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**Section I – PRODUCT IDENTIFICATIONS**

<b>CHEMICAL NAME:</b> Nickel – based Super Alloys	<b>CHEMICAL FAMILY:</b> Metal Alloy
<b>TRADE NAMES:</b> Inconel- 718	<b>FORMULA:</b> This alloy contains aluminum, manganese, carbon, molybdenum, chromium, nickel, cobalt, niobium, silicon, copper, titanium, and iron metals. The hazardous constituents are given below for each alloy.

**Section II – CHEMICAL COMPOSITIONS**

HAZARDOUS CONSTITUENTS FOR WHICH PELs or TLVs EXIST		ALLOYS	PERCENT %	CAS NUMBER	EXPOSURE LIMITS (mg/m <sup>3</sup> )	
					OSHA <sup>1</sup> PEL	ACGIH <sup>2</sup> TLV
Element	PEL/ TLV Established for					
Nickel	Nickel	Inconel 718	54%	7440-02-0	1.0 mg/m3	1.0 mg/m3
Chromium	Chromium	Inconel 718	19%	7440-47-3	1.0 mg/m3	0.5 mg/m3
Iron	Iron	Inconel 718	17%	7439-89-6	10 mg/m3	5 mg/m3

**Section II – CHEMICAL COMPOSITIONS (continued)**

HAZARDOUS CONSTITUENTS FOR WHICH PELs or TLVs EXIST		ALLOYS	PERCENT %	CAS NUMBER	EXPOSURE LIMITS (mg/m <sup>3</sup> )	
					OSHA <sup>1</sup> PEL	ACGIH <sup>2</sup> TLV
Element	PEL/ TLV Established for					
Molybdenum	Molybdenum	Inconel 718	3%	7439-98-7	15 mg/m <sup>3</sup>	10 mg/m <sup>3</sup>
Niobium	Niobium	Inconel 718	5%	7440-03-1	5 mg/m <sup>3</sup>	5 mg/m <sup>3</sup>
Manganese	Manganese	Inconel 718	0.35%	7439-96-5	5 mg/m <sup>3</sup>	5 mg/m <sup>3</sup>
Carbon	Carbon	Inconel 718	0.08%	7440-44-0	5 mg/m <sup>3</sup>	10 mg/m <sup>3</sup>
Cobalt	Cobalt	Inconel 718	<1%	7440-48-4	0.1mg/m <sup>3</sup>	0.1 mg/m <sup>3</sup>
Silicon	Silicon	Inconel 718	0.35%	7440-21-3	15 mg/m <sup>3</sup>	5 mg/m <sup>3</sup>
Copper	Copper	Inconel 718	0.3%	7440-03-1	1 mg/m <sup>3</sup>	1 mg/m <sup>3</sup>
Titanium	Titanium Dioxide	Inconel 718	<1%	7440-32-6	15 mg/m <sup>3</sup>	10 mg/m <sup>3</sup>
Aluminum	Aluminum	Inconel 718	0.8%	7429-90-5	n/a	10 mg/m <sup>3</sup>

**SUMMARY:** These products contain small amounts (<1%) of various chemicals in addition to those listed. These small quantities are frequently referred to as “trace” or “residual” elements that generally originate in the raw materials used.

**NOTE:** No permissible exposure limits (PELs) or threshold limit values (TLVs) exist for these specific alloys. Values shown are applicable to component elements. Various combinations of the above components may appear in grades supplied. More specific information on a particular grade may be obtained from the specific heat certification or by contacting SAM.

<sup>1</sup> OSHA Permissible Exposure Limits (PELs) are 8-hour Time-Weighted Average (TWA) concentrations unless otherwise noted.

<sup>2</sup> Threshold Limit Values (TLV) established by the American Conference of Governmental Industrial Hygienists (ACGIH) are 8-hour TWA concentrations unless otherwise noted. A Short Term Exposure Limit (STEL) is a 15-minute TWA exposure that should not be exceeded at any time during a workday, even if the 8-hour TWA is within the TLV-TWA.

☆☆☆☆☆ **Emergency Overview** ☆☆☆☆☆

**SAM considers this product in the solid form to be nonhazardous.** However, operations such as abrading, burning, welding, sawing, brazing, grinding, cutting, polishing, and machining that results in the creation of dust or elevated temperatures may cause eye, skin, and respiratory tract irritation.

**Section III – HAZARDS IDENTIFICATION**

<b>PRIMARY ENTRY ROUTES</b>		<p><b>Inhalation:</b> Yes</p> <p><b>Ingestion:</b> Yes</p> <p><b>Skin Contact:</b> Yes</p> <p><b>Eye Contact:</b> Yes</p>
<b>EFFECTS OF OVEREXPOSURE</b>	<b>ACUTE</b>	<p><b>Ingestion:</b> May cause nausea, vomiting, and diarrhea.</p> <p><b>Skin:</b> Irritant to skin and mucous membranes.</p> <p><b>Inhalation:</b> May cause irritation of respiratory tract. May exacerbate preexisting conditions.</p> <p><b>Eyes:</b> May cause irritation.</p>
<b>EFFECTS OF OVEREXPOSURE (Continued)</b>	<b>CHRONIC</b>	<p><b>EYES:</b> May cause eye inflammation</p> <p><b>DERMAL:</b> May cause dermatitis.</p> <p><b>INHALATION:</b> May cause allergic sensitization and asthma, lung inflammation, pneumonitis, pneumonia, bronchitis, siderosis (benign lung disease caused by inhaling iron particles); diffuse pulmonary fibrosis, nasal perforation and nasal cavity damage.</p> <p><b>INGESTION:</b> Large or repeated doses may cause central nervous system damage, possible permanent liver damage, gout and inflammation of the joints.</p>
<b>CARCINOGENIC REFERENCES</b>		ACGIH, IARC, NIOSH, NTP, and OSHA do consider Inconel 718 a carcinogen.
<b>MEDICAL CONDITIONS AGGRAVATED BY EXPOSURE</b>		Chronic respiratory disease may be aggravated by exposure to dust or fumes.

<b>Section IV – FIRST AID MEASURES</b>	
<b>INHALATION</b>	Remove to fresh air, keep warm and quiet, give oxygen if breathing is difficult, and seek medical attention if irritation persists.
<b>INGESTION</b>	Never give anything by mouth to someone who is unconscious or convulsing. DO NOT induce vomiting. If conscious and alert, rinse mouth and drink 2 to 4 cups of milk or water. Get immediate medical attention.
<b>SKIN</b>	Remove contaminated clothing but do not shake clothing, brush material off skin, and wash affected area with mild soap and water. If irritation persists, seek medical attention. Skin cuts and abrasion can be treated by first aid.
<b>EYES</b>	Flush eyes for at least 15 minutes, including under upper and lower eyelids with lukewarm water. If irritation persists seek medical attention. Do not allow victim to rub eyes or to keep eyes tightly shut.
<b>NOTES TO PHYSICIAN</b>	Individuals with Wilson's disease are more susceptible to chronic copper poisoning. Because of their high densities, super alloys may produce striking abnormalities in chest X-rays.

<b>Section V – FIRE</b>	
<b>FLAMMABILITY RATING</b>	Non - Flammable
<b>FIRE AND EXPLOSION HAZARD</b>	Finely divided material such as dust, shaving, etc. may be ignited by heat, sparks or flames. May burn rapidly with flare burning effect. Fire may produce irritating or poisonous gases. High concentration of airborne dust in an enclosed area can explode or burn if exposed to a source of ignition. If dust cloud forms, immediately eliminate all possible sources of ignition such as sparks, open flames, etc. Working with this material can produce heat and sparks, which may ignite flammable material and vapors in the work place. Use of water on finely divided material may cause explosive hydrogen gas and heat to be evolved.
<b>FIRE EXTINGUISHING MEDIA</b>	Use suitable extinguishing media for surrounding materials and type of fire. Powder fires should be extinguished with a class D extinguisher, dry sand or dry dolomite, or other metal fire extinguishing agents.
<b>INCOMPATIBILITY (Materials to avoid)</b>	Reacts with strong acids to produce hydrogen gas.
<b>HAZAROUS DECOMPOSITION PRODUCTS</b>	Metal Oxide fume.
<b>HAZARDOUS POLYMERIZATION</b>	Will not occur.
<b>SPECIAL INFORMATION</b>	Metal dust particles in the air can present an explosion hazard. If dust cloud forms, immediately eliminate all possible sources of ignition such as sparks, open flames, etc. Working with this material can produce heat and sparks, which may ignite flammable materials and vapors in the workplace.

**Section VI – SPILL OR LEAK PROCEDURES**

**Evacuation Procedures and Safety:** Notify safety or health physics personnel; evacuate all non-essential personnel and provide adequate ventilation. Clean up personnel need protection against contact with inhalation of dust or oxides. Prevent skin contact. Wearing full protective clothing/equipment, scoop up spilled powder into suitable containers for disposal.

**Containment of Spills:** Spills should be contained if it can be done without risk.

**Clean up and Disposal of Spill:** Use non-sparking/anti-static containers, tools, and equipment. Do not push powder long distances across the floor. Dust cleaning methods recognized by NFPA include vacuum cleaning, sweeping, and water wash-down. Blow downs using compressed air are more likely to result in dust dispersions and shall not be permitted unless other methods result in greater personal risk. Keep in small piles away from each other. Keep material way from plant trash and other combustible material. Follow all applicable Federal, state and local regulations governing the disposal of materials.

**Environmental:** Airborne emissions, spills and releases to the environment (discharge to streams, sewer systems, groundwater, surface soil, etc.) should be controlled immediately.

**Section VII – HANDLING AND STORAGE**

<b>HANDLING</b>	If airborne dust is generated, use an appropriate NIOSH – or MSHA – approved respirator. Wash hands thoroughly after handling, before eating, or applying cosmetics. Wash exposed skin at the end of each shift. Do not shake clothing, rags, or other items to remove dust. Keep container tightly sealed unless in use.
<b>STORAGE</b>	Store away from open flames or sparks and store in cool dry conditions.

**Section VIII – SPECIAL PROTECTION INFORMATION**

<b>RESPIRATORY PROTECTION</b>	Not required under normal conditions of use or handling. For Dust or Fumes - Use appropriate NIOSH – or MSHA – approved respirators if engineering controls are infeasible or insufficient.
<b>SKIN PROTECTION</b>	Wear coveralls, safety shoes, etc., as needed and as appropriate to the conditions of handling and use.
<b>EYE PROTECTION</b>	Use safety goggles or glasses with side shields.
<b>VENTILATION</b>	Local exhaust ventilation should be used to control exposure to airborne dust or fume whenever possible.

<b>Section IX – PHYSICAL DATA</b>	
<b>FREEZING POINT:</b> n/a	<b>VAPOR PRESSURE (mmHg):</b> n/a
<b>MELTING POINT:</b> 1260°C – 1336°C	<b>VAPOR DENSITY (AIR=1):</b> n/a
<b>BOILING POINT:</b> > 1500°C	<b>DENSITY (H<sub>2</sub>O=1):</b> n/a
<b>FLASHPOINT:</b> n/a	<b>SOLUBILITY IN WATER:</b> insoluble
<b>pH:</b> n/a	<b>PHYSICAL STATE:</b> Solid
<b>APPEARANCE AND ODOR:</b> Silver/gray odorless powder.	<b>SPECIFIC GRAVITY:</b> 8.19 g/cc
<b>Section X – REACTIVITY DATA</b>	
<b>STABILITY</b>	Stable under normal conditions of storage and handling.
<b>INCOMPATIBILITY</b>	Avoid strong acids yielding hydrogen gas. Can react with strong bases.
<b>DECOMPOSITION</b>	Decomposition products may include metal oxides of fumes
<b>Section XI – TOXICOLOGY DATA</b>	
<b>INHALATION</b>	Rabbit (nickel): 130 g/m <sup>3</sup> 35 weeks (intermittent) – 6 hours Human (chromium VI) 110 g/m <sup>3</sup> 3 years (continuous) tumorigenic (carcinogenic per RTECS). Pig (cobalt): 100g/m <sup>3</sup> / 6 hours for 13 weeks (intermittent) Human (manganese): 2300 g/m <sup>3</sup>
<b>EYE IRRITATION:</b>	Irritating effect from nickel, cobalt, and chromium. Unknown amounts of cobalt have produced severe reaction in rabbits with abscess involving lens, ciliary body, vitreous humor and retina.
<b>SKIN CONTACT</b>	Irritating effect from cobalt and chromium.
<b>Oral LD<sub>50</sub></b>	Guinea Pig (nickel) 5mg/kg Rabbit (cobalt): 6171mg/kg Rat (cobalt) 750 mg/kg Human (copper) TD50: 120g/kg results in nausea or vomiting Human (chromium): 71 mg/kg
<b>Skin Sensitization</b>	Sensitization from nickel and cobalt is possible.

<b>Chronic Toxicity Studies</b>	Nickel compounds may cause a form of dermatitis know as nickel itch. They may also cause intestinal disorders, convulsion and asphyxia. Airborne nickel contaminated dusts are regarded as carcinogenic to the respiratory tract. Cobalt is an experimental neoplastigen and tumorigen. It is an experimental carcinogen of the connective tissue and lungs ingestion may cause burning in the mouth, esophagus, and stomach. Inhalation of dusts and fumes may cause irritation of the respiratory tract and labored breathing and coughing. Sensitization, nausea, flushing of the face and ringing in the ears is also possible. Chronic ingestion may result in pericardial effusion, polycardial effusion, polycythemia, cardiac failure, vomiting, convulsion and thyroid enlargement. Chromium may cause nausea, diarrhea, vomiting, skin and eye irritation and pneumoconiosis. Iron compounds may cause vomiting, diarrhea, pink urine, black stool and liver damage. Iron may cause damage to the kidneys and may irritate the respiratory tract and cause pulmonary fibrosis if inhaled. Chromium (II) and (III) compounds may cause nausea, diarrhea, vomiting, skin and ye irritation and pneumoconiosis. Acute molybdenum poisoning in laboratory animals has caused weight loss, anemia, deficit lactation, male sterility, osteoporosis and bone joint abnormalities.
<b>Toxicity Data</b>	The best of our knowledge, the acute toxicity of this alloy is not fully known.
<b>Mutagenicity Data</b>	Not available for the alloy. Mutagenic effect from chromium have been observed in tests on human (DNA damage from Cr VI of human leukocyte at 50 mol/L) and laboratory.
<b>Section XII – ECOLOGICAL DATA</b>	
No data available.	

<b>Section XIII – DISPOSAL</b>	
<b>DISPOSAL</b>	Chemical waste generators must determine whether a discarded chemical is classified as a hazardous waste. US EPA guidelines for classification determination are listed in 40 CFR 261.3. Waste generators must consult state and local hazardous waste regulation to ensure complete and accurate classification. Scrap metal can be reclaimed for reuse.
<b>DISPOSAL REGULATORY REQUIREMENTS</b>	Follow applicable Federal, State and Local regulations.
<b>CONTAINER CLEANING AND DISPOSAL</b>	Follow applicable Federal, State and Local regulations. Observe safe handling precautions.
<b>Section XIV – SHIPPING INFORMATION: DOT TRANSPORTATION DATA (49 CFR 172.101)</b>	
Proper Shipping Name: Nickel Based Super Alloy Powder. Special Information: This material need not to be classified as Flammable Solid and may be shipped as non- hazardous material.	
<b>Section XV – REGULATORY INFORMATION</b>	
<b>COMPONENTS</b>	Aluminum, Vanadium, Copper, Tin, Zirconium
<b>TSCA</b>	LISTED. Does not contain any Class 1 or Class 2 ozone depletors.
<b>Clean Water Act</b>	Alloy is not listed as Hazardous under the Clean Water Act. None of the components in the alloy is listed as Hazardous under the Clean Water Act, but chromium is listed as a Priority Pollutant and is a Toxic Pollutant under the Clean Water Act.
<b>OSHA</b>	Listed as air contaminant (29 CFR 1910.100) Hazardous by definition of Hazard Communication Standard ( 29 CFR 1910.1200)

<b>SUBJ. TO SEC. 313 RPT</b>	Aluminum, Cobalt, Copper, manganese nickel and chromium are subject to the reporting requirement of Section 313 of SARA Title III and 40 CFR Part 372.	
<b>SUBJ. TO SEC. 302 RPT</b>	N/A	
<b>RCRA</b>	N/A	
<b>SARA 311/312</b>	Acute Health Hazard	Aluminum, Copper
	Chronic Health Hazard	Copper
	Fire Hazard	NO
	Sudden Release of Pressure Hazard	NO
	Reactivity Hazard	NO
<b>STATE</b>	Chromium is on the right to know list for CA, NH, FL, PA, MA and MN. During welding, thermal cutting and melting, this material may produce cobalt oxides, nickel compounds and hexavalent chromium compounds which are known to the State of California to cause cancer- State of California, Health and Welfare Agency.	

## Section XVI – ADDITIONAL INFORMATION

### Hazard Rating Systems:

NFPA Code:

Health: 2

Flammability: 2

Reactivity: 1

**Disclaimer:** Individuals handling this product should be informed of the recommended safety precautions and should have access to this information. This information relates to the specific material designed and may not be valid for such material used in combination with any other materials or in any other processes. Such information is to the best of our knowledge and belief, accurate and reliable as of the date compiled. However, no representation, warranty or guarantee is made as to its accuracy, reliability or completeness. It is the user's completeness of such information for their own particular use. We do not accept liability for any loss or damage that may occur from the use of this information nor do we offer warranty against patent infringement.

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