

**Material Safety Data Sheet**  
***Titanium & Titanium Alloys***  
**Hamilton Precision Metals, Inc.**  
**AMETEK Specialty Metal Products**

Prepared 8/00  
Revision 2 (8/07)

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**Section 1 --- Chemical Product and Company Identification**

Product Identification: Titanium & Titanium Alloys  
CP Titanium Grades 1, 2, 3 and 4,  
Titanium Grades 9 and 38, Titanium 15-3-3-3, Ti Beta 21S  
See Technical Data Sheet for composition of specific alloys.

Manufacturer: Hamilton Precision Metals Inc.  
1780 Rohrerstown Road  
Lancaster, PA 17601  
Emergency Telephone No.: Chemtrec (800) 424-9300

**Section 2 --- Composition/Information on Ingredients**

Each alloy contains one or more of the following ingredients. Consult the Technical Data Sheet for the composition of specific alloys.

<u>Ingredients</u>	<u>CAS NO.</u>	<u>OSHA PEL</u>	<u>ACGIH TLV</u>	
Aluminum	7429-90-5	15 mg/m <sup>3</sup>	10 mg/m <sup>3</sup>	(Respirable dust, welding fume = 5 mg/m <sup>3</sup> )
Chromium	7440-47-3	0.5 mg/m <sup>3</sup>	0.5 mg/m <sup>3</sup>	
Iron	7439-89-6	10 mg/m <sup>3</sup>	5 mg/m <sup>3</sup>	(Iron oxide dust and fume)
Molybdenum	7439-98-7	15 (5) mg/m <sup>3</sup>	10 (0.5) mg/m <sup>3</sup>	Insoluble (Soluble). 3 mg/m <sup>3</sup> = Respirable (ACGIH)
Niobium	7440-03-1	NE*	NE*	
Silicon	7440-21-3	15 mg/m <sup>3</sup>	10 mg/m <sup>3</sup>	(Respirable dust PEL is 5 mg/m <sup>3</sup> )
Titanium	7440-32-6	15 mg/m <sup>3</sup>	10 mg/m <sup>3</sup>	(Titanium dioxide)
Vanadium	7440-62-2	0.5 mg/m <sup>3</sup>	0.05 mg/m <sup>3</sup>	(Vanadium pentoxide, respirable dust)
Tin	7440-31-5	2 mg/m <sup>3</sup>	2 mg/m <sup>3</sup>	

**Section 3 --- Hazard Identification**

**Appearance and Odor:** Gray/silver solid, no odor.  
**HMIS Rating:** None Reported  
**Primary Entry Routes:** Inhalation of dust or fume if cut or welded.  
**Target Organs:** Respiratory tract, eyes, if cut or welded.

***Acute (Immediate) Effects***

**Inhalation:** Exposure to solid in current state should not cause any ill health effects. However, if cutting or welding the inhalation of metal particulates may cause chills, fever, sweating, nausea, and cough (symptoms of metal fume fever). Metal fume fever symptoms typically begin within 4 to 12 hours after the initial exposure and lasts for approximately 24 hours without causing permanent damage. Other effects may include nose and throat irritation, metallic taste, difficulty breathing, wheezing, coughing, weight loss, excessive urination, diarrhea, pulmonary damage, nasopharyngitis, laryngitis and chest pain.

### Section 3 --- Hazard Identification (Continued)

**Eye:** Cutting or welding of product may cause eye irritation; damage the cornea, and/or conjunctivitis.

**Skin:** Dust from cutting or welding may cause skin irritation and dermatitis especially in creases of the skin where dust may accumulate and rub against skin. Some individuals may become sensitized from repeated contact with metal powders, especially alloys containing vanadium.

**Ingestion:** If cut or welded, hand, clothing, food and drink contact with metal dust, fume or powder can cause ingestion of particulate during hand to mouth activities such as eating, drinking, smoking, etc. may occur. However, ingestion of small amounts is unlikely to cause significant health effects.

#### *Chronic (Long Term Effects)*

NA in current state. Effects of long term or repeated exposure when cutting or welding product may include respiratory disease with symptoms ranging from shortness of breath and cough to permanent difficulty due to loss of function. Effects on the heart may be caused by excessive exposure to dust or fumes containing titanium. Chromium metal and certain compounds have been linked to nasal, bronchial and lung cancers. Aluminum and iron have been indicated to cause gastro-intestinal disorders and non-significant changes in the lung. Long term or repeated overexposure to iron dust can cause siderosis, a “benign” pneumoconiosis. Repeated or long term ingestion of large quantities of iron may result in fibrosis of the pancreas, diabetes mellitus, liver cirrhosis, and cardiac poisoning. Heating this material (i.e. welding, etc.) may generate Chromium VI. Chronic health effects specific to an element(s) may be difficult to detect due to the numerous elemental constituents in this metal.

#### *Medical Conditions Generally Aggravated by Exposure*

Individuals who may have had allergic reaction or sensitivity to metals such as chromium may encounter skin rash or dermatitis if skin contact with this product occurs. Persons with impaired pulmonary function, airway diseases and conditions such as asthma, emphysema, chronic bronchitis, etc. may incur further disability if excessive concentrations of dust or fume are inhaled. If prior damage to disease to the Neurologic (nervous), Circulatory, Hematologic (blood) or Renal (kidney) systems has occurred, proper screening or examinations should be conducted on individuals who may be exposed to further risk if handling and use of this material causes excessive exposure.

#### *Carcinogenicity*

OSHA, IARC, or NTP lists components of some alloys as carcinogens. Chromium metal is listed as IARC Class 3 (not classifiable as carcinogenic to humans). Chromium VI is classified as IARC-1, (carcinogenic to humans), and NTP –1 (known to be a human carcinogen). Other Chromium compounds are listed with an IARC-3 (not classifiable as to carcinogenicity to humans).

The IARC, NTP, or OSHA do not list the following metals used in the alloys as carcinogens – aluminum, iron, titanium, molybdenum, niobium, silicon, vanadium, or tin.

### Section 4 --- First Aid Measures

**Inhalation:** Move the person to fresh air and support breathing as required. Consult a physician if victim has continued difficulty breathing.

**Eye Contact:** Lift eyelids and flush immediately with flooding amounts of water for at least 15 minutes. Do not allow the victim to rub his/her eyes or keep them shut. Consult a physician or ophthalmologist if all material cannot be removed or if there is continuing irritation.

**Skin Contact:** Skin cuts and abrasions can be treated by standard first aid. Remove clothing around affected area. Rinse away loose material and wash affected area with soap and water. If there is a severe skin reaction or reddened or blistered skin, consult a physician.

**Ingestion:** Never give anything by mouth to an unconscious or convulsing person. Contact a poison control center with information from this MSDS and the Technical Data Sheet on the composition of the material ingested. Unless the poison control center advises otherwise, give the person one or two glasses of water, then induce vomiting. After first aid have the person see a physician for follow up care.

## Section 5 --- Fire Fighting Measures

**Flash Point:** None reported

**Autoignition Temperature:** None reported for alloy but metal powders can burn and form explosive mixtures in air. Some components of the alloy do have autoignition temperatures: chromium dust cloud 1076°F (580°C), dust layer 752°F (400°C); Aluminum dust cloud 1202°F (650°C), dust layer 1400°F (760°C), and titanium dust cloud 896 °F (480 °C).

**Lower Explosive Limit:** None reported for alloy but some component powders do have reported limits – Chromium 0.23 oz/ft<sup>3</sup>, Aluminum >0.04 oz/ft<sup>3</sup>.

**Upper Explosive Limit:** None reported.

**Extinguishing Media:** If metal is reduced to a powder form, use dry sand, dry graphite or other Class “D” fire extinguishing powder.

**Unusual Fire or Explosion Hazards:** Fine dust suspended in the air may ignite or explode. Titanium is ignitable and may explode if in a finely divided form (i.e. cutting and/or grinding).

**Fire Fighting:** Wear a self-contained breathing apparatus (SCBA) with full facepiece operated in the pressure demand or positive pressure mode. Do not allow runoff from fire fighting to enter roadways or sewers. Material may dry out and present additional fire/explosion hazards.

## Section 6 --- Accidental Release Measures

In solid form this material poses no special clean-up problems. If this material is in powder or dust form, wear appropriate protective clothing and respiratory protection for the situation. Collect spilled material utilizing a vacuum system equipped with a high efficiency particulate air filtration system and place in sealed containers for reclamation or disposal. Use clean up measures that minimize dust. Avoid inhalation of dust. Remove sources of heat or ignition as dust clouds can burn or explode. Recycle or dispose of material according to local, state, and federal regulations.

## Section 7 --- Handling and Storage

**Handling:** Use local exhaust ventilation if cutting or welding. If workers are exposed to dust (i.e. cutting, etc.) provide appropriate respiratory, eye, and skin protection. An eyewash station should be readily available to areas of use.

**Storage:** Protect containers from physical damage. Keep cool, dry and isolated from acids, caustics, halogenated compounds, and oxidizers. Fine metal powder should be kept away from open flames and sources of ignition.

## Section 8 --- Exposure Controls and Personal Protection

**Engineering Control and Ventilation:** If welding or cutting (causing dust) provide local exhaust with a minimum face velocity of 60 fpm.

**Respiratory Protection:** Wear NIOSH/MSHA approved respirators if there is a potential for exposure to dust above exposure limits for individual components of the powder and the additive effects of the components. Use NIOSH respiratory protection guidelines to select proper respiratory protection.

**Eye Protection:** Wear safety glasses with side shields and /or goggles as necessary to prevent dust from entering eyes.

**Skin Protection:** Use appropriate gloves when handling. Cut-resistant gloves should be worn to prevent metal cuts and skin abrasions particularly during the handling of strip.

## Section 9 --- Physical and Chemical Properties

**Physical State:** Gray/silver solid.

**Appearance/Odor:** No odor.

**Solubility:** Insoluble in water.

**Specific Gravity (H<sub>2</sub>O=1):** Approx 4.5

**Melting Point:** Approx. 3000 °F

**Evaporation Rate:** N/A

**Vapor Pressure (mm Hg):** N/A

**Boiling Point:** N/A

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## Section 10 --- Stability and Reactivity

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**Stability:** Product is stable.

**Polymerization:** Hazardous polymerization will not occur.

**Chemical Incompatibilities:** Reacts with mineral acids and oxidizing agents to form flammable and explosive hydrogen gas. Contact with Red Fuming Nitric Acid may cause a violent reaction.

**Conditions to Avoid:** Heat may cause production of metal fumes.

**Hazardous Decomposition Products:** Toxic metal oxides and carbon and nitrogen oxides may be produced during a fire involving metal alloys.

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## Section 11 --- Toxicological Information

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Toxicological data is not available for most pure metals and metal powders. Information may be available for metal oxides, metal salts, and other metal compounds. Refer to toxicological reference sources such as NIOSH RTECS for information if client use of this alloy creates metal compounds. Select information on metals and metal powders is listed below:

Chromium – Acute oral effect, human –  $LD_{Lo} = 71$  mg/kg.

Iron – Acute oral, human – 20-60 ug/kg.

Tin – Unreported route, human -  $TD_{Lo} = 250$  mg/kg

Vanadium – Acute inhalation, human –  $TC_{Lo} = 346$  mg/m<sup>3</sup>.

Silicon – Acute oral, rat –  $LD = 3160$  mg/kg.

Molybdenum – Acute oral, rat -  $TD_{Lo} = 5800$  ug/kg.

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## Section 12 --- Ecological Information

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Data not available for metal.

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## Section 13 --- Disposal Considerations

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Collect spilled material and place in sealed containers for reclamation or disposal. Recycle or dispose of material according to local, state, and federal regulations.

If product is in powder or dust form, use clean up measures that minimize dust. Avoid inhalation of dust and use respiratory protection as necessary. Remove sources of heat or ignition as dust clouds can burn or explode.

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## Section 14 --- Transport Information

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No special requirements.

### Section 15 --- Regulatory Information

Component	CERCLA Hazardous Substance (Section 102)	CERCLA Reportable Quantity (Lbs.)	CWA NPDES Discharge (Section 307(a))	CAA Section 112	SARA Toxic Chemical (40 CFR 372)	SARA Extremely Hazardous Substance (40 CFR 355)
Aluminum	---	---	---	---	X	---
Chromium	X	5,000**	X	X	X	---
Iron	---	---	---	---	---	---
Titanium	---	---	---	---	---	---
Vanadium	---	---	---	---	X	*
Tin	---	---	---	---	---	---
Molybdenum	---	---	---	---	---	---
Niobium	---	---	---	---	---	---
Silicon	---	---	---	---	---	---

\* Vanadium pentoxide fume or dust is listed as an Extremely Hazardous Substance with a Reportable Quantity of 1,000 Lbs. and a Threshold Planning Quantity of 100/1,000 Lbs.

\*\* following the RQ indicates that no release reporting is required if the diameter of the pieces of the solid metal released is 100 micrometers (0.004 inches) or more.

The listed components by themselves are not classified as RCRA hazardous wastes. However, certain compounds containing some components, or certain processing of some components, may produce hazardous wastes. Consult 40 CFR 261 for classification and lists of hazardous wastes.

TSCA: The chemical substances in this product are on the TSCA Section 8 Inventory

Components listed as OSHA air contaminants are found in Section 2 of this MSDS.

**International Regulations as Follows:**

Canadian WHMIS: This MSDS has been prepared in compliance with Controlled Product Regulations except for the use of the 16 headings.

Canadian DSL: The chemical substances in this product are listed on the Domestic Substance List (DSL).

### Section 16 --- Other Information

Aluminum, chromium, and vanadium are subject to the reporting requirements of Section 313 of the Emergency Planning and Community Right-to-Know Act of 1986 and of 40 CFR 372.

THE ABOVE INFORMATION IS BELIEVED TO BE ACURATE BASED ON THE MOST CURRENT DATA AVAILABLE. AMETEK MAKES NO WARRANTY, EITHER EXPRESSED OR IMPLIED, WITH RESPECT TO SUCH INFORMATION, AND ASSUMES NO LIABILITY RESULTING FROM ITS USE. USERS ARE ADVISED TO CONDUCT THEIR OWN TEST TO DETERMINE THE SAFETY AND SUITABILITY OF EACH PRODUCT OR PRODUCT COMBINATION FOR THEIR OWN PURPOSES. AMETEK SHALL NOT BE LIABLE FOR ANY CLAIMS, LOSSES OR DAMAGES OF ANY THIRD PARTY OR FOR LOST PROFITS OR INCIDENTAL OR CONSEQUENTIAL DAMAGES.

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