization and scarring of the lungs (pulmonary fibrosis).

Additional health effects from elevated temperature processing (e.g., welding, melting): Acute overexposure: Can cause metal fume fever (nausea, fever, chills, shortness of breath and malaise), the accumulation of fluid in the lungs (pulmonary edema) and reduced ability of the blood to carry oxygen (methemaglobin). Chronic overexposures: Can cause respiratory sensitization, scarring of the lungs (pulmonary fibrosis), central nervous system damage, secondary Parkinson's disease, reproductive harm and lung cancer.

Contact with residual oil/oil coating: Can cause irritation. Prolonged or repeated skin contact may cause dermatitis.

Information on toxicological effects

Components	Species	Test Results
Aluminum (CAS 7429-90-5)		
<u>Acute</u>		
Oral		
LD50	Rat	> 10000 mg/kg > 2000 mg/kg
Cadmium (CAS 7440-43-9)		
<u>Acute</u>		
Inhalation		
LC50	Rat	0.025 mg/l, 900 Days
Oral		
LD50	Mouse	890 mg/kg
	Rat	225 mg/kg
Nickel (CAS 7440-02-0)		
<u>Acute</u>		
Oral		
LD50	Rat	> 9000 mg/kg
Zinc (CAS 7440-66-6)		
<u>Acute</u>		
Oral		
LD50	Rat	630 mg/kg
Compounds Formed During Processing	Species	Test Results

Silica, amorphous (CAS 112926-00-8)		
<u>Acute</u>		
Oral		
LD50	Mouse	> 15000 mg/kg
	Rat	> 22500 mg/kg
Acute toxicity	Dust and fumes from processing: Can cause irritation of the eyes, skin and upper respiratory tract. Heating above the melting point releases metallic oxides which may cause metal fume fever by inhalation. The symptoms are shivering, fever, malaise and muscular pain.	
Skin corrosion/irritation	Non-corrosive.	
Serious eye damage/eye irritation	Dust and fume from processing: Dust in the eyes will cause irritation.	
Respiratory or skin sensitization	Dust and fume from processing: Contains (Cobalt, Nickel). May produce an allergic reaction. May cause sensitization by inhalation and skin contact.	
Respiratory sensitization	Dust and fumes from processing: Contains (Cobalt, Nickel). May produce an allergic reaction. May cause sensitization by inhalation.	
Skin sensitization	Dust and fume from processing: Contains nickel. May produce an allergic reaction. May cause sensitization by skin contact.	
Germ cell mutagenicity	Contains a substance which may have a mutagenic effect.	
Neurological effects	Dust or fume from processing May cause central nervous system effects.	
Pre-existing conditions aggravated by exposure	Dust and fume from processing: Asthma, chronic lung disease, and skin rashes.	
Carcinogenicity	Product as shipped: Does not present any cancer hazards.	
	Dust from mechanical processing: Can present a cancer hazard (Nickel, Cobalt, Lead). Dust and fumes from welding or elevated temperature processing: Can present a cancer hazard (Hexavalent chromium compounds, Lead compounds, Cobalt compounds, Nickel compounds, Welding fumes).	
ACGIH Carcinogens		
Aluminum (CAS 7429-90-5)	A4 Not classifiable as a human carcinogen.	
Aluminum oxide (non-fibrous) (CAS 1344-28-1)	A4 Not classifiable as a human carcinogen.	

Cadmium (CAS 7440-43-9)
 Chromium (CAS 7440-47-3)
 Chromium (III) compounds (CAS S~CR3~I)
 Chromium (VI) compounds (CAS 18540-29-9)
 Cobalt (CAS 7440-48-4)

Cobalt compounds, inorganic (CAS RR-02516-1)

Iron oxide (CAS 1309-37-1)
 Lead (CAS 7439-92-1)

Lead compounds, inorganic (CAS S~PB~I)

Magnesium oxide (CAS 1309-48-4)
 Manganese (CAS 7439-96-5)
 Manganese oxide (CAS 1344-43-0)
 Nickel (CAS 7440-02-0)
 Nickel compounds, insoluble (CAS S~NI~L)
 Nitrogen dioxide (CAS 10102-44-0)
 Oil mist, mineral (CAS 8012-95-1)

Ozone (CAS 10028-15-6)

A2 Suspected human carcinogen.
 A4 Not classifiable as a human carcinogen.
 A4 Not classifiable as a human carcinogen.
 A1 Confirmed human carcinogen.
 A3 Confirmed animal carcinogen with unknown relevance to humans.
 A3 Confirmed animal carcinogen with unknown relevance to humans.
 A4 Not classifiable as a human carcinogen.
 A3 Confirmed animal carcinogen with unknown relevance to humans.
 A3 Confirmed animal carcinogen with unknown relevance to humans.
 A4 Not classifiable as a human carcinogen.
 A4 Not classifiable as a human carcinogen.
 A4 Not classifiable as a human carcinogen.
 A5 Not suspected as a human carcinogen.
 A1 Confirmed human carcinogen.
 A4 Not classifiable as a human carcinogen.
 A2 Suspected human carcinogen.
 A4 Not classifiable as a human carcinogen.
 A4 Not classifiable as a human carcinogen.

IARC Monographs. Overall Evaluation of Carcinogenicity

Cadmium (CAS 7440-43-9)
 Chromium (CAS 7440-47-3)
 Chromium (III) compounds (CAS S~CR3~I)
 Chromium (VI) compounds (CAS 18540-29-9)
 Iron oxide (CAS 1309-37-1)
 Lead (CAS 7439-92-1)
 Lead compounds, inorganic (CAS S~PB~I)
 Nickel (CAS 7440-02-0)
 Nickel compounds, insoluble (CAS S~NI~L)
 Silica, amorphous (CAS 112926-00-8)

1 Carcinogenic to humans.
 3 Not classifiable as to carcinogenicity to humans.
 3 Not classifiable as to carcinogenicity to humans.
 1 Carcinogenic to humans.
 3 Not classifiable as to carcinogenicity to humans.
 2B Possibly carcinogenic to humans.
 2A Probably carcinogenic to humans.
 1 Carcinogenic to humans.
 1 Carcinogenic to humans.
 3 Not classifiable as to carcinogenicity to humans.

US OSHA Hazard Categories (10)

Not regulated.

US OSHA Hazard Categories (9)

Not regulated.

US. National Toxicology Program (NTP) Report on Carcinogens

Cadmium (CAS 7440-43-9)
 Chromium (VI) compounds (CAS 18540-29-9)
 Lead (CAS 7439-92-1)
 Lead compounds, inorganic (CAS S~PB~I)
 Nickel (CAS 7440-02-0)

Oil mist, mineral (CAS 8012-95-1)

Known To Be Human Carcinogen.
 Known To Be Human Carcinogen.
 Reasonably Anticipated to be a Human Carcinogen.
 Reasonably Anticipated to be a Human Carcinogen.
 Known To Be Human Carcinogen.
 Reasonably Anticipated to be a Human Carcinogen.
 Known To Be Human Carcinogen.

US. OSHA Specifically Regulated Substances (29 CFR 1910.1001-1050)

Cadmium (CAS 7440-43-9)
 Chromium (VI) compounds (CAS 18540-29-9)

Cancer
 Cancer

Reproductive toxicity

Product as shipped: Does not present any reproductive hazards.

Dust from mechanical processing:
 Can present a reproductive hazard (Lead).

Dust and fumes from welding or elevated temperature processing:
 Can present a reproductive hazard (Manganese compounds, Lead compounds).

Routes of exposure

Eye contact. Inhalation. Skin contact.

Specific target organ toxicity - single exposure

Not available.

Specific target organ toxicity - repeated exposure

Dust and fume from processing: Causes damage to organs through prolonged or repeated exposure by inhalation.

Aspiration hazard

Not an aspiration hazard. Not classified. Based on available data, the classification criteria are not met.

12. Ecological information

Ecotoxicity Not expected to be harmful to aquatic organisms.

Components		Species	Test Results
Cadmium (CAS 7440-43-9)			
Aquatic			
Crustacea	EC50	Water flea (Daphnia magna)	0.0491 mg/l, 48 hours
Fish	LC50	Rainbow trout,donaldson trout (Oncorhynchus mykiss)	0.0024 - 0.0029 mg/l, 96 hours
Chromium (CAS 7440-47-3)			
Aquatic			
Crustacea	EC50	Water flea (Daphnia magna)	0.01 - 0.7 mg/l, 48 hours
Fish	LC50	Carp (Cyprinus carpio)	14.3 mg/l, 96 hours
Copper (CAS 7440-50-8)			
Aquatic			
Crustacea	EC50	Water flea (Daphnia magna)	0.036 mg/l, 48 hours
Fish	LC50	Fathead minnow (Pimephales promelas)	0.0319 - 0.0544 mg/l, 96 hours
Iron (CAS 7439-89-6)			
Aquatic			
Crustacea	LC50	Cockle (Cerastoderma edule)	100 - 330 mg/l, 48 hours
		Common shrimp, sand shrimp (Crangon crangon)	33 - 100 mg/l, 48 hours
Fish	LC50	Channel catfish (Ictalurus punctatus)	> 500 mg/l, 96 hours
Lead (CAS 7439-92-1)			
Aquatic			
Fish	LC50	Rainbow trout,donaldson trout (Oncorhynchus mykiss)	1.17 mg/l, 96 hours
Manganese (CAS 7439-96-5)			
Aquatic			
Crustacea	EC50	Water flea (Daphnia magna)	40 mg/l, 48 hours
Nickel (CAS 7440-02-0)			
Aquatic			
Crustacea	EC50	Water flea (Daphnia magna)	1 mg/l, 48 hours
Fish	LC50	Fathead minnow (Pimephales promelas)	2.923 mg/l, 96 hours
Zinc (CAS 7440-66-6)			
Aquatic			
Crustacea	EC50	Water flea (Daphnia magna)	2.8 mg/l, 48 hours
Fish	LC50	Rainbow trout,donaldson trout (Oncorhynchus mykiss)	0.56 mg/l, 96 hours

Compounds Formed During Processing		Species	Test Results
Ozone (CAS 10028-15-6)			
Aquatic			
Fish	LC50	Rainbow trout,donaldson trout (Oncorhynchus mykiss)	0.0081 - 0.0106 mg/l, 96 hours

Persistence and degradability Not inherently biodegradable.

Bioaccumulative potential No data available on bioaccumulation.

Mobility in soil Not considered mobile.

Mobility in general Not considered mobile.

Other adverse effects Not known.

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: Not federally regulated in the U.S. if disposed of "as is." RCRA waste codes other than described here may apply depending on use of the product. Status must be determined at the point of waste generation. Refer to 40 CFR 261 or state equivalent in the U.S. TCLP testing is recommended for cadmium, chromium, and lead in a waste disposal scenario.
Waste from residues / unused products	If reuse or recycling is not possible, disposal must be made according to local or governmental regulations.
Contaminated packaging	Dispose of in accordance with local regulations.

14. Transport information

General Shipping Information

Basic Shipping Information

ID number	-
Proper shipping name	Not regulated
Hazard class	-
Packing group	-

General Shipping Notes

- When "Not regulated", enter the proper freight classification, SDS Number and Product Name onto the shipping paperwork.

Disclaimer

This section provides basic classification information and, where relevant, information with respect to specific modal regulations, environmental hazards and special precautions. Otherwise, it is presumed that the information is not available/not relevant

15. Regulatory information

US 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.

TSCA Section 12(b) Export Notification (40 CFR 707, Subpt. D)

Chromium (VI) compounds (CAS 18540-29-9) 0.1 % Annual Export Notification required.

CERCLA Hazardous Substance List (40 CFR 302.4)

Cadmium (CAS 7440-43-9)	Listed.
Chromium (CAS 7440-47-3)	Listed.
Chromium (II) compounds (CAS S~CR2~C)	Listed.
Chromium (III) compounds (CAS S~CR3~I)	Listed.
Chromium (VI) compounds (CAS 18540-29-9)	Listed.
Cobalt (CAS 7440-48-4)	Listed.
Copper (CAS 7440-50-8)	Listed.
Lead (CAS 7439-92-1)	Listed.
Lead compounds, inorganic (CAS S~PB~I)	Listed.
Manganese (CAS 7439-96-5)	Listed.
Manganese compounds, inorganic (CAS S~MN~C)	Listed.
Manganese oxide (CAS 1344-43-0)	Listed.
Nickel (CAS 7440-02-0)	Listed.
Nickel compounds, insoluble (CAS S~NI~L)	Listed.
Nitric oxide (CAS 10102-43-9)	Listed.
Nitrogen dioxide (CAS 10102-44-0)	Listed.
Zinc (CAS 7440-66-6)	Listed.
Zinc oxide (CAS 1314-13-2)	Listed.

US EPCRA Section 304 Extremely Haz. Subs. & CERCLA Haz. Subs.: Section 304 EHS reportable quantity

Nitric oxide (CAS 10102-43-9)	10 LBS
Nitrogen dioxide (CAS 10102-44-0)	10 LBS
Ozone (CAS 10028-15-6)	100 LBS

US. OSHA Specifically Regulated Substances (29 CFR 1910.1001-1050)

Cadmium (CAS 7440-43-9)	Cancer
Chromium (VI) compounds (CAS 18540-29-9)	Cancer

Lead (CAS 7439-92-1)	Reproductive toxicity
Lead compounds, inorganic (CAS S~PB~I)	Reproductive toxicity
Cadmium (CAS 7440-43-9)	Lung
Chromium (VI) compounds (CAS 18540-29-9)	Eye irritation
Lead (CAS 7439-92-1)	Central nervous system
Lead compounds, inorganic (CAS S~PB~I)	Central nervous system
Cadmium (CAS 7440-43-9)	Kidney
Chromium (VI) compounds (CAS 18540-29-9)	Skin sensitization
Lead (CAS 7439-92-1)	Kidney
Lead compounds, inorganic (CAS S~PB~I)	Kidney
Cadmium (CAS 7440-43-9)	Acute toxicity
Lead (CAS 7439-92-1)	Blood
Lead compounds, inorganic (CAS S~PB~I)	Blood
Lead (CAS 7439-92-1)	Acute toxicity
Lead compounds, inorganic (CAS S~PB~I)	Acute toxicity

US OSHA Hazard Categories (9)

Not regulated.

US OSHA Hazard Categories (10)

Not regulated.

Superfund Amendments and Reauthorization Act of 1986 (SARA)

Section 311/312 hazard categories	Immediate Hazard - Yes	If particulates are generated during processing
	Delayed Hazard - Yes	If particulates are generated during processing
	Fire Hazard - No	
	Pressure Hazard - No	
	Reactivity Hazard - Yes	If molten

SARA 302 Extremely hazardous substance

Chemical name	CAS number	Reportable quantity	Threshold planning quantity	Threshold planning quantity, lower value	Threshold planning quantity, upper value
Nitric oxide	10102-43-9	10	100 lbs		
Nitrogen dioxide	10102-44-0	10	100 lbs		
Ozone	10028-15-6	100	100 lbs		

SARA 311/312 Hazardous chemical Yes

Disclaimer The user of this SDS should verify the substance specific concentration information as it relates to regulatory reporting. Listed concentrations may cover a range of formulations and process batch variations.

Superfund Amendments and Reauthorization Act of 1986 (SARA)

SARA 313 (TRI reporting)

Chemical name	CAS number	% by wt.
Aluminum	7429-90-5	≥70
Copper	7440-50-8	≤4.6
Nickel	7440-02-0	≤5.1
Zinc	7440-66-6	≤5.1
Manganese	7439-96-5	≤1.6
Cobalt	7440-48-4	≤1.1
Lead	7439-92-1	0 - 0.3

US state regulations

US. California Proposition 65

US - California Proposition 65 - CRT: Listed date/Carcinogenic substance

Cadmium (CAS 7440-43-9)	Listed: October 1, 1987
Chromium (VI) compounds (CAS 18540-29-9)	Listed: February 27, 1987
Cobalt (CAS 7440-48-4)	Listed: July 1, 1992
Cobalt compounds, inorganic (CAS RR-02516-1)	Listed: July 1, 1992
Lead (CAS 7439-92-1)	Listed: October 1, 1992
Lead compounds, inorganic (CAS S~PB~I)	Listed: October 1, 1992
Nickel (CAS 7440-02-0)	Listed: May 7, 2004
Nickel compounds, insoluble (CAS S~NI~L)	Listed: May 7, 2004

US - California Proposition 65 - CRT: Listed date/Developmental toxin

Cadmium (CAS 7440-43-9)	Listed: May 1, 1997
Chromium (VI) compounds (CAS 18540-29-9)	Listed: December 19, 2008
Lead (CAS 7439-92-1)	Listed: February 27, 1987
Lead compounds, inorganic (CAS S~PB~I)	Listed: February 27, 1987

US - California Proposition 65 - CRT: Listed date/Female reproductive toxin

Chromium (VI) compounds (CAS 18540-29-9)	Listed: December 19, 2008
Lead (CAS 7439-92-1)	Listed: February 27, 1987
Lead compounds, inorganic (CAS S~PB~I)	Listed: February 27, 1987

US - California Proposition 65 - CRT: Listed date/Male reproductive toxin

Cadmium (CAS 7440-43-9)	Listed: May 1, 1997
Chromium (VI) compounds (CAS 18540-29-9)	Listed: December 19, 2008
Lead (CAS 7439-92-1)	Listed: February 27, 1987
Lead compounds, inorganic (CAS S~PB~I)	Listed: February 27, 1987

International Inventories

Country(s) 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)	No
Europe	European Inventory of Existing Commercial Chemical Substances (EINECS)	Yes
Europe	European List of Notified Chemical Substances (ELINCS)	No
Japan	Inventory of Existing and New Chemical Substances (ENCS)	No
Korea	Existing Chemicals List (ECL)	Yes
New Zealand	New Zealand Inventory	Yes
Philippines	Philippine Inventory of Chemicals and Chemical Substances (PICCS)	Yes
United States & Puerto Rico	Toxic Substances Control Act (TSCA) Inventory	Yes

*A "Yes" indicates that all components of this product comply with the inventory requirements administered by the governing country(s)

A "No" indicates that one or more components of the product are not listed or exempt from listing on the inventory administered by the governing country(s).

16. Other information, including date of preparation or last revision**SDS Status**

November 2, 2016: Change(s) in Section: 1, 2, 3, 8 and 16.
 April 26, 2016: Change(s) in Section: 1, 2, 11 and 16.
 February 29, 2016: Change(s) in Section: 1, 3 and 16.
 December 29, 2015: Change(s) in Section: 3 and 1.
 May 28, 2015: New format.
 September 11, 2013: Change(s) in Section: 1, 2, 4, 5, 6, 7, 8, 10, 11, 12, 13, 15 and 16.
 April 29, 2010: Change(s) in Section: 1 and 3.
 May 27, 2009: New format.
 April 4, 2007: Reviewed on a periodic basis in accordance with Arconic policy. Change(s) in Section: 1, 2, 3, 4, 5, 7, 8, 10, 11, 12, 13, 14 and 15.
 March 15, 2004: Reviewed on a periodic basis in accordance with Arconic policy. Change(s) in Section: 1 and 8.

Hazardous Materials Control Committee
 +1-412-553-4649

Revision date

November 2, 2016.

Version #

11

Revision information

Product and Company Identification: Product and Company Identification
 Identification: Emergency Information
 Identification: Website
 Composition / Information on Ingredients: Disclosure Overrides
 Handling and storage: Dross Handling
 Other information, including date of preparation or last revision: SDS Status
 Other information, including date of preparation or last revision: Other information 1
 GHS: Classification

Further information

Refer to NFPA 654, Standard for the Prevention of Fire and Dust Explosions from the Manufacturing, Processing, and Handling of Combustible Particulate Solids, for safe handling.

Disclaimer

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

Other information

- Guide to Occupational Exposure Values 2016, Compiled by the American Conference of Governmental Industrial Hygienists (ACGIH).
- NIOSH Pocket Guide to Chemical Hazards, U.S. Department of Health and Human Services, September 2005.
- expub, Expert Publishing, LLC., www.expub.com,
- Ariel, 3E Company, www.3Ecompany.com

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
CPR Cardio-pulmonary Resuscitation
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
EWC 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
SIMDUT Système d'Information sur les Matières Dangereuses Utilisées au Travail
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 ***

Hazard statement

May cause allergy or asthma symptoms or breathing difficulties if inhaled. May cause an allergic skin reaction. May cause cancer by inhalation. May damage fertility or the unborn child by inhalation. Causes damage to organs through prolonged or repeated exposure by inhalation. May form combustible dust concentrations in air.

Precautionary statement**Prevention**

Do not breathe dust/fume. In case of inadequate ventilation wear respiratory protection. Contaminated work clothing must not be allowed out of the workplace. Wear protective gloves/clothing and eye/face protection. Use personal protective equipment as required. Obtain 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.

Response

IF INHALED: If breathing is difficult, remove person to fresh air and keep comfortable for breathing. If experiencing respiratory symptoms: Call a POISON CENTER or doctor/physician.

IF ON SKIN: Wash with plenty of soap and water. If skin irritation or rash occurs: Get medical advice/attention.

Wash contaminated clothing before reuse.

IF exposed or concerned: Get medical advice/attention.

Get medical advice/attention if you feel unwell.

Storage

Store in a dry place. Keep dry.

Disposal

Dispose of contents/container in accordance with local/regional/national/international regulations.

**Danger****Supplemental information**

Non-combustible as supplied. Small chips, fine turnings and dust from processing may be readily ignitable.

Explosion/fire hazards may be present when:

- Dust or fines are dispersed in air.
- 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 from mechanical processing: Can cause irritation of the eyes, skin and upper respiratory tract. Contains (Cobalt, Nickel). May produce an allergic reaction. Chronic overexposures: Can cause reduction in the number of red blood cells, respiratory sensitization, asthma, skin abnormalities (pigmentation changes), scarring of the lungs and lung cancer.

Additional health effects from elevated temperature processing (e.g., welding, melting): Acute overexposure: Can cause metal fume fever, the accumulation of fluid in the lungs and reduced ability of the blood to carry oxygen. Chronic overexposures: Can cause respiratory sensitization, scarring of the lungs, central nervous system damage, secondary Parkinson's disease, reproductive harm, and lung cancer.

Contact with residual oil/oil coating: Can cause irritation. Prolonged or repeated skin contact may cause dermatitis.

FIRE FIGHTING MEASURES: Use Class D extinguishing agents on fines, dust or molten metal. Use coarse water spray on chips and turnings.

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

IN CASE OF SPILL: Collect scrap for recycling. If molten: Use dry sand to contain the flow of material. 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. Wear appropriate personal protective equipment.

See Arconic SDS Number 684.

**ARCONIC**

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