

# MATERIAL SAFETY DATA SHEETS

MATERIAL	TRADE: DESIGNATION (A)	MSDS
COPPER BASE ALLOY CASTINGS, RODS, BARS, TUBES, SHAPES, FLATS, FORGINGS AND BILLET	PAS/MoldStar ALLOY NUMBERS 18, 21, 22, 954, 97, 959, C18000, MoldMATE 90, MoldStar™ 90 & MoldStar™150	M03-191E

## ALL OF OUR ALLOYS ARE FREE OF BERYLLIUM

(A) AS SHOWN ON SHIPPING/PROMOTIONAL DOCUMENTS

PAGES ONE THROUGH ELEVEN OF THE FOLLOWING MATERIAL SAFETY DATA SHEETS M03-191, REVISION E, PROVIDE INFORMATION FOR ELEMENTS COMBINED WITH COPPER TO MAKE SPECIFIC ALLOYS. EXACT COMPOSITIONS OF ALLOYS ARE UNIQUE TO PARTICULAR PRODUCTS AND ARE DETERMINED BY PRODUCT IDENTIFICATION NUMBERS. PLEASE REFER TO PROMOTIONAL LITERATURE OR PRODUCT CERTIFICATIONS FOR SPECIFIC ALLOY COMPOSITIONS. NOT ALL THE ELEMENTS SHOWN ON THE MATERIAL SAFETY DATA SHEETS ARE USED IN ALL THE PRODUCT NUMBERS.

ALL OF OUR PRODUCTS ARE CERTIFIED AS BEING BERYLLIUM-FREE AND HAVING **NOMERCURY** CONTENT.

### MATERIAL SAFETY DATA SHEET

No. M03-191, Rev. F, Dated: January 6, 2014

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#### Section 1. COMPANY AND PRODUCT IDENTIFICATION

**Distributor Name** Performance Alloys and Services, Inc  
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**Address:** N116 W18515 Morse Dr

Germantown, Wisconsin, 53022 USA

**Telephone Numbers:** 800-272-3031, 262-255-6662, FAX:262-255-3655

**Numbers:**

Copper Base Alloy Castings, Rods, Bars, Tubes, Shapes, Flat Products  
**Material Name:** and Scrap Materials.

These materials are commonly referred to as High-Copper Alloys, Aluminum Bronzes, Silicon Bronzes, Manganese Bronzes and Copper-Nickel Alloys.

## Section 2. COMPOSITION/INFORMATION ON COMPONENTS

Individual Alloy compositions are shown on the Certification of Chemical and Mechanical Properties, when supplied, or may be found in Performance Alloys promotional literature or website: [www.performancealloys.net](http://www.performancealloys.net)

Component	CAS Number	Percent	OSHA PEL 8-Hr TWA Milligrams per	ACGIH-TLV 8-Hr TWA Cubic Meter
<u>Aluminum</u> **		0-20		
Metal	7429-90-5	Dust	15	10
		Fume	5	5
<u>Chromium</u>				
Metal	7440-47-3	0-2	1	.05
<u>Cobalt</u> *				
Metal	7440-48-4	0-3 Dust and Fume	.05	.05
<u>Copper</u> *				
Metal	7440-50-8	50-100 Dust	1	1
		Fume	0.1	0.2
<u>Iron</u>				
Iron Oxide	7439-89-6	0-6 Dust and Fume	10	5
<u>Lead</u> *				
Metal	7439-92-1	0-11 Inorganic Dust and Fume	0.05	0.15
<u>Manganese</u> *				
Metal	7439-96-5	0-14 Dust	5	5
		Fume	1	1
<u>Nickel</u>				
Metal and Insoluble compounds	7440-02-0	0-32	1	1
<u>Niobium</u>				
Metal	7440-03-1	0-3	None	Established
<u>Silicon</u>				
	7440-21-3	0-4 Dust	10	10
<u>Tin</u>				
Oxide and Inorganic Compounds	7440-31-5	0-20	2	2
<u>Zinc</u> **				
Oxide	7440-66-6	0-42 Dust	10	10
		Fume	5	5
<u>Zirconium</u>				
Metal	7440-67-7	0-0.5	5	5

Elements having a listed percentage greater than zero will be present in all alloy grades.  
Elements having percentages starting with zero may not be present in certain alloy grades.

\* This constituent, a toxic chemical, makes this product subject to the reporting requirements of Section 313 of Title III of the Superfund Amendments and Reauthorization Act of 1986 and 40 CFR Part 372. Quantity threshold for this chemical, below which reporting of releases is not required, is 25,000 pounds.

\* This constituent is reportable only if in the form of dust or fume .

Note: Chromium, lead and nickel are heavy metals and have been identified as potential

human carcinogens.

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### Section 3. HAZARDS IDENTIFICATION

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#### Emergency Overview

There are no chemical hazards from these alloy grades in the solid form.

#### Potential Health Effects

Machining, grinding, flame-cutting or welding of these alloy products will put contaminants, primarily copper, in the air. Aluminum, cobalt, manganese, nickel or zinc may be present if part of the specific alloy grade. If copper dust and fumes are adequately controlled, the other named metals and any unnamed metals which may be present in the alloy will not represent a hazard.

Copper fumes and dust irritate the nose and throat. If too much fume is inhaled, it will cause a sweet or metallic taste in the mouth. High concentrations of the fumes can cause metal fume fever, which resembles the flu. Inhaling excessive amounts of copper dust and fume over a long period of time can cause anemia. The dust may also cause skin and eye irritation after short exposure .

Some forms of nickel have been found to cause cancer in animals. One form, nickel subsulfide, which was present in an old smelting process no longer used, was the apparent cause of lung and nasal cancer in humans. Since then, studies have shown that the potential for ordinary forms of nickel and its oxides to cause cancer in humans is very weak, if it exists at all.

Long, continued exposure to manganese dust or fume causes a number of symptoms which can get quite serious. On the other hand, manganese is an essential trace element for human metabolism and an average daily intake of 2 to 5 mg, mostly in food, is necessary for health. This intake is about 20 to 50% of the intake resulting from the PEL and TLV of 1 mg/cu.m air.

Excessive manganese effects the central nervous system, with the following symptoms in order of increasing exposure: apathy, loss of appetite, uncontrolled laughter, insomnia followed by sleepiness, headache, leg cramps, speech disturbances, mask-like facial appearance, clumsy movement, difficult walking, frequent falling, tremors, salivation, sweating, mental detachment.

High production machining, grinding and welding operations, etc. frequently require local exhaust ventilation. If ventilation is not adequate, wear a NIOSH approved dust and fume respirator.

Grinding on castings that have not been cleaned or that contain embedded sand may generate significant amounts of dust containing free silica, which can cause silicosis. IARC has listed crystalline silica as Class 2A, probably can cause lung cancer.

<u>Ingredient</u>	<u>OSHA</u>	<u>NTP</u>	<u>IARC</u>	<u>TARGET ORGAN</u>
Chromium	N	Y	3	Lung
Hexavalent Cr	N	Y	1	Lung
Lead	N	N	2B	Lung, Stomach
Nickel	N	Y	1	Lung, Stomach

N = Not listed as a Human Carcinogen

Y = Listed as a Human Carcinogen

Code for IARC evidence of human carcinogenicity: 1 = Positive, 2A = Probable; 2B = Possible; 3 = Not Classified, 4 = Probably Negative.

#### Section 4. FIRST AID MEASURES

Eye Contact:	Flush well with running water to remove particulate. Get medical attention.
Skin Contact:	Vacuum off excess dust. Wash well with soap and water. Avoid blowing particulate into the atmosphere. Contact with these alloy grades in the molten condition will cause severe burns. Get medical attention.
Inhalation:	Remove to fresh air. Get medical attention.
Ingestion:	Seek medical attention if large quantities of material have been ingested.

#### Section 5. FIRE FIGHTING MEASURES

Flash Point: Not Applicable

Methods Used: Not Applicable

Flammable Limits:

- LFL: Not Applicable
- UFL: Not Applicable

Extinguishing Media: See Below

Special Fire Fighting Procedures: Solid, massive form is not combustible under normal conditions. Use fire fighting methods that are appropriate for surrounding fire.

Solid, massive form is not Use fire fighting methods

Small chips, fine turnings and dust may ignite readily. Use coarse water spray on chips, turnings, etc. Use class D extinguishing agents or dry sand on fines. DO NOT use halogenated agents on small chips or fines. Dust clouds may be explosive. PREVENT FORMATION OF A DUST CLOUD.

Molten metal alloys may explode on contact with water. They may also react violently with water, rust and certain other metal oxides (e.g. oxides of copper, iron and lead).

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## Section 6. ACCIDENTAL RELEASE MEASURES

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There are no hazards from these alloy grades in solid form.

Vacuum or sweep material and place in a disposal container. Wear protective gloves to avoid cuts from burrs or sharp edges when handling larger pieces for disposal.

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## Section 7. HANDLING AND STORAGE

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No special precautions are necessary for bulk materials. Store material away from incompatible materials and keep dust or fines away from sources of ignition.

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## Section 8. EXPOSURE CONTROLS/PERSONAL PROTECTION

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Respiratory Protection: If exposure above the PEL or TLV, NIOSH approved respirator for fume or dust, dependent upon the source of airborne contaminant.

Ventilation: Required if dust or fume created in handling or working on this material.

Local Exhaust: Required if dust or fume created in handling or working on this material.

Mechanical (General): As above to reduce airborne dust or fume.

Protective Gloves: Required for melting, grinding, cutting or welding operations. Select glove approved for the specific operation.

Eye Protection: Required for melting, grinding, cutting or welding operations. Minimum requirement of safety glasses with side shields for these operations. Melting and welding may require special eye protection including face shields and specially tinted glass and/or

welder's helmet. Grinding operations may require face shields.

Other Protective Clothing or Equipment: Use leather or equal protective gloves and body clothing while welding. As required for all other operations performed on the product.

Work/Hygiene Practices: Use ear muffs or plugs if the noise level is above 90 dBA when performing operations on the product. Always evaluate the operations done on this product in accordance with OSHA or relevant state, federal or local standards.

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## Section 9. PHYSICAL AND CHEMICAL PROPERTIES

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Appearance and Odor: Silver/grey, yellow or reddish color with no odor.

Melting Point (F): Approximately 1600-2100 depending on specific alloy grade. Alloys have a range of temperature over which melting occurs.

Specific Gravity: Approximately 8.1-8.9 depending on specific alloy grade.

Vapor Pressure: Not applicable.

Vapor Density: Not Applicable.

% Volatile by Volume: Not Applicable.

Evaporation Rate: Not applicable.

Solubility in Water: Insoluble.

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## Section 10. STABILITY AND REACTIVITY

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

Conditions to Avoid: Molten metal may react violently with water. Avoid contact of finely divided material with heat, oxidizers, acids, alkalis, molten lithium and halogenated compounds.

Incompatibility with Other Materials: Avoid acids, bases and oxidizers.

Hazardous Decomposition Products: Metal fume.

Hazardous Polymerization: Will not occur.

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## Section 11. TOXICOLOGICAL INFORMATION

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Permissible Exposure Limits and Threshold Limit Values : Section 2.

Route(s) of Entry:

- Inhalation: Yes
- Skin: Yes
- Ingestion: Yes

### **Effects of Overexposure:**

#### Aluminum

Aluminum dust/fines and fumes are a low health risk by inhalation and are normally treated as a nuisance dust in normal operations (e.g. milling, cutting and grinding). The AIHA Hygiene Guide lists toxicity by ingestion as "none expected." Chronic exposure may cause pulmonary fibrosis characterized by breathing difficulty, coughing, shortness of breath, wheezing and other respiratory difficulties. Aluminum has been implicated in Alzheimer's disease.

#### Chromium

In some workers, chromium compounds act as allergens, may cause dermatitis and may also produce pulmonary sensitization. Chromic acid and chromates have a direct corrosive effect on the skin and the mucous membranes of the upper respiratory tract. Although rare, there may be the possibility of skin and pulmonary sensitization. IARC has determined that there is sufficient evidence of increased lung cancer among workers in the chromate-producing industry and possible among chromium alloy workers. This determination is supported by sufficient evidence for carcinogenicity to animals and possible mutagenicity testing of Cr VI compounds.

#### Cobalt

Cobalt has been reported as causing hyper sensitization type dermatitis in individuals who are susceptible. Animal studies have shown that particulate cobalt is an acutely irritating substance and industrial exposures, possibly combined with small amounts of silica, are reported capable of producing serious pneumoconiosis which is initially of an insidious nature.

#### Copper

Melting, grinding and cutting of copper may produce fumes or dust exposure and breathing these fumes or dust may present potentially significant health hazards. Fumes of copper may cause metal fume fever with flu-like symptoms and skin and hair discoloration. While industrial dermatitis has not been reported, keratinization of the hands and the soles of the feet has been reported. Systemically as well, copper dust and fume cause irritation of the upper respiratory tract, metallic taste in the mouth and nausea. Chronic poisoning may result

in Wilson's disease, characterized by damage to the blood cells, brain, kidneys, liver and pancreas. Symptoms include weakness, anemia, abdominal pain and yellowing of the skin.

### Iron

The inhalation of iron oxide fumes may cause benign pneumoconiosis which is called siderosis. This disease is reported not to be disabling, but makes x-ray determination of other lung conditions difficult or impossible.

### Lead

Short Term Exposure: Lead is an accumulative poison. Inhalation effects of exposure to fumes or dust of inorganic lead may develop quickly. Symptoms include decreased physical fitness, fatigue, sleep disturbance, headache, aching bones and muscles, constipation, abdominal pains and decreasing appetite. The effects are reversible and complete recovery is possible. Inhalation of large amounts of lead may lead to seizures, coma and death.

Long Term Exposure: Long term exposure can result in a buildup of lead in the body and more severe symptoms. These may include anemia, pale skin, a blue line at the gum margin, decreased hand grip strength, abdominal pain, severe constipation, nausea, vomiting and paralysis of the wrist joint. Prolonged exposure may also result in kidney damage. If the nervous system is affected, usually due to very high exposures, the resulting effects include severe headache, convulsions, coma, delirium and death. Ingesting alcohol and physical exertion may bring on symptoms. Continued exposure can result in decreased fertility and/or increased chances of miscarriage or birth defects.

### Manganese

Chronic manganese poisoning may result from inhalation of dust or fume. The central nervous system is the chief site of the injury. Chronic manganese poisoning is not a fatal disease although it is extremely disabling. Some individuals may be hyper susceptible to manganese. Freshly formed manganese fume has caused fever and chill similar to metal fume fever.

### Nickel

The most common ailment arising from contact with nickel or its compounds is an allergic dermatitis known as "nickel itch" which usually occurs when the skin is moist. Generally nickel and most salts of nickel do not cause systemic poisoning. IARC has determined that there is at least limited evidence that nickel and certain nickel compounds may be human carcinogens. Several nickel compounds are carcinogenic to laboratory animals by various routes of entry.

### Silicon

Silicon exposure poses little health risk with only minimal effects on the lungs. Silicon dioxide, silica, formed when silicon is heated in air may cause pulmonary fibrosis and silicosis on chronic exposure. This is a form of pneumoconiosis which is characterized by the formation of nodules of scar tissue (fibrosis) throughout the lungs. Silicosis can cause difficult or labored breathing especially on exertion, decreased physical work capacity and sometimes an enlarged chest.

### Tin

The inhalation of inorganic tin fumes or dust may cause an apparent benign pneumoconiosis



called stannosis which is reported not to be disabling.

### Zinc

Zinc is relatively low in toxicity but inhalation of fumes may cause "metal fume fever." Onset of symptoms may be delayed 4-12 hours and include irritation of the nose, mouth and throat, cough, stomach pain, headache, nausea, vomiting, metallic taste, chills, fever, pains in the muscles and joints, thirst, bronchitis or pneumonia and a bluish tint to the skin. These symptoms go away in 24-48 hours and leave no effect.

### Zirconium

A study of twenty two workers exposed to fumes from a zirconium reduction process for 1-5 years revealed no abnormalities referable to the exposure. There are no well-documented cases of toxic effects from industrial exposure. Granulomata of the human axillary skin have occurred from the use of deodorants containing zirconium, although the metal is not regarded as a skin sensitizer in other types of exposure.

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## Section 12. ECOLOGICAL INFORMATION

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No information is available.

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## Section 13. DISPOSAL CONSIDERATIONS

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The alloy grades covered by this Material Safety Data Sheet are recyclable. The value of solids, turnings, etc. will be increased when segregated by alloy grade. Recycling is recommended.

Any disposal practice must be in compliance with local, state and federal laws and regulations (contact local or state environmental agency for specific rules)

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## Section 14. TRANSPORTATION INFORMATION

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Not a Hazardous Material for DOT Shipping.

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## Section 15. REGULATORY INFORMATION

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See Section 2 for identification of alloy components which may be subject to SARA 313 regulation.

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## Section 16. OTHER INFORMATION

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Revised to format of ANSI Standard Z400.1-1993.

The following hazard ratings are recommended for the alloy grades covered by this Material Safety Data Sheet:

NFPA

Fire - 0

Health - 0

Reactivity - 0

Specific Hazard - none