

MATERIAL SAFETY DATA SHEET

I. MATERIAL IDENTIFICATION

Manufacturer's Name: Miller Centrifugal Casting Company
Address: P.O. Box 456
110 Centrifugal Lane
Cecil, PA 15321-0456

Telephone Number: 724-745-0300

Material Name: Copper Alloy Castings

II. HAZARDOUS INGREDIENTS

	CAS NUMBER	%	OSHA 8-hr TWA	ACGIH 8-hr. TWA
Aluminum	7429-90-5	See Chart	None	10 mg/m ³
Antimony	7440-36-0	See Chart	.5 mg/m ³	0.5 mg/m ³
Copper	7440-50-8	See Chart	Dust = 1 mg/m ³ Fume=0.1 mg/m ³	1mg/m ³ 0.2 mg/m ³
Iron	1309-37-1	See Chart	10 mg/m ³ as oxide fume	5 mg/m ³ as oxide fume
Lead	7439-92-1	See Chart	50 ug/m ³	150 mg/m ³
Magnesium	1309-48-4	See Chart	15 mg/m ³ as oxide fume	10 mg/m ³ as oxide fume
Manganese	7439-96-5	See Chart	Dust - 5 mg/m ³ Fume - None	Dust - 5 mg/m ³ Fume - 1 mg/m ³
Nickel	7440-02-0	See Chart	1 mg/m ³	1 mg/m ³
Phosphorus	7732-14-0	See Chart	0.1 mg/m ³	0.1 mg/m ³
Silicon	7440-21-3	See Chart	None	Total - 10 mg/m ³
Tin	7440-31-5	See Chart	2 mg/m ³ inorganics except as oxides for PEL and TLV	2 mg/m ³
Zinc	7440-66-6	See Chart	5 mg/m ³	5 mg/m ³ Fume
Silica	7631-86-9	Unknown	(1)	0.1 mg/m ³ Respirable

Trace Elements: Arsenic and Sulfur

(1) OSHA PEL for quartz (Respirable Dust Fraction) is: 10 mg/m³ divided by the percent of quartz plus 2

$$= \frac{10}{\%SiO_2 + 2}$$

Miller Centrifugal produces various types of copper base castings. These alloys may contain some or all of the metals above. To determine the levels or presence of these metals in the alloys produced, please refer to the chart attached at the end of this material safety data sheet.

III. PHYSICAL DATA

Melting Point (F): 1550-2150 Specific Gravity: 7.5 – 9.0
Vapor Pressure: NA Vapor Density: NA
% Volatile by Volume: NA Evaporation Rate: NA
Solubility in Water: Insoluble
Appearance and or: Yellow to reddish color with no odor

IV. FIRE AND EXPLOSION HAZARD DATA

Flash Point: NA Method Used: NA
Flammable Limits: LEL = NA UEL = NA
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. Fire and explosion hazards are moderate when material is in the form of dust and exposed to heat, flames, chemical reaction, or contact with powerful oxidizers. Use special mixtures of dry chemical or sand. Molten metal may explode on contact with water. Firefighters should wear self-contained breathing apparatus and protective clothing.

V. HEALTH HAZARD DATA

Permissible Exposure Limits and Threshold Limit Values: See Section II

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, grinding). The AIHA Hygiene Guide lists toxicity as "none expected."

Antimony

Antimony and its compounds are irritating to the skin and mucous membranes and are systemic poisons. Effects are reported to include a metallic taste in the mouth, vomiting, colic, loss of appetite and weight, and diarrhea. In addition, dermatitis may result which starts as an inflammation of the hair follicles and can progress through pus formation and sloughing to leave a contracted scar. Chronic inhalation of antimony trioxide is reported to produce a reduction in white blood cells and damage to the liver. Antimony and its compounds have been identified as suspected cancer causing agents.

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.

Copper

Melting, grinding, 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.

Iron

The inhalation of iron oxide fumes may cause an apparent 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 not develop quickly. Symptoms may 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. Alcohol ingestion and physical exertion may bring on symptoms. Continued exposure can result in decreased fertility and/or increased chances of miscarriage or birth defects.

Magnesium

Inhalation of freshly produced magnesium fume has caused metal fume fever similar to the better known “zinc chills.” Heavy exposure to magnesium oxide is irritating to the eyes, nose, and throat. Presence in a wound can increase inflammation and retard healing. Finely powdered magnesium is a fire hazard, and severe injuries and deaths have occurred from ignition of powdered magnesium.

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 hypersusceptible to manganese. Freshly formed manganese fume has caused fever and chill similar to metal fume fever.

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 are reported to leave no effect.

Silica

Inhalation Hazard – The disease associated with chronic (long-term) exposure to free silica is called silicosis. 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. The degree of hazard depends upon the silica content, concentration and size of the airborne dust, as well as the length of exposure. Silicosis may also make the lungs more susceptible to other diseases and silicotuberculosis can be a severe complication.

Emergency and First Aid Procedures:

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.

Inhalation: Remove to fresh air. Get medical attention.

Ingestion: Seek medical attention if large quantities of material have been ingested (unlikely in the product state as sold, castings.)

VI. REACTIVITY DATA

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

Conditions to Avoid: Molten metal may react violently with water.

Incompatibility (Materials to avoid): Acids, bases, and oxidizers

Hazardous Decomposition or Byproducts: Metal fume. NOTE: if grinding or any work is done on the casting, release of silica may result from residual sand on the surface of the casting.

Hazardous Polymerization: Will not occur.

VII. PRECAUTIONS FOR SAFE HANDLING OR USE

Steps to Be Taken in Case Material is Released or Spilled: No special precautions are necessary for spills of bulk material. If large quantities of dust are spilled, remove by vacuuming or wet sweeping to prevent heavy concentrations of airborne dust. Follow federal, state, and local regulations concerning the disposal of waste.

Waste Disposal Method: Dispose of in accordance with federal, state, and local regulations. Cleanup personnel should wear respirators and protective clothing.

Precautions to be Taken in Handling and Storing: Store material away from incompatible materials and keep dust from sources of ignition.

Other Precautions: See all other sections of this MSDS.

VIII. CONTROL MEASURES

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 levels.

Protective gloves: Required for melt, grind, cut, weld operations. Select glove approved for the specific operation.

Eye Protection: Required for melt, grind, cut, or weld 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. Grinding operations may also require faceshield.

Other Protective Clothing or Equipment: As required for the work done on or with the casting.

Work/Hygiene Practices: As required for the work done with lead bearing materials. No food may be allowed in the work area. Always wash thoroughly before leaving work area. Shower before leaving the work site and provide special work clothing when necessary. Work clothes must be stored separate from street clothing and be marked for laundering. Meet requirements of the OSHA lead standard where necessary. Always evaluate the jobs done on this product in accordance with OSHA or relevant state, federal, or local standards.

		Composition, % max except as indicated													
Classification	Copper Alloy UNS No	Copper	Tin	Lead	Zinc	Iron	Antimony	Nickel (incl. Cobalt)	Sulfur	Phosphorus	Aluminum	Manganese	Silicon	Arsenic	Magnesium
Leaded red brass	C83450	87.0-89.0	2.2-3.0	1.5-2.5	5.8-7.5	0.25	0.25	0.8-1.5	0.08	0.03	0.005		0.005		
	C83600	84.0-86.0	4.3-6.0	4.0-5.7	4.3-6.0	0.25	0.25	0.8	0.08	0.03	0.005		0.005		
	C83800	82.0-83.5	3.5-4.2	5.8-6.8	5.5-8.0	0.25	0.25	0.8	0.08	0.02	0.005		0.005		
Leaded semi-red brass	C84200	78.0-82.0	4.3-6.0	2.0-2.8	10.0-16.0	0.35	0.25	0.8	0.08	0.02	0.005		0.005		
	C84400	79.0-82.0	2.5-3.5	6.3-7.7	7.0-10.0	0.35	0.25	0.8	0.08	0.02	0.005		0.005		
	C84800	75.0-76.7	2.3-3.0	5.5-6.7	13.0-16.0	0.35	0.25	0.8	0.08	0.02	0.005		0.005		
Leaded yellow brass	C85200	70.0-73.0	0.8-1.7	1.5-3.5	21.0-27.0	0.50	0.20	0.8	0.05	0.01	0.005		0.05		
	C85400	66.0-69.0	0.50-1.5	1.5-3.5	25.0-31.0	0.50		0.8			0.005		0.05		
	C85700	58.0-63.0	0.50-1.5	0.8-1.5	33.0-40.0	0.50		0.8			0.80		0.05		
	C85800	57.0 min	1.5	1.5	31.0-41.0	0.50	0.05	0.50	0.05	0.01	0.50	0.25	0.25	0.05	
High-strength yellow brass	C86200	60.0-66.0	0.10	0.10	22.0-28.0	2.0-4.0		0.8			3.0-4.9	2.5-5.0			
	C86300	60.0-66.0	0.10	0.10	22.0-28.0	2.0-4.0		0.8			5.0-7.5	2.5-5.0			
	C86400	56.0-62.0	0.50-1.0	0.50-1.3	34.0-42.0	0.40-2.0		0.8			0.50-1.5	0.10-1.0			
	C86500	55.0-60.0	1.0	0.30	36.0-42.0	0.40-2.0		0.8			0.50-1.5	0.10-1.5			
	C86700	55.0-60.0	1.5	0.50-1.5	30.0-38.0	1.0-3.0		0.8			1.0-3.0	1.0-3.5			
Silicon bronze and silicon brass	C87300	94.0 min		0.20	0.25	0.20					1.0-3.0	0.8-1.5	3.5-4.5		
	C87400	79.0 min		1.0	12.0-16.0						0.5		2.5-4.0		
	C87500	88.0 min		0.50	12.0-16.0						0.5		3.0-5.0		
	C87600	80.0 min		0.50	4.0-7.0	0.20						0.25	3.5-5.5		
	C87800	80.0 min	0.25	0.15	12.0-16.0	0.15	0.05	0.20	0.05	0.01	0.15	0.15	3.8-4.2	0.05	0.01
	C87900	63.0 min	0.25	0.25	30.0-36.0	0.40	0.05	0.50	0.05	0.01	0.15	0.15	0.8-1.2	0.05	0.05
Tin bronze and leaded tin bronze	C90300	86.0-89.0	7.8-9.0	0.25	3.5-5.0	0.15	0.20	0.8	0.05		0.005				
	C90500	86.0-89.0	9.5-10.5	0.25	1.5-3.0	0.15	0.20	0.8	0.05		0.005				
	C90700	88.0-90.0	10.3-12.0	0.50	0.50	0.15	0.10	0.50	0.05		0.005				
	C90800	85.0-89.0	11.3-13.0	0.25	0.25	0.15	0.10	0.50	0.05		0.005				
	C91000	84.0-86.0	14.3-16.0	0.20	1.5	0.15	0.10	0.8	0.05		0.005				
	C91100	82.0-85.0	15.3-17.0	0.25	0.25	0.15	0.20	0.50	0.05		0.005				
	C91300	79.0-82.0	18.3-20.0	0.25	0.25	0.15	0.20	0.50	0.05		0.005				
	C91600	86.0-89.0	10.0-10.8	0.25	0.25	0.15	0.10	1.2-2.0	0.05		0.005				
	C91700	84.0-87.0	11.5-12.5	0.25	0.25	0.15	0.10	1.2-2.0	0.05		0.005				
	C92200	86.0-89.0	5.8-6.5	1.0-1.8	3.5-5.0	0.20	0.20	0.8	0.05		0.005				
	C92300	85.0-89.0	7.8-9.0	0.30-0.9	3.0-5.0	0.20	0.20	0.8	0.05		0.005				
	C92500	85.0-88.0	10.3-12.0	1.0-1.5	0.50	0.20	0.20	0.8-1.5	0.05		0.005				
	C92700	86.0-89.0	9.3-11.0	1.0-2.3	0.8	0.15	0.20	0.8	0.05		0.005				
	C92800	78.0-82.0	15.3-17.0	4.0-5.7	0.8	0.15	0.20	0.8	0.05		0.005				
C92900	82.0-86.0	9.3-11.0	2.0-3.0	0.25	0.15	0.10	2.8-4.0	0.05		0.005					
High-lead tin bronze	C93200	82.0-84.0	6.5-7.5	6.5-7.7	2.5-4.0	0.20	0.30	0.8	0.08	0.03	0.005		0.005		
	C93400	82.0-85.0	7.3-9.0	7.0-8.7	0.8	0.20	0.30	0.8	0.08	0.03	0.005		0.005		
	C93500	83.0-85.0	4.5-5.5	8.5-9.7	0.50-1.5	0.10	0.30	0.8	0.08	0.04	0.005		0.005		
	C93700	78.0-81.0	9.3-10.7	8.3-10.7	0.8	0.10	0.50	0.8	0.08	0.05	0.005		0.005		
	C93800	76.0-79.0	6.5-7.5	14.0-16.0	0.8	0.10	0.50	0.8	0.08	0.05	0.005		0.005		
	C93900	76.5-79.5	5.3-7.0	14.0-17.7	1.5	0.35	0.50	0.8	0.08	0.05	0.005		0.005		
	C94000	69.0-72.0	12.3-14.0	14.0-15.7	0.50	0.25	0.50	0.50-1.0	0.08	0.05	0.005		0.005		
	C94100	72.0-79.0	4.7-6.5	15.0-21.7	3.0	0.10	0.7	0.8	0.08	0.05	0.005		0.005		
	C94300	69.0-73.0	4.7-5.8	22.0-24.5	0.8	0.10	0.7	0.8	0.08	0.05	0.005		0.005		
	C94400	78.0-82.0	7.3-9.0	9.0-11.7	0.8	0.10	0.7	0.8	0.08	0.05	0.005		0.005		
	C94500	70.0-75.0	6.3-8.0	16.0-21.5	1.0	0.10	0.7	0.8	0.08	0.05	0.005		0.005		
	Nickel tin bronze and leaded pickle tine bronze	C94700	86.0-89.0	4.7-6.0	0.08	1.3-2.5	0.20	0.10	4.5-6.0	0.05	0.05	0.005		0.005	
C94800		85.0-89.0	4.7-6.0	0.30-0.9	1.3-2.5	0.20	0.10	4.5-6.0	0.05	0.05	0.005		0.005		
C94900		79.0-81.0	4.3-6.0	4.0-5.7	4.3-6.0	0.25	0.25	4.5-6.0	0.08	0.05	0.005		0.005		
C95200		86.0 min				2.5-4.0					8.5-9.5				
C95300		86.0 min				0.8-1.5					9.0-11.0				
C95400		83.0 min				3.0-5.0		1.5 max			10.0-11.5				
C95410		83.0 min				3.0-5.0		1.5-2.5			10.0-11.5				
C95500		78.0 min				3.0-5.0		3.0-5.5			10.0-11.5				

	C95600 C95700 C95800	88.0 min 71.0 min 78.0 min		0.03 0.02		2.0-4.0 3.5-4.5		0.25 1.5-3.0 4.0-5.0			6.0-8.0 7.0-8.5 8.5-9.5	11.0-14.0 0.8-1.5	1.8-3.3 0.10 0.05		
Cupro-nickel	C96200 C96400 C96800	84.5-87.0 65.0-67.0 remainder	0.05C 0.05C 7.5-8.5	0.005 0.005	1.0Cb 0.7-1.5Cb 0.1-0.3Cb	1.0-1.8 0.25-1.0		9.0-11.0 29.5-31.5 9.5-10.5	0.02 0.020	0.005 0.005	0.8-1.5 0.8-1.5 0.05-0.30	0.25 0.30-0.50			0.005 -0.15
Leaded nickel bronze	C97300 C97600 C97800	53.0-58.0 63.0-66.0 64.0-67.0	1.5-3.0 3.5-4.5 4.5-5.5	8.0-11.0 3.5-5.0 1.0-2.0	17.0-25.0 3.0-9.0 1.0-4.0	1.0 1.0 1.0	0.35 0.25 0.20	11.0-14.0 19.5-21.0 24.0-26.0	0.08 0.08 0.08	0.05 0.05 0.05	0.005 0.005 0.005	0.5 1.0 1.0	0.05 0.05 0.05		