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 Meets the Requirements of OSHA Standard 29 CFR 1910.1200 Hazard
 Communication and EPA Supplier Notification Requirements under Section 313 of
 Emergency Planning and Community Right-to-Know Act.

MATERIAL SAFETY DATA SHEET (MSDS) MANGANESE BRONZE ALLOY CASTINGS LEADED MANGANESE BRONZE ALLOY CASTINGS MSDS SC-000-022 Rev. 10 DATE ISSUED: 10/07
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PART I *What is the material and what do I need to know in an emergency?*

SECTION 1 — PRODUCT IDENTIFICATION & COMPANY INFORMATION

PRODUCT NAME: MANGANESE BRONZE ALLOY CASTINGS LEADED MANGANESE BRONZE ALLOY CASTINGS	
OTHER DESIGNATIONS: UNS ALLOY DESIGNATIONS: C86100 C86500 C86200 C86700 C86300 C86800 C86400	
MANUFACTURER'S NAME	STREET ADDRESS
EMERGENCY TELEPHONE NO.	MAILING ADDRESS
TELEPHONE NO.	CITY, STATE, ZIP CODE
FAX NO.	E-MAIL ADDRESS / WEB SITE

SECTION 2 – HAZARD IDENTIFICATION

OVERVIEW:
 There are no chemical hazards from these castings in solid form. The solid casting is not flammable.

Dust and fume from processing can cause irritation of eyes, skin and respiratory tract; lung disease and other systemic effects.

- Dust or fumes generated by machining, grinding, or welding of casting may produce airborne contaminants, primarily aluminum, cobalt, copper, iron, lead, manganese, nickel, tin and zinc. Also, see the MSDS for the welding rod being used.
- Note:** Prolonged breathing excessive amounts of silica dust, which may be embedded in the surface of castings can cause silicosis or other health effects including lung cancer.

Explosion / fire hazards may be present when:

- Aluminum dust or fines are dispersed in the air.
- Aluminum chips, dust or fines are in contact with water, chlorinated solvents or certain metal oxides.

POTENTIAL HEALTH EFFECTS:	
EYES:	Grinding or machining of castings may generate flying metal particles that may cause eye irritation or injury.
SKIN:	Dermatitis or irritation is possible from skin contact with cobalt, nickel and zinc.
INGESTION:	Ingestion of particulate can occur during hand to mouth activities such as eating, drinking and smoking. Ingestion of lead can cause anemia, nervous system damage, kidney damage, reproductive effects, lung and stomach cancer
INHALATION:	<p>Prolonged or repeated over exposure to dust or fumes from these casting may cause the following health effects:</p> <p>Aluminum: Irritation of the respiratory tract.</p> <p>Cobalt: Respiratory sensitization, asthma, scarring of the lungs and damage to the heart muscle.</p> <p>Copper: Nose and throat irritation, metal fume fever and gastrointestinal tract irritation.</p> <p>Iron: Overexposure to iron oxide fume over a long period of time can cause siderosis, sometimes called "iron pigmentation" of the lung. It can be seen on a chest x-ray but causes little or no disability.</p> <p>Lead: Anemia, nervous system damage, kidney damage, reproductive effects, lung and stomach cancer.</p> <p>Manganese: Central nervous system impairment.</p> <p>Nickel: Lung and nasal cancer.</p> <p>Tin: Respiratory irritation. Prolonged inhalation of tin dust or fume may produce distinctive changes in the lung with no apparent disability or complications.</p> <p>Zinc: Inhalation of zinc fume may cause metal fume fever with flu-like symptoms</p>

ENVIRONMENTAL EFFECTS:
 Environmental effects may be possible depending on conditions of use.

SECTION 3 — COMPOSITION / INFORMATION ON INGREDIENTS

Section 3A—Information on Ingredients				
MATERIAL	Wt %	CAS NUMBER	ACGIH TLV mg/m ³	OSHA PEL mg/m ³
Aluminum (as Al) Total Dust Respirable Dust	0.5-7.5	7429-90-5	10 N/E	15 5
Cobalt (as Co) Metal dust and fume Elemental and inorganic compounds	0.0-4.0	7440-48-4	N/E 0.02	0.1 N/E
Copper (Cu)	55.0-68.0	7440-50-8	1	1
Iron (Fe)	0.4-4.0	1309-37-1	N/E	N/E
Lead (Pb)	<0.2-1.5	7439-92-1	0.05	30µg/m ³ AL 50µg/m ³ PEL
Manganese (Mn)	0.1-5.0	7439-96-5	N/E	N/E
Nickel (Ni)	0.0-4.0	7440-02-0	1.5 (I)	1.0
Tin (Sn)	<0.2-1.5	7440-31-5	2	2
Zinc (Zn)	17.1-42.0	7440-66-6	N/E	N/E
Section 3B- Potential Byproducts of Welding, Cutting or Other Further Processing				
Aluminum oxide Total dust Respirable dust		1344-28-1	10 N/E	15 5

Copper Compounds Fume, as Cu Dusts and mists, as Cu		7440-50-8 various various	0.2 1	0.1 1
Iron Compounds Iron oxide (Fe ₂ O ₃) fume Iron oxide (Fe ₂ O ₃) respirable		1309-37-1 1309-37-1	N/E 5	10 N/E
Lead Compounds Inorganic compounds, as Pb		7439-92-1	0.05	30µg/m ³ AL 50µg/m ³ PEL See 29 CFR 1910.1025
Manganese Compounds Manganese fume and inorganic compounds		7439-96-5	0.2	5 (C)
Nickel Compounds (as Ni) Insoluble inorganic compounds Soluble inorganic compounds Nickel oxide		various various 1313-99-1	0.2 (I) 0.1 (I) 0.2 (I)	1 0.5 1
Tin compounds (as Sn) Tin Oxide & inorganic compounds, except SnH ₄ Inorganic compounds, except oxides, as Sn Tin Oxides, as Sn		various various 18282-10-5; 21651-19-4	2 N/E 2.0	N/E 2 N/E
Zinc metal Zinc oxide total dust Zinc oxide respirable dust Zinc oxide fume		7440-66-6 1314-13-2 1314-13-2 1314-13-2	N/E N/E 2 N/E	N/E 15 5 5

TERMS

N/E = None Established
 TLV = Threshold Limit Value/American Conference of Industrial Hygienists (ACGIH) 8-hr time weighted average
 PEL = Permissible Exposure Limit / OSHA 8-hr time weighted average
 AL = OSHA Action Level
 C = Ceiling limit
 mg/m³ = milligrams per cubic meter
 µg/m³ = micrograms per cubic meter
 (I) = Inhalable fraction
 (R) = Respirable fraction

Section 3C—Carcinogen Classification of Ingredients/ Potential Byproducts

INGREDIENT/BYPRODUCT	OSHA	NTP	IARC	ACGIH	EPA	TARGET ORGAN
Aluminum	NL	NL	NL	NL	NL	
Cobalt Alloys	NL	NL	NL	NL	NL	Lung
Cobalt and compounds	NL	NL	2B	NL	NL	
Cobalt and inorganic compounds, as Co	NL	NL	NL	A3	NL	
Copper	NL	NL	NL	NL	D	
Iron Oxide (Fe ₂ O ₃)	NL	NL	3	A4	NL	
Lead	NL	R	2A (INORGANIC COMPOUNDS)	A3 (INORGANIC COMPOUNDS)	B2	Lung, Stomach, Liver, Kidney

Manganese	NL	NL	NL	NL	D	
Nickel (metal)	NL	R	2B	A5	NL	Lung, Nasal passages
Nickel, insoluble compounds	NL	K	NL	A1	NL	
Nickel, soluble compounds	NL	K	NL	A4	NL	
Nickel oxide	NL	K	1	A1	NL	
Tin						
Metal	NL	NL	NL	NL	NL	
Oxide & inorganic compounds except hydride	NL	NL	NL	NL	NL	
Zinc Oxide	NL	NL	NL	NL	D	
OSHA – Occupational Safety & Health Administration Y = Listed as a Human Carcinogen NTP – National Toxicology Program K = Know to be a Human Carcinogen R = Reasonably Anticipated to be a Human Carcinogen (RAHC) IARC – International Agency for Research on Cancer 1 = Carcinogen to Humans 2A = Probably Carcinogenic to Humans 2B = Possibly Carcinogenic to Humans 3 = Unclassified as Carcinogenicity in Humans 4 = Probably not Carcinogenic to Humans NL = Not Listed			ACGIH – American Conference of Governmental Industrial Hygienists A1 = Confirmed Human Carcinogen A2 = Suspected Human Carcinogen A3 = Confirmed Animal Carcinogen A4 = Not Classifiable as a Human Carcinogen A5 = Not Suspected as a Human Carcinogen EPA – U.S. Environmental Protection Agency A = Human Carcinogen K = Known Human Carcinogen D = Not Classified as to Human Carcinogenicity. No Data Available B1 = Probable Human Carcinogen. Sufficient Evidence from Epidemiology Studies L = Likely to Produce Cancer in Humans B2 = Probable Human Carcinogen. Sufficient Evidence from Animal Studies			
TERMS N/E = None Established TLV = Threshold Limit Value/American Conference of Industrial Hygienists (ACGIH) 8-hr time weighted average PEL = Permissible Exposure Limit / OSHA 8-hr time weighted average AL = OSHA Action Level C = Ceiling limit mg/m ³ = milligrams per cubic meter µg/m ³ = micrograms per cubic meter (I) = Inhalable fraction (R) = Respirable fraction						

PART II *What should I do if a hazardous situation occurs?*

SECTION 4 — FIRST AID MEASURES	
EYES:	Flush eyes with plenty of water or eye wash solution. Metal particles should be removed by a trained individual such as a nurse or physician.
SKIN:	If a rash develops, seek medical consultation.
INGESTION:	Not normally applicable.
INHALATION:	If problems develop move to fresh air and seek medical attention.
SECTION 5 — FIRE & EXPLOSION DATA	
FLAMMABLE PROPERTIES:	Castings will not burn or explode. However, finely divided metal dust may burn or explode.
EXTINGUISHING MEDIA :	Use fire-extinguishing media that are appropriate for fire in surrounding area.
PROTECTION OF FIREFIGHTERS:	Firefighters should wear NIOSH approved, positive pressure, self-contained breathing apparatus and full protective clothing when appropriate for surrounding fire.
SECTION 6 — ACCIDENTAL RELEASE MEASURES	
Accidental release measures do not apply to solid castings. Accidental release of dust collected from machining, welding, etc. should be cleaned up and disposed of in accordance with federal, state and local regulations.	

PART III *How can I prevent hazardous situations from occurring?*

SECTION 7 — HANDLING & STORAGE

RECOMMENDED STORAGE:

No special storage requirements needed.

PROCEDURES FOR HANDLING:

For castings with sharp edges, wear appropriate work gloves. When handling heavy castings wear appropriate safety shoes.

SECTION 8 — EXPOSURE CONTROLS & PERSONAL PROTECTION

ENGINEERING CONTROLS:

No specific controls are needed when the casting is in a solid state. If welding, grinding or machining on castings provide sufficient general ventilation and/or local exhaust to maintain concentrations below PEL's and TLV's. Refer to Section 3 for exposure guidelines.

If ventilation is not adequate, wear a NIOSH approved dust and fume respirator.

If work is to be done in a confined space use appropriate confined space procedures. Refer to OSHA Standard 29 CFR 1910.146.

Grinding castings that have not been cleaned or that contain embedded sand may generate significant amounts of dust containing free silica. Local ventilation may be required to prevent overexposures.

PERSONAL PROTECTION:

Hand:

Work gloves are advisable for handling castings.

Eye:

Safety glasses with side shields and/or face shield for particles (grinding). Welding goggles or welding helmet for cutting or welding.

Respiratory:

If an exposure limit is exceeded, a NIOSH approved half-face dust/mist respirator may be worn for up to ten times the exposure limit. A full-face piece dust/mist respirator may be worn up to 50 times the exposure limit. For emergencies or instances where the exposure levels are not known, use a full-facepiece positive-pressure, air-supplied respirator.

Foot:

Safety shoes must be worn to protect against foot injury when heavy castings are handled.

Body:

Wear appropriate protective clothing if arc-air gouging, cutting or welding castings.

Other:

If noise is at or above 85dBA, hearing protection should be worn. Refer to OSHA Standard 29 CFR 1910.95.

SECTION 9 — PHYSICAL & CHEMICAL PROPERTIES

APPEARANCE /PHYSICAL STATE:

Solid, yellow -orange in color

ODOR:

None

VAPOR DENSITY:

Not applicable

MELTING POINT:

1981°F (1083°C) for copper

SPECIFIC GRAVITY:

0.32 lb/in³ (8.95g/cm³) for copper

BOILING POINT:

4703°F (2595°C) for copper.

VAPOR PRESSURE:

Not applicable

FLASH POINT:

Not applicable for castings in solid form

EVAPORATION RATE:

Not applicable

FLAMMABILITY:

Not flammable

SOLUBILITY IN WATER:

Insoluble

UPPER AND LOWER FLAMMABILITY LIMITS:

Not applicable for castings in solid form

pH:

Not applicable

AUTO IGNITION TEMPERATURE: Not applicable	PERCENT VOLATILE BY VOLUME: Not applicable
DECOMPOSITION TEMPERATURE: Not applicable	PARTITION COEFFICIENT: Not applicable
SECTION 10 — STABILITY & REACTIVITY	
CHEMICALLY STABLE? Yes	
CONDITIONS TO AVOID: None	
INCOMPATIBILITY: Metal dust can burn or explode and must be protected from ignition sources such as grinding sparks, etc. Under some conditions, metal dust is incompatible with some oxidizing conditions and may be incompatible with oxidizers, acids and water and may ignite or explode.	
CONDITIONS OF REACTIVITY: None	IMPACT/SHOCK SENSITIVITY: Not applicable
HAZARDOUS DECOMPOSITION PRODUCTS: None	HAZARDOUS POLYMERIZATION: Not applicable

PART IV *Is there any other useful information about this material?*

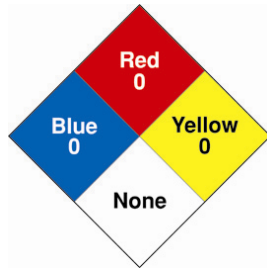
SECTION 11 — TOXICOLOGICAL INFORMATION	
No toxicological information is available for solid castings. There are extensive toxicological data available on the various components of this material. An adequate representation of all these data is beyond the scope of this document.	
SECTION 12 — ECOLOGICAL INFORMATION	
No ecological information is available for solid castings. There are extensive ecological data available on the various components of this material. An adequate representation of all these data is beyond the scope of this document.	
SECTION 13 — DISPOSAL CONSIDERATIONS	
Recover or recycle if possible. Dispose of according to federal, state and local regulations.	
SECTION 14 — TRANSPORTATION INFORMATION	
USA DEPARTMENT OF TRANSPORTATION (DOT) - HM181: Not regulated	
CANADIAN TRANSPORT DANGEROUS GOODS (TDG): Not regulated	SHIPPING NAME: Not regulated
HAZARD CLASS: Not regulated	UN (United Nations) / NA (North American) #: Not regulated
LABEL(S) REQUIRED? No	PACKING GROUP: Not regulated
INTERNATIONAL TRANSPORTATION REGULATIONS: Not applicable	SPECIAL SHIPPING INFORMATION: Not applicable
SECTION 15 — REGULATORY INFORMATION	
USA - OSHA (Hazard Communication Standard, 29 CFR 1910.1200, Air Contaminants 29 CFR 1910.1000, and Lead 29 CFR 1910.1025): A finished casting is an article as defined in the OSHA Hazard Communication Standard 29CFR 1910.1200 (c). Dust or fumes generated by cleaning, machining, grinding, or welding of the casting may produce airborne contaminants, such as aluminum, cobalt, copper, iron, lead, manganese, nickel, tin, zinc and silica.	

<p>USA - EPA (Toxic Substances Control Act – TSCA): All components of these products are on the TSCA inventory list or are excluded from listing.</p> <p>USA - EPA (SARA Title III) The following components, Aluminum dust or fume, Cobalt, Copper, Lead, Manganese, Nickel and Zinc dust or fume make this product subject to reporting Requirements of Section 313 of Title III of the Superfund Amendments and Reauthorization Act of 1986 and 40 CFR Part 72. Quantity threshold amounts are 25,000 pounds for manufacturing, importing or processing and 10,000 pounds for otherwise used.</p>
<p>CANADA - WHMIS (Workplace Hazardous Materials Information System): This MSDS has been prepared according to the hazard criteria of the Controlled Product Regulations (CPR) and the MSDS contains the information required by the CPR.</p>
<p>CANADIAN DSL (Domestic Substance List) Inventory Status: All components of these products are on the DSL Inventory.</p>
<p>CEPA (Canadian Environmental Protection Act): Lead and nickel oxide are on the CEPA Toxic Substances Lists</p>
<p>EINECS No. (European Inventory of Commercial Chemical Substances): All components of these products are on the EINECS list.</p>
<p>RoHS (Restriction of Certain Hazardous Substances): Castings containing lead may be regulated by RoHS</p>
<p>CALIFORNIA PROPOSITION 65: WARNING: This product contains or produces chemicals known to the State of California to cause cancer and birth defects (or other reproductive harm). (California Health & Safety Code 25248.5 et seq.)</p>
<p>U.S. STATE REGULATORY INFORMATION Some of the components listed in Section 3 above may be covered under specific state regulations.</p>

SECTION 16 — OTHER INFORMATION

**National Fire Protection Association (NFPA) RATINGS:
For Castings in Solid Form**

Health: 0 Fire: 0 Reactivity: 0 Specific Hazard: None



Health Hazard: (Blue)

- 0—(material that on exposure under fire conditions would offer no hazard beyond that of ordinary combustible materials);
- 1—(materials that on exposure under fire conditions could cause irritation or minor residual injury);
- 2—(materials that on intense or continued exposure under fire conditions could cause temporary incapacitation or possible residual injury);
- 3—(materials that can on short exposure could cause serious temporary or residual injury);
- 4—(materials that under very short exposure causes death or major residual injury).


Flammability Hazard (Red)

- 0—minimal hazard);
- 1—(materials that require substantial pre-heating before burning);
- 2—(combustible liquid or solids; liquids with a flash point of 38-93°C [100-200°F]);
- 3—(Class IB and IC flammable liquids with flash points below 38°C [100°F]);
- 4—(Class IA flammable liquids with flash points below 23°C [73°F] and boiling points below 38°C [100°F].

Reactivity Hazard: (Yellow)

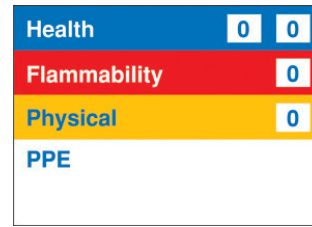
- 0—(normally stable);
- 1—(material that can become unstable at elevated temperatures or which can react slightly with water);
- 2—(materials that are unstable but do not detonate or which can react violently with water);
- 3—(materials that can detonate when initiated or which can react explosively with water);
- 4—(materials that can detonate at normal temperatures or pressures).

Specific Hazard: (White)

Oxidizer OXY
 Acid ACID
 Alkali ALK
 Corrosive COR
 Use No Water ~~W~~
 Radiation Hazard 
 Polymerizes P

**Hazardous Materials Information System (HMIS) RATINGS
For Castings in Solid Form**

Health: 0 Flammability: 0 Physical Hazards: 0



Health Hazard: (Blue)

- 0—(no significant risk to health);
- 1—(irritation or minor reversible injury possible);
- 2—(temporary or minor injury may occur);
- 3—(major injury likely unless prompt action is taken and medical treatment is given);
- 4—(life-threatening, major or permanent damage may result from single or repeated overexposures).

Flammability: (Red)

- 0—(materials that will not burn);
- 1—(materials that must be preheated before ignition will occur);
- 2—(materials which must be moderately heated or exposed to high ambient temperatures before ignition will occur);
- 3— materials capable of ignition under almost all normal temperature conditions);
- 4—(flammable gases, or very volatile flammable liquids with flash points below 73°F and boiling points below 100°F. Materials may ignite spontaneously with air. (Class IA)).

Physical Hazards: (Orange)

- 0— (materials that are normally stable, even under fire conditions and will **not** react with water, polymerize, decompose, condense, or self-react. Non-explosives);
- 1—(materials that are normally stable but can become unstable (self-react) at high temperatures and pressures. Materials may react non-violently with water or undergo hazardous polymerization in the absence of inhibitors);
- 2—(materials that are unstable and may undergo violent chemical changes at normal temperature and pressure with low risk for explosion. Materials may react violently with water or form peroxides upon exposure to air);
- 3—(materials that may form explosive mixtures with water and are capable of detonation or explosive reaction in the presence of a strong initiating source. Materials may polymerize, decompose, self-react, or undergo other chemical change at normal temperature and pressure with moderate risk of explosion);
- 4—(materials that are readily capable of explosive water reaction, detonation or explosive decomposition, polymerization, or self-reaction at normal temperature and pressure).

LABEL INFORMATION: The following hazard information is required for labels under OSHA Standard 29 CFR 1910.1200. Other label information may be added.

MANGANESE BRONZE ALLOYS LEADED MANGANESE BRONZE ALLOYS

—WARNING—

Grinding, welding or arc gouging of this casting creates dust or fumes containing substances listed below with corresponding possible health effects after prolonged or repeated overexposure.

Aluminum: Irritation of the respiratory tract.

Cobalt: Skin irritation, dermatitis, respiratory sensitization, asthma, scarring of the lungs and damage to the heart muscle

Copper: Nose and throat irritation, sweet or metallic taste, metal fume fever with flu-like symptoms, anemia.

Iron: Overexposure to iron oxide fume over a long time can cause siderosis, sometimes called "iron pigmentation" of the lung. It can be seen on a chest x-ray but causes little or no disability.

Lead: Anemia, nervous system damage, kidney damage, reproductive effects, lung and stomach cancer

Manganese: Central nervous system impairment

Nickel: Dermatitis, lung and nasal cancer

Tin: Respiratory irritation. Prolonged inhalation of tin dust or fume may produce distinctive changes in the lung with no apparent disability or complications.

Zinc: Inhalation of zinc fume may cause metal fume fever with flu-like symptoms

Wear eye protection

Wear a NIOSH approved respirator if dust or fume concentrations exceed exposure limits.

MANUFACTURED BY:

Name:

Address:

NOTE:

This data is offered in good faith as typical values and not as a product specification. No warranty either expressed or implied is hereby made. The recommended industrial hygiene and safe handling procedures are believed to be generally applicable. However, each user should review the recommendations in specific context of the intended use and determine if they are appropriate.

MSDS SHEET PREPARED BY:

American Foundry Society, Inc.
Occupational Safety & Health Committee (10-Q)

DATE:

10/07