Material Safety Data Sheet

Issuing Date 23-Nov-2011 **Revision Date** **Revision Number** 0

1. PRODUCT AND COMPANY IDENTIFICATION

Product Name **Stainless Steel and Alloys of Stainless Steel**

Distributor
ThyssenKrupp Materials NA, Inc.
22355 W. Eleven Mile Road
Southfield, Michigan 48034
TEL: 248-233-5681

Emergency Telephone Number 248-233-5681

2. HAZARDS IDENTIFICATION

WARNING!

Emergency Overview

Non-combustible as supplied.
Small chips, fines and dust from processing may be readily ignitable.
Hazardous fumes can also occur in post-processing operations
Product dust may be irritating to eyes, skin and respiratory system.
Dust may form explosive mixture in air
Possibly cancer hazard by inhalation

Appearance Metallic, Solid **Physical State** Solid. **Odor** Odorless

OSHA Regulatory Status

General Hazard Statement: Solid metallic products are generally classified as "articles" and do not constitute hazardous materials in solid form under the definitions of the OSHA Hazard Communication Standard (29 CFR 1910.1200). Any articles manufactured from these solid products would be generally classified as non-hazardous. However, some hazardous elements contained in these products can be emitted under certain processing conditions such as but not limited to: burning, melting, cutting, sawing, brazing, grinding, machining, milling, and welding.

Potential Health Effects

Principle Routes of Exposure Eye contact. Skin contact. Inhalation.

Acute Toxicity

Eyes Dust contact with the eyes can lead to mechanical irritation.

Skin Contact with dust can cause mechanical irritation or drying of the skin. Contact with oils from processing may cause irritation. Prolonged skin contact may defat the skin and produce dermatitis. Repeated or prolonged skin contact may cause allergic reactions with susceptible persons.

Inhalation May be harmful if inhaled. Inhalation of dust in high concentration may cause irritation of respiratory system. Inhalation of fumes may cause metal-fume fever.

Ingestion May be harmful if swallowed. May cause additional affects as listed under "Inhalation".

Chronic Effects Repeated contact may cause allergic reactions in very susceptible persons. Avoid repeated exposure. Prolonged exposure may cause chronic effects. Repeated or prolonged skin contact may cause skin irritation and/or dermatitis and sensitization of susceptible persons. May cause central nervous system depression with nausea, headache, dizziness, vomiting, and incoordination. May cause adverse effects on the bone marrow and blood-forming system. May cause adverse liver effects.

Elevated temperature processing such as welding and plasma arc cutting may release hazardous fumes. Overexposure to metal fumes may cause pulmonary edema (fluid in the lungs) and methemaglobinemia. May also cause pulmonary fibrosis and lung cancer.

Aggravated Medical Conditions Allergies. Skin disorders. Respiratory disorders. Central nervous system. Pre-existing eye disorders. Blood disorders. Kidney disorders. Liver disorders. Nasal cavities. Lungs.

Interactions with Other Chemicals Irritants. Sensitizers. Epoxies. Use of alcoholic beverages may enhance toxic effects.

Environmental Hazard See Section 12 for additional Ecological Information.

3. COMPOSITION/INFORMATION ON INGREDIENTS

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

Chemical Name	CAS-No	Weight %
Iron	7439-89-6	66.0-88.0
Chromium	7440-47-3	0.01-30.0
Nickel	7440-02-0	0.01-27.0
Manganese	7439-96-5	0.01-6.0
Molybdenum	7439-98-7	0.01-6.0
Titanium	7440-32-6	0.01-6.0
Copper	7440-50-8	0.01-6.0
Sulfur dioxide	7446-09-5	0.01`-2.0
Phosphorus	7723-14-0	0.01-2.0
Cobalt	7440-48-4	0.01-2.0
Carbon	7440-44-0	0.01-2.0
Silicon	7440-21-3	0.01-2.0
Tungsten	7440-33-7	0.00-1.8
Niobium	7440-03-1	0.00-1.00
Aluminum	7429-90-5	0.01-0.5
Tantalum	7440-25-7	0.15-0.45
Selenium	7782-49-2	0.03-0.35

Stainless Steel Alloys may be comprised of all or variations of the alloys shown here.

4. FIRST AID MEASURES

Eye Contact Immediately flush with plenty of water. After initial flushing, remove any contact lenses and continue flushing for at least 15 minutes. Keep eye wide open while rinsing. Consult a physician.

Skin Contact Wash skin with soap and water. In the case of skin irritation or allergic reactions see a physician.

Inhalation Move to fresh air. If breathing is difficult, give oxygen. If not breathing, give artificial respiration. Consult a physician.

Ingestion Do NOT induce vomiting. Call a physician or Poison Control Center immediately. Drink plenty of water. Never give anything by mouth to an unconscious person.

Notes to Physician May cause sensitization of susceptible persons. Treat symptomatically.

5. FIRE-FIGHTING MEASURES

Flammable Properties This product does not present fire or explosion hazards as shipped. Small chips, fines, and dust from processing may be readily ignitable.

Flash Point Not applicable.

Suitable Extinguishing Media Class D extinguishing agents on fines, dust or molten metal. Use coarse water spray on chips and fines.

Unsuitable Extinguishing Media DO NOT use halogenated extinguishing agents on small chips or fines. DO NOT use water for fires invoving molten metal. These fire extinguishing agents will react with burning material.

Explosion Data
Sensitivity to Mechanical Impact None
Sensitivity to Static Discharge None

Specific Hazards Arising from the Chemical Thermal decomposition can lead to release of irritating gases and vapors. In the event of fire and/or explosion do not breathe fumes. May cause sensitization by inhalation and skin contact.

Protective Equipment and Precautions for Firefighters As in any fire, wear self-contained breathing apparatus pressure-demand, MSHA/NIOSH (approved or equivalent) and full protective gear.

NFPA	**Health Hazard** 2	**Flammability** 0	**Instability** 0	**Physical and Chemical Hazards** -
HMIS	**Health Hazard** 2*	**Flammability** 0	**Physical Hazard** 0	**Personal Protection** X

**Indicates a chronic health hazard.*

6. ACCIDENTAL RELEASE MEASURES

Personal Precautions Use personal protective equipment. Keep people away from and upwind of spill/leak.

Environmental Precautions Prevent further leakage or spillage if safe to do so. Prevent product from entering drains. Do not flush into surface water or sanitary sewer system.

Methods for Containment Prevent further leakage or spillage if safe to do so.

Methods for Cleaning Up Avoid dust formation. Collect scrap for recycling.

If product is molten, contain the flow using dry sand or salt flux as a dam. All tools and containers which come in contact with molten metal must be preheated or specially coated and rust free. Allow the spill to cool before remelting as scrap.

7. HANDLING AND STORAGE

Handling Avoid contact with skin, eyes and clothing. Wear personal protective equipment. Avoid dust formation. Keep material dry. Avoid contact with sharp edges or heated material. Hot and cold aluminum are not visually different. Hot aluminum does not always glow red.

Storage Keep container tightly closed in a dry and well-ventilated place.

8. EXPOSURE CONTROLS / PERSONAL PROTECTION

Exposure Guidelines

Chemical Name	ACGIH TLV	OSHA PEL	NIOSH IDLH
Aluminum 7429-90-5	TWA: 1 mg/m^{3}respirable fraction	TWA: 15 mg/m^{3}total dust TWA: 5 mg/m^{3}respirable fraction (vacated) TWA: 15 mg/m^{3}total dust (vacated) TWA: 5 mg/m^{3}respirable fraction	TWA: 10 mg/m^3 total dust TWA: 5 mg/m^3 respirable dust
Manganese 7439-96-5	TWA: 0.2 mg/m^3	(vacated) TWA: 1 mg/m^{3}fume (vacated) STEL: 3 mg/m^{3}fume (vacated) Ceiling: 5 mg/m^3 Ceiling: 5 mg/m^{3}fume	IDLH: 500 mg/m^3 TWA: 1 mg/m^3 fume STEL: 3 mg/m^3
Molybdenum 7439-98-7	TWA: 10 mg/m^{3}inhalable fraction TWA: 3 mg/m^{3}respirable fraction	(vacated) TWA: 10 mg/m^3	IDLH: 5000 mg/m^3
Nickel 7440-02-0	TWA: 1.5 mg/m^3	TWA: 1 mg/m^3 (vacated) TWA: 1 mg/m^3	IDLH: 10 mg/m^3 TWA: 0.015 mg/m^3
Silicon 7440-21-3		TWA: 15 mg/m^{3}total dust TWA: 5 mg/m^{3}respirable fraction (vacated) TWA: 10 mg/m^{3}total dust (vacated) TWA: 5 mg/m^{3}respirable fraction	TWA: 10 mg/m^3 total dust TWA: 5 mg/m^3 respirable dust
Tantalum 7440-25-7		TWA: 5 mg/m^3 (vacated) TWA: 5 mg/m^3	IDLH: 2500 mg/m^{3}dust TWA: 5 mg/m^3 dust STEL: 10 mg/m^{3}dust
Tungsten 7440-33-7	STEL: 10 mg/m^3 TWA: 5 mg/m^3	(vacated) TWA: 5 mg/m^3 (vacated) STEL: 10 mg/m^3	TWA: 5 mg/m^3 STEL: 10 mg/m^3
Cobalt 7440-48-4	TWA: 0.02 mg/m^3	TWA: 0.1 mg/m^{3}dust and fume (vacated) TWA: 0.05 mg/m^{3}dust and fume	IDLH: 20 mg/m^{3}dust and fume TWA: 0.05 mg/m^3 dust and fume
Copper 7440-50-8	TWA: 0.2 mg/m^{3}fume	TWA: 0.1 mg/m^{3}fume TWA: 1 mg/m^{3}dust and mist (vacated) TWA: 0.1 mg/m^3 Cu dust, fume, mist	IDLH: 100 mg/m^{3}dust, fume and mist TWA: 1 mg/m^3 dust and mist TWA: 0.1 mg/m^3 fume
Sulfur dioxide 7446-09-5	STEL: 0.25 ppm	TWA: 5 ppm TWA: 13 mg/m^3 (vacated) TWA: 2 ppm (vacated) TWA: 5 mg/m^3 (vacated) STEL: 5 ppm (vacated) STEL: 15 mg/m^3	IDLH: 100 ppm TWA: 2 ppm TWA: 5 mg/m^3 STEL: 5 ppm STEL: 13 mg/m^3
Phosphorus 7723-14-0		TWA: 0.1 mg/m^3 (vacated) TWA: 0.1 mg/m^3	IDLH: 5 mg/m^3 TWA: 0.1 mg/m^3
Selenium 7782-49-2	TWA: 0.2 mg/m^3	TWA: 0.2 mg/m^3 Se (vacated) TWA: 0.2 mg/m^3	IDLH: 1 mg/m^3 TWA: 0.2 mg/m^3

ACGIH TLV: American Conference of Governmental Industrial Hygienists - Threshold Limit Value. OSHA PEL: Occupational Safety and Health Administration - Permissible Exposure Limits. NIOSH IDLH: Immediately Dangerous to Life or Health.

Other Exposure Guidelines Vacated limits revoked by the Court of Appeals decision in AFL-CIO v. OSHA, 965 F.2d 962 (11th Cir., 1992). Hexavalent chrome may be formed during welding.

Engineering Measures
Showers
Eyewash stations
Ventilation systems

Personal Protective Equipment

Eye/Face Protection Safety glasses with side-shields.

Skin and Body Protection Impervious clothing. Impervious gloves.

Respiratory Protection If exposure limits are exceeded or irritation is experienced, NIOSH/MSHA approved respiratory protection should be worn. Positive-pressure supplied air respirators may be required for high airborne contaminant concentrations. Respiratory protection must be provided in accordance with current local regulations.

Hygiene Measures Do not breathe vapors/dust. When using, do not eat, drink or smoke. Provide regular cleaning of equipment, work area and clothing. Avoid contact with skin, eyes and clothing. Wash hands before breaks and immediately after handling the product. Keep away from food, drink and animal feeding stuffs.

9. PHYSICAL AND CHEMICAL PROPERTIES

Appearance	Metallic, Solid.	**Odor**	Odorless.
Odor Threshold	No information available	**Physical State**	Solid
pH	No information available.		
Flash Point	Not applicable.	**Autoignition Temperature**	No information available.
Decomposition Temperature	No information available.	**Boiling Point/Boiling Range**	No information available
Melting Point/Range	1300°C / 2400°F		
Flammability Limits in Air	No information available.		
Specific Gravity	7.9	**Solubility**	No information available.
Evaporation Rate	No information available	**Vapor Pressure**	No data available.
Vapor Density	No data available.		

10. STABILITY AND REACTIVITY

Stability	Stable under recommended storage conditions.
Incompatible Products	Acids. Alkalies. Metal oxides. Iron powder and water: may cause an explosive reaction forming hydrogen gas when heated above 1470F (800C). Moisture.
Conditions to Avoid	Dust formation. Heat, flames and sparks.
Hazardous Decomposition Products	Iron oxides. Metal fume. Chromium oxides.
Hazardous Polymerization	Hazardous polymerization does not occur.

11. TOXICOLOGICAL INFORMATION

Acute Toxicity

Product Information

Inhalation May cause irritation of respiratory tract. Inhalation of fumes may cause metal fume fever, which is characterized by flu-like symptoms with metallic taste, fever, chills, cough, weakness, chest pain, muscle pain and increased white blood cell count.

Eye Contact Dust contact with the eyes can lead to mechanical irritation.

Chemical Name	LD50 Oral	LD50 Dermal	LC50 Inhalation
Iron	= 984 mg/kg (Rat)		
Nickel	> 9000 mg/kg (Rat)		
Cobalt	= 6170 mg/kg (Rat)		> 10 mg/L (Rat) 1 h
Sulfur dioxide		-	Per CGA P-20: 2500 ppm/1hr (Rat)
Phosphorus	= 3.03 mg/kg (Rat)	= 100 mg/kg (Rat)	= 4.3 mg/L (Rat) 1 h
Selenium	= 6700 mg/kg (Rat)		

Chronic Toxicity

Chronic Toxicity Repeated contact may cause allergic reactions in very susceptible persons. Avoid repeated exposure. Prolonged exposure may cause chronic effects. Repeated or prolonged skin contact may cause skin irritation and/or dermatitis and sensitization of susceptible persons. May cause central nervous system depression with nausea, headache, dizziness, vomiting, and incoordination. May cause adverse effects on the bone marrow and blood-forming system. May cause adverse liver effects.

Elevated temperature processing such as welding and plasma arc cutting may release hazardous fumes. Overexposure to metal fumes may cause pulmonary edema (fluid in the lungs) and methemaglobinemia. May also cause pulmonary fibrosis and lung cancer.

Carcinogenicity This product contains one or more substances which are classified by IARC as carcinogenic to humans (Group I), probably carcinogenic to humans (Group 2A) or possibly carcinogenic to humans (Group 2B).

Chemical Name	ACGIH	IARC	NTP	OSHA
Chromium		Group 3		
Nickel		Group 2B Group 1	Reasonably Anticipated	X
Sulfur dioxide		Group 3	-	-
Cobalt	A3	Group 2A Group 2B		X
Selenium		Group 3		

ACGIH: (American Conference of Governmental Industrial Hygienists)
A3 - Animal Carcinogen
IARC: (International Agency for Research on Cancer)
Group 1 - Carcinogenic to Humans
Group 2A - Probably Carcinogenic to Humans
Group 2B - Possibly Carcinogenic to Humans
NTP: (National Toxicity Program)
Reasonably Anticipated - Reasonably Anticipated to be a Human Carcinogen
OSHA: (Occupational Safety & Health Administration)
X - Present

Target Organ Effects Blood. Central nervous system (CNS). Eyes. Kidney. Liver. Lungs. Nasal cavities. Respiratory system. Skin.

12. ECOLOGICAL INFORMATION

Ecotoxicity

Very toxic to aquatic organisms, may cause long-term adverse effects in the aquatic environment.

Chemical Name	Toxicity to Algae	Toxicity to Fish	Toxicity to Microorganisms	Daphnia Magna (Water Flea)
Iron	-	LC50 96 h: = 0.56 mg/L semi-static (Cyprinus carpio) LC50 96 h: = 13.6 mg/L static (Morone saxatilis)	-	-
Nickel	EC50 96 h: 0.174 - 0.311 mg/L static (Pseudokirchneriella subcapitata) EC50 72 h: = 0.18 mg/L (Pseudokirchneriella subcapitata)	LC50 96 h: = 1.3 mg/L semi-static (Cyprinus carpio) LC50 96 h: = 10.4 mg/L static (Cyprinus carpio) LC50 96 h: > 100 mg/L (Brachydanio rerio)	-	EC50 48 h: = 1 mg/L Static (Daphnia magna) EC50 48 h: > 100 mg/L (Daphnia magna)
Copper	EC50 96 h: 0.031 - 0.054 mg/L static (Pseudokirchneriella subcapitata) EC50 72 h: 0.0426 - 0.0535 mg/L static (Pseudokirchneriella subcapitata)	LC50 96 h: 0.0068 - 0.0156 mg/L (Pimephales promelas) LC50 96 h: < 0.3 mg/L static (Pimephales promelas) LC50 96 h: = 0.052 mg/L flow-through (Oncorhynchus mykiss) LC50 96 h: = 0.112 mg/L flow-through (Poecilia reticulata) LC50 96 h: = 0.2 mg/L flow-through (Pimephales promelas) LC50 96 h: = 0.3 mg/L semi-static (Cyprinus carpio) LC50 96 h: = 0.8 mg/L static (Cyprinus carpio) LC50 96 h: = 1.25 mg/L static (Lepomis macrochirus)	-	EC50 48 h: = 0.03 mg/L Static (Daphnia magna)
Phosphorus	-	LC50 96 h: 0.001-0.004 mg/L static (Lepomis macrochirus) LC50 96 h: 0.0017-0.0035 mg/L flow-through (Lepomis macrochirus) LC50 96 h: 0.011-0.028 mg/L static (Pimephales promelas) LC50 96 h: 0.015-0.032 mg/L static (Oncorhynchus mykiss) LC50 96 h: > 100 mg/L static (Brachydanio rerio)	-	EC50 48 h: 0.025 - 0.037 mg/L Static (Daphnia magna) EC50 48 h: = 0.03 mg/L (Daphnia magna)
Cobalt	-	LC50 96 h: > 100 mg/L static (Brachydanio rerio)	-	-

13. DISPOSAL CONSIDERATIONS

Waste Disposal Methods Dispose of in accordance with local regulations.

Contaminated Packaging Do not re-use empty containers.

US EPA Waste Number D007
D010

Chemical Name	RCRA	RCRA - Basis for Listing	RCRA - D Series Wastes	RCRA - U Series Wastes
Chromium - 7440-47-3		Included in waste streams: F032, F034, F035, F037, F038, F039	5.0 mg/L regulatory level	
Nickel - 7440-02-0	(hazardous constituent - no waste number)	Included in waste streams: F006, F039		
Selenium - 7782-49-2		Included in waste stream: F039	1.0 mg/L regulatory level	

This product contains one or more substances that are listed with the State of California as a hazardous waste.

Chemical Name	California Hazardous Waste
Chromium	Toxic Corrosive Ignitable
Nickel	Toxic powder Ignitable powder
Manganese	Ignitable powder
Molybdenum	Ignitable powder
Titanium	Ignitable powder
Copper	Toxic
Phosphorus	Toxic Ignitable Reactive
Cobalt	Toxic powder Ignitable powder
Aluminum	Ignitable powder

14. TRANSPORT INFORMATION

DOT Not regulated

TDG Not regulated

MEX Not regulated

15. REGULATORY INFORMATION

International Inventories

TSCA Complies
DSL Complies
EINECS Complies
ENCS Complies
IECSC Complies

15. REGULATORY INFORMATION

KECL Complies
PICCS Complies
AICS Complies

Legend

TSCA - United States Toxic Substances Control Act Section 8(b) Inventory
DSL/NDSL - Canadian Domestic Substances List/Non-Domestic Substances List

U.S. Federal Regulations

Section 313 of Title III of the Superfund Amendments and Reauthorization Act of 1986 (SARA). This product contains a chemical or chemicals which are subject to the reporting requirements of the Act and Title 40 of the Code of Federal Regulations, Part 372:

Chemical Name	CAS-No	Weight %	SARA 313 - Threshold Values %
Chromium	7440-47-3	30	1.0
Cobalt	7440-48-4	2	0.1
Copper	7440-50-8	6	1.0
Manganese	7439-96-5	6	1.0
Nickel	7440-02-0	27	0.1
Phosphorus	7723-14-0	2	1.0

SARA 311/312 Hazard Categories

Acute Health Hazard	Yes
Chronic Health Hazard	Yes
Fire Hazard	No
Sudden Release of Pressure Hazard	No
Reactive Hazard	No

Clean Water Act

This product contains the following substances which are regulated pollutants pursuant to the Clean Water Act (40 CFR 122.21 and 40 CFR 122.42):

Chemical Name	CWA - Reportable Quantities	CWA - Toxic Pollutants	CWA - Priority Pollutants	CWA - Hazardous Substances
Nickel		X	X	
Copper		X	X	
Phosphorus	1 lb			X
Selenium		X	X	

CERCLA

This material, as supplied, contains one or more substances regulated as a hazardous substance under the Comprehensive Environmental Response Compensation and Liability Act (CERCLA) (40 CFR 302):

Chemical Name	Hazardous Substances RQs	Extremely Hazardous Substances RQs	RQ
Nickel	100 lb		RQ 100 lb final RQ RQ 45.4 kg final RQ
Chromium			RQ 5000 lb final RQ RQ 2270 kg final RQ
Copper	5000 lb		RQ 5000 lb final RQ RQ 2270 kg final RQ
Sulfur dioxide		500 lb	
Phosphorus	1 lb	1 lb	RQ 1 lb final RQ RQ 0.454 kg final RQ
Selenium	100 lb		RQ 100 lb final RQ RQ 45.4 kg final RQ

U.S. State Regulations

California Proposition 65

This product contains the following Proposition 65 chemicals:

Chemical Name	CAS-No	California Prop. 65
Nickel	7440-02-0	Carcinogen
Cobalt	7440-48-4	Carcinogen

U.S. State Right-to-Know Regulations

Chemical Name	New Jersey	Massachusetts	Pennsylvania	Illinois	Rhode Island
Aluminum	X	X	X		X
Manganese	X	X	X	X	X
Molybdenum	X	X	X		X
Nickel	X	X	X	X	X
Silicon	X	X	X		X
Tantalum	X	X	X		X
Titanium	X				
Tungsten	X	X	X		X
Carbon			X		X
Chromium		X			X
Cobalt	X	X	X	X	X
Copper	X	X	X	X	X
Sulfur dioxide	X	X	X		X
Phosphorus	X	X	X	X	X
Selenium	X	X	X	X	X

International Regulations

Chemical Name	Carcinogen Status	Exposure Limits
Aluminum		Mexico: TWA= 10 mg/m^3
Manganese		Mexico: TWA 0.2 mg/m^3 Mexico: TWA 1 mg/m^3 Mexico: STEL 3 mg/m^3
Nickel		Mexico: TWA 1 mg/m^3
Silicon		Mexico: TWA 10 mg/m^3 Mexico: STEL 20 mg/m^3
Tantalum		Mexico: TWA 5 mg/m^3 Mexico: STEL 10 mg/m^3
Tungsten		Mexico: TWA 5 mg/m^3 Mexico: STEL 10 mg/m^3
Carbon		Mexico: TWA 2 mg/m^3
Chromium		Mexico: TWA 0.5 mg/m^3
Cobalt	A3	Mexico: TWA= 0.1 mg/m^3
Copper		Mexico: TWA= 1 mg/m^3 Mexico: TWA= 0.2 mg/m^3 Mexico: STEL= 2 mg/m^3
Sulfur dioxide		Mexico: TWA 2 ppm Mexico: TWA 5 mg/m^3 Mexico: STEL 5 ppm Mexico: STEL 10 mg/m^3
Phosphorus		Mexico: TWA 0.1 mg/m^3 Mexico: STEL 0.3 mg/m^3
Selenium		Mexico: TWA 0.2 mg/m^3

Canada

This product has been classified in accordance with the hazard criteria of the Controlled Products Regulations (CPR) and the MSDS contains all the information required by the CPR.

WHMIS Hazard Class
Non-controlled

Chemical Name	NPRI
Aluminum	X
Nickel	X
Chromium	X
Cobalt	X
Sulfur dioxide	X

Phosphorus	X
Selenium	X

Legend
NPRI - National Pollutant Release Inventory

16. OTHER INFORMATION

Prepared By
Product Stewardship
23 British American Blvd.
Latham, NY 12110
1-800-572-6501

Issuing Date 23-Nov-2011
Revision Date

Revision Note Initial Release.

General Disclaimer

The information provided on this MSDS is correct to the best of our knowledge, information and belief at the date of its publication. The information given is designed only as a guide for safe handling, use, processing, storage, transportation, disposal and release and is not to be considered as a warranty or quality specification. The information relates only to the specific material designated and may not be valid for such material used in combination with any other material or in any process, unless specified in the text.

End of Safety Data Sheet

Material Safety Data Sheet

Issuing Date 23-Nov-2011 **Revision Date** **Revision Number** 0

1. PRODUCT AND COMPANY IDENTIFICATION

Product Name **Copper / Copper Alloys**

Synonyms Cu.

Distributor
ThyssenKrupp Materials NA, Inc.
22355 W. Eleven Mile Road
Southfield, Michigan 48034
TEL: 248-233-5681

Emergency Telephone Number 248-233-5681

2. HAZARDS IDENTIFICATION

WARNING!

Emergency Overview

Non-combustible as supplied.
Small chips, fines and dust from processing may be readily ignitable.
Hazardous fumes can also occur in post-processing operations
Product dust may be irritating to eyes, skin and respiratory system.
Dust may form explosive mixture in air
Possibly cancer hazard by inhalation

Appearance Silver or yellow to red **Physical State** Solid. **Odor** Odorless

OSHA Regulatory Status

General Hazard Statement: Solid metallic products are generally classified as "articles" and do not constitute hazardous materials in solid form under the definitions of the OSHA Hazard Communication Standard (29 CFR 1910.1200). Any articles manufactured from these solid products would be generally classified as non-hazardous. However, some hazardous elements contained in these products can be emitted under certain processing conditions such as but not limited to: burning, melting, cutting, sawing, brazing, grinding, machining, milling, and welding.

Potential Health Effects
Principle Routes of Exposure Eye contact. Skin contact. Inhalation.

Acute Toxicity

Eyes Dust contact with the eyes can lead to mechanical irritation.

Skin Contact with dust can cause mechanical irritation or drying of the skin. Contact with oils from processing may cause irritation. Prolonged skin contact may defat the skin and produce dermatitis. Repeated or prolonged skin contact may cause allergic reactions with susceptible persons.

Inhalation May be harmful if inhaled. Inhalation of dust in high concentration may cause irritation of respiratory system. Inhalation of fumes may cause metal-fume fever.

Ingestion May be harmful if swallowed. May cause additional affects as listed under "Inhalation".

Chronic Effects

Repeated contact may cause allergic reactions in very susceptible persons. Avoid repeated exposure. Prolonged exposure may cause chronic effects. Repeated or prolonged skin contact may cause skin irritation and/or dermatitis and sensitization of susceptible persons. May cause central nervous system depression with nausea, headache, dizziness, vomiting, and incoordination. May cause adverse effects on the bone marrow and blood-forming system. May cause adverse liver effects.

Elevated temperature processing such as welding and plasma arc cutting may release hazardous fumes. Inhalation of beryllium dust or fume may cause chronic beryllium disease (CBD) and is a cancer hazard. Overexposure to metal fumes may cause pulmonary edema (fluid in the lungs) and methemaglobinemia. May also cause pulmonary fibrosis and lung cancer. Lead compounds may be absorbed by ingestion, by inhalation and through the skin. Lead may damage kidney function, the blood forming system and the reproductive system. Inorganic lead compounds can cause developmental damage.

Aggravated Medical Conditions

Allergies. Skin disorders. Respiratory disorders. Central nervous system. Pre-existing eye disorders. Blood disorders. Kidney disorders. Liver disorders. Nasal cavities. Lungs.

Interactions with Other Chemicals

Irritants. Sensitizers. Epoxies. Use of alcoholic beverages may enhance toxic effects.

Environmental Hazard

Very toxic to aquatic organisms, may cause long-term adverse effects in the aquatic environment. See Section 12 for additional Ecological Information.

3. COMPOSITION/INFORMATION ON INGREDIENTS

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

Chemical Name	CAS-No	Weight %
Copper	7440-50-8	45.00-99.00
Zinc oxide	1314-13-2	0.00-40.0
Nickel	7440-02-0	0.00-33.0
Lead	7439-92-1	0.00-16.0
Aluminum	7429-90-5	0.00-13.50
Tin	7440-31-5	0.00-13.0
Iron oxide	1309-37-1	0.00-5.50
Manganese	7439-96-5	0.00-5.0
Silicon	7440-21-3	0.01-0.5
Thallium	7440-28-0	0.00-3.4
Cobalt	7440-48-4	0.00-2.70
Beryllium	7440-41-7	0.00-2.00
Cadmium and compounds (as Cd)	7440-43-9	0.00-1.00
Arsenic	7440-38-2	0.00-0.50
Sulfur dioxide	7446-09-5	0.00-0.30
Zirconium	7440-67-7	0.00-0.25

Copper and Copper Alloys may be comprised of all or variations of the alloys shown here.

4. FIRST AID MEASURES

Eye Contact Immediately flush with plenty of water. After initial flushing, remove any contact lenses and continue flushing for at least 15 minutes. Keep eye wide open while rinsing. Consult a physician.

Skin Contact Wash skin with soap and water. In the case of skin irritation or allergic reactions see a physician.

Inhalation Move to fresh air. If breathing is difficult, give oxygen. If not breathing, give artificial respiration. Consult a physician.

Ingestion Do NOT induce vomiting. Call a physician or Poison Control Center immediately. Drink plenty of water. Never give anything by mouth to an unconscious person.

Notes to Physician May cause sensitization of susceptible persons. Treat symptomatically.

5. FIRE-FIGHTING MEASURES

Flammable Properties This product does not present fire or explosion hazards as shipped. Small chips, fines, and dust from processing may be readily ignitable.

Flash Point Not applicable.

Suitable Extinguishing Media Class D extinguishing agents on fines, dust or molten metal. Use coarse water spray on chips and fines.

Unsuitable Extinguishing Media DO NOT use halogenated extinguishing agents on small chips or fines. DO NOT use water for fires invoving molten metal. These fire extinguishing agents will react with burning material.

Explosion Data
Sensitivity to Mechanical Impact None
Sensitivity to Static Discharge None

Specific Hazards Arising from the Chemical Thermal decomposition can lead to release of irritating gases and vapors. In the event of fire and/or explosion do not breathe fumes. May cause sensitization by inhalation and skin contact.

Protective Equipment and Precautions for Firefighters As in any fire, wear self-contained breathing apparatus pressure-demand, MSHA/NIOSH (approved or equivalent) and full protective gear.

NFPA	**Health Hazard** 2	**Flammability** 0	**Instability** 0	**Physical and Chemical Hazards** -
HMIS	**Health Hazard** 2*	**Flammability** 0	**Physical Hazard** 0	**Personal Protection** X

**Indicates a chronic health hazard.*

6. ACCIDENTAL RELEASE MEASURES

Personal Precautions Use personal protective equipment. Keep people away from and upwind of spill/leak.

Environmental Precautions Prevent further leakage or spillage if safe to do so. Prevent product from entering drains. Do not flush into surface water or sanitary sewer system.

Methods for Containment Prevent further leakage or spillage if safe to do so.

Methods for Cleaning Up Avoid dust formation. Collect scrap for recycling.

If product is molten, contain the flow using dry sand or salt flux as a dam. All tools and containers which come in contact with molten metal must be preheated or specially coated and rust free. Allow the spill to cool before remelting as scrap.

7. HANDLING AND STORAGE

Handling

Avoid contact with skin, eyes and clothing. Wear personal protective equipment. Avoid dust formation. Keep material dry. Avoid contact with sharp edges or heated material. Hot and cold aluminum are not visually different. Hot aluminum does not always glow red.

Storage

Keep container tightly closed in a dry and well-ventilated place.

8. EXPOSURE CONTROLS / PERSONAL PROTECTION

Exposure Guidelines

Chemical Name	ACGIH TLV	OSHA PEL	NIOSH IDLH
Copper 7440-50-8	TWA: 0.2 mg/m³fume	TWA: 0.1 mg/m³fume TWA: 1 mg/m³dust and mist (vacated) TWA: 0.1 mg/m³ Cu dust, fume, mist	IDLH: 100 mg/m³dust, fume and mist TWA: 1 mg/m³ dust and mist TWA: 0.1 mg/m³ fume
Aluminum 7429-90-5	TWA: 1 mg/m³respirable fraction	TWA: 15 mg/m³total dust TWA: 5 mg/m³respirable fraction (vacated) TWA: 15 mg/m³total dust (vacated) TWA: 5 mg/m³respirable fraction	TWA: 10 mg/m³ total dust TWA: 5 mg/m³ respirable dust
Antimony 7440-36-0	TWA: 0.5 mg/m³	TWA: 0.5 mg/m³ (vacated) TWA: 0.5 mg/m³	IDLH: 50 mg/m³ TWA: 0.5 mg/m³
Arsenic 7440-38-2	TWA: 0.01 mg/m³	TWA: 10 µg/m³ As Action Level: 5 µg/m³ As (vacated) TWA: 0.5 mg/m³	IDLH: 5 mg/m³ Ceiling: 0.002 mg/m³ 15 min
Beryllium 7440-41-7	TWA: 0.00005 mg/m³inhalable fraction S*	TWA: 2 µg/m³ (vacated) TWA: 2 µg/m³ (vacated) STEL: 25 µg/m³ 30 min (vacated) Ceiling: 5 µg/m³ Ceiling: 5 µg/m³ Be	IDLH: 4 mg/m³ Ceiling: 0.0005 mg/m³
Cadmium and compounds (as Cd) 7440-43-9	TWA: 0.01 mg/m³ TWA: 0.002 mg/m³respirable fraction	TWA: 0.1 mg/m³fume applies to any operations or sectors for which the Cadmium standard is stayed or otherwise not in effect TWA: 0.2 mg/m³dust applies to any operations or sectors for which the Cadmium standard is stayed or otherwise not in effect TWA: 5 µg/m³ Action Level: 2.5 µg/m³ (vacated) STEL: 0.3 ppm fume Ceiling: 0.3 mg/m³fume applies to any operations or sectors for which the Cadmium standard is stayed or otherwise not in effect Ceiling: 0.6 mg/m³dust applies to any operations or sectors for which the Cadmium standard is stayed or otherwise not in effect	IDLH: 9 mg/m³dust
Cobalt 7440-48-4	TWA: 0.02 mg/m³	TWA: 0.1 mg/m³dust and fume (vacated) TWA: 0.05 mg/m³dust and fume	IDLH: 20 mg/m³dust and fume TWA: 0.05 mg/m³ dust and fume
Lead 7439-92-1	TWA: 0.05 mg/m³	TWA: 50 µg/m³ Action Level: 30 µg/m³Poison, See 29 CFR 1910.1025	IDLH: 100 mg/m³ TWA: 0.050 mg/m³
Iron oxide 1309-37-1	TWA: 5 mg/m³respirable fraction	TWA: 10 mg/m³fume (vacated) TWA: 10 mg/m³fume	IDLH: 2500 mg/m³ Fe dust and fume TWA: 5 mg/m³Fe dust and fume
Manganese 7439-96-5	TWA: 0.2 mg/m³	(vacated) TWA: 1 mg/m³fume (vacated) STEL: 3 mg/m³fume (vacated) Ceiling: 5 mg/m³ Ceiling: 5 mg/m³fume	IDLH: 500 mg/m³ TWA: 1 mg/m³ fume STEL: 3 mg/m³
Silicon 7440-21-3		TWA: 15 mg/m³total dust TWA: 5 mg/m³respirable fraction (vacated) TWA: 10 mg/m³total dust (vacated) TWA: 5 mg/m³respirable fraction	TWA: 10 mg/m³ total dust TWA: 5 mg/m³ respirable dust
Nickel 7440-02-0	TWA: 1.5 mg/m³	TWA: 1 mg/m³ (vacated) TWA: 1 mg/m³	IDLH: 10 mg/m³ TWA: 0.015 mg/m³
Zinc oxide 1314-13-2	STEL: 10 mg/m³respirable fraction TWA: 2 mg/m³respirable fraction	TWA: 5 mg/m³fume TWA: 15 mg/m³total dust TWA: 5 mg/m³respirable fraction (vacated) TWA: 5 mg/m³fume (vacated) TWA: 10 mg/m³total dust (vacated) TWA: 5 mg/m³respirable fraction (vacated) STEL: 10 mg/m³fume	IDLH: 500 mg/m³ Ceiling: 15 mg/m³dust TWA: 5 mg/m³ dust and fume STEL: 10 mg/m³fume

Chemical Name	ACGIH TLV	OSHA PEL	NIOSH IDLH
Tellurium 13494-80-9	TWA: 0.1 mg/m³	TWA: 0.1 mg/m³ (vacated) TWA: 0.1 mg/m³	IDLH: 25 mg/m³ TWA: 0.1 mg/m³
Silver 7440-22-4	TWA: 0.1 mg/m³dust and fume	TWA: 0.01 mg/m³ (vacated) TWA: 0.01 mg/m³	IDLH: 10 mg/m³dust TWA: 0.01 mg/m³ dust
Thallium 7440-28-0	TWA: 0.02 mg/m³inhalable fraction S*	(vacated) TWA: 0.1 mg/m³ (vacated) S*	
Tin 7440-31-5	TWA: 2 mg/m³	TWA: 2 mg/m³ Sn except oxides (vacated) TWA: 2 mg/m³	IDLH: 100 mg/m³ TWA: 2 mg/m³
Zirconium 7440-67-7	STEL: 10 mg/m³ TWA: 5 mg/m³	TWA: 5 mg/m³ Zr (vacated) TWA: 5 mg/m³ (vacated) STEL: 10 mg/m³	IDLH: 50 mg/m³ TWA: 5 mg/m³ STEL: 10 mg/m³
Sulfur dioxide 7446-09-5	STEL: 0.25 ppm	TWA: 5 ppm TWA: 13 mg/m³ (vacated) TWA: 2 ppm (vacated) TWA: 5 mg/m³ (vacated) STEL: 5 ppm (vacated) STEL: 15 mg/m³	IDLH: 100 ppm TWA: 2 ppm TWA: 5 mg/m³ STEL: 5 ppm STEL: 13 mg/m³
Phosphorus 7723-14-0		TWA: 0.1 mg/m³ (vacated) TWA: 0.1 mg/m³	IDLH: 5 mg/m³ TWA: 0.1 mg/m³

ACGIH TLV: American Conference of Governmental Industrial Hygienists - Threshold Limit Value. OSHA PEL: Occupational Safety and Health Administration - Permissible Exposure Limits. NIOSH IDLH: Immediately Dangerous to Life or Health.

Other Exposure Guidelines Vacated limits revoked by the Court of Appeals decision in AFL-CIO v. OSHA, 965 F.2d 962 (11th Cir., 1992). Hexavalent chrome may be formed during welding.

Engineering Measures Showers
Eyewash stations
Ventilation systems

Personal Protective Equipment

Eye/Face Protection Safety glasses with side-shields.

Skin and Body Protection Impervious clothing. Impervious gloves.

Respiratory Protection If exposure limits are exceeded or irritation is experienced, NIOSH/MSHA approved respiratory protection should be worn. Positive-pressure supplied air respirators may be required for high airborne contaminant concentrations. Respiratory protection must be provided in accordance with current local regulations.

Hygiene Measures Do not breathe vapors/dust. When using, do not eat, drink or smoke. Provide regular cleaning of equipment, work area and clothing. Avoid contact with skin, eyes and clothing. Wash hands before breaks and immediately after handling the product. Keep away from food, drink and animal feeding stuffs.

9. PHYSICAL AND CHEMICAL PROPERTIES

Appearance	Silver or yellow to red.	**Odor**	Odorless.
Odor Threshold	No information available	**Physical State**	Solid
pH	No information available.		
Flash Point	Not applicable.	**Autoignition Temperature**	No information available.
Decomposition Temperature	No information available.	**Boiling Point/Boiling Range**	No information available
Melting Point/Range	1290 - 2260°F		
Flammability Limits in Air	No information available.		
Specific Gravity	2.5-2.9	**Water Solubility**	Insoluble in water.
Solubility	No information available.	**Evaporation Rate**	No information available
Vapor Pressure	No data available.	**Vapor Density**	No data available.

10. STABILITY AND REACTIVITY

Stability	Stable under recommended storage conditions.
Incompatible Products	Acids. Alkalies. Water. Moisture. Metal oxides.
Conditions to Avoid	Dust formation. Heat, flames and sparks.
Hazardous Decomposition Products	Metal fume. Copper compounds. Lead oxides. Lead and chromium compounds.
Hazardous Polymerization	Hazardous polymerization does not occur.

11. TOXICOLOGICAL INFORMATION

Acute Toxicity

Product Information

Inhalation

May cause irritation of respiratory tract. Inhalation of fumes may cause metal fume fever, which is characterized by flu-like symptoms with metallic taste, fever, chills, cough, weakness, chest pain, muscle pain and increased white blood cell count.

Eye Contact

Dust contact with the eyes can lead to mechanical irritation.

Chemical Name	LD50 Oral	LD50 Dermal	LC50 Inhalation
Antimony	= 7 g/kg (Rat)		
Arsenic	= 763 mg/kg (Rat)		
Cadmium and compounds (as Cd)	= 2330 mg/kg (Rat)		= 8 mg/L (Rabbit) 4 h
Bismuth	= 5 g/kg (Rat)		
Cobalt	= 6170 mg/kg (Rat)		> 10 mg/L (Rat) 1 h
Iron oxide	> 10000 mg/kg (Rat)		
Magnesium	= 230 mg/kg (Rat)		
Manganese	= 9 g/kg (Rat)		
Silicon	= 3160 mg/kg (Rat)		
Nickel	> 9000 mg/kg (Rat)		
Zinc oxide	> 5000 mg/kg (Rat)		
Tellurium	= 83 mg/kg (Rat)		> 2420 mg/m³(Rat) 4 h
Silver	2000 mg/kg (Rat)		
Sulfur dioxide		-	Per CGA P-20: 2500 ppm/1hr (Rat)
Phosphorus	= 3.03 mg/kg (Rat)	= 100 mg/kg (Rat)	= 4.3 mg/L (Rat) 1 h

Chronic Toxicity

Chronic Toxicity

Repeated contact may cause allergic reactions in very susceptible persons. Avoid repeated exposure. Prolonged exposure may cause chronic effects. Repeated or prolonged skin contact may cause skin irritation and/or dermatitis and sensitization of susceptible persons. May cause central nervous system depression with nausea, headache, dizziness, vomiting, and incoordination. May cause adverse effects on the bone marrow and blood-forming system. May cause adverse liver effects.

Elevated temperature processing such as welding and plasma arc cutting may release hazardous fumes. Inhalation of beryllium dust or fume may cause chronic beryllium disease (CBD) and is a cancer hazard. Overexposure to metal fumes may cause pulmonary edema (fluid in the lungs) and methemaglobinemia. May also cause pulmonary fibrosis and lung cancer. Lead compounds may be absorbed by ingestion, by inhalation and through the skin. Lead may damage kidney function, the blood forming system and the reproductive system. Inorganic lead compounds can cause developmental damage.

Carcinogenicity

This product contains one or more substances which are classified by IARC as carcinogenic to humans (Group I), probably carcinogenic to humans (Group 2A) or possibly carcinogenic to humans (Group 2B).

Chemical Name	ACGIH	IARC	NTP	OSHA
Nickel		Group 2B Group 1	Reasonably Anticipated	X
Lead	A3	Group 2A	Reasonably Anticipated	X
Iron oxide		Group 3		
Cobalt	A3	Group 2A Group 2B		X
Beryllium	A1	Group 1	Known	X
Cadmium and compounds (as Cd)	A2	Group 1	Known	X
Arsenic	A1	Group 1	Known	X
Sulfur dioxide		Group 3	-	-

ACGIH: (American Conference of Governmental Industrial Hygienists)
A3 - Animal Carcinogen
IARC: (International Agency for Research on Cancer)
Group 1 - Carcinogenic to Humans
Group 2A - Probably Carcinogenic to Humans
Group 2B - Possibly Carcinogenic to Humans
NTP: (National Toxicity Program)
Reasonably Anticipated - Reasonably Anticipated to be a Human Carcinogen
OSHA: (Occupational Safety & Health Administration)
X - Present

Target Organ Effects	Blood. Central nervous system (CNS). Eyes. Kidney. Liver. Lungs. Nasal cavities. Respiratory system. Skin.

12. ECOLOGICAL INFORMATION

Ecotoxicity

Very toxic to aquatic organisms, may cause long-term adverse effects in the aquatic environment.

Chemical Name	Toxicity to Algae	Toxicity to Fish	Toxicity to Microorganisms	Daphnia Magna (Water Flea)
Copper	EC50 96 h: 0.031 - 0.054 mg/L static (Pseudokirchneriella subcapitata) EC50 72 h: 0.0426 - 0.0535 mg/L static (Pseudokirchneriella subcapitata)	LC50 96 h: 0.0068 - 0.0156 mg/L (Pimephales promelas) LC50 96 h: < 0.3 mg/L static (Pimephales promelas) LC50 96 h: = 0.052 mg/L flow-through (Oncorhynchus mykiss) LC50 96 h: = 0.112 mg/L flow-through (Poecilia reticulata) LC50 96 h: = 0.2 mg/L flow-through (Pimephales promelas) LC50 96 h: = 0.3 mg/L semi-static (Cyprinus carpio) LC50 96 h: = 0.8 mg/L static (Cyprinus carpio) LC50 96 h: = 1.25 mg/L static (Lepomis macrochirus)	-	EC50 48 h: = 0.03 mg/L Static (Daphnia magna)
Zinc oxide	Selenastrum capricornutum 72-hour EC50: 0.14 mg/l	Oncorhynchus mykiss 96-hour LC50: 0.14 mg/l		Daphnia magna 48-hour EC50: 0.07 mg/l
Nickel	EC50 96 h: 0.174 - 0.311 mg/L static (Pseudokirchneriella subcapitata) EC50 72 h: = 0.18 mg/L (Pseudokirchneriella subcapitata)	LC50 96 h: = 1.3 mg/L semi-static (Cyprinus carpio) LC50 96 h: = 10.4 mg/L static (Cyprinus carpio) LC50 96 h: > 100 mg/L (Brachydanio rerio)	-	EC50 48 h: = 1 mg/L Static (Daphnia magna) EC50 48 h: > 100 mg/L (Daphnia magna)
Lead		LC50 96 h: = 0.44 mg/L semi-static (Cyprinus carpio) LC50 96 h: = 1.17 mg/L flow-through (Oncorhynchus mykiss) LC50 96 h: = 1.32 mg/L static (Oncorhynchus mykiss)		EC50 48 h: = 600 µg/L (water flea)
Cobalt	-	LC50 96 h: > 100 mg/L static (Brachydanio rerio)	-	-
Cadmium and compounds (as Cd)		LC50 96 h: 0.0004-0.003 mg/L (Pimephales promelas) LC50 96 h: = 0.002 mg/L (Cyprinus carpio) LC50 96 h: = 0.003 mg/L flow-through (Oncorhynchus mykiss) LC50 96 h: = 0.006 mg/L static (Oncorhynchus mykiss) LC50 96 h: = 0.016 mg/L (Oryzias latipes) LC50 96 h: = 0.24 mg/L static (Cyprinus carpio) LC50 96 h: = 21.1 mg/L flow-through (Lepomis macrochirus) LC50 96 h: = 4.26 mg/L semi-static (Cyprinus carpio)		EC50 48 h: = 0.0244 mg/L Static (Daphnia magna)

13. DISPOSAL CONSIDERATIONS

Waste Disposal Methods Dispose of in accordance with local regulations.

Contaminated Packaging Do not re-use empty containers.

US EPA Waste Number D006
D007
D008
D011

Chemical Name	RCRA	RCRA - Basis for Listing	RCRA - D Series Wastes	RCRA - U Series Wastes
Nickel - 7440-02-0	(hazardous constituent - no waste number)	Included in waste streams: F006, F039		
Lead - 7439-92-1	(hazardous constituent - no waste number)	Included in waste streams: F035, F037, F038, F039, K002, K003, K005, K046, K048, K049, K051, K052, K061, K062, K064, K065, K066, K069, K086, K100, K176	= 5.0 mg/L regulatory level	
Thallium - 7440-28-0		Included in waste streams: F039, K178		
Beryllium - 7440-41-7	P015	Included in waste stream: F039		
Cadmium and compounds (as Cd) - 7440-43-9		Included in waste streams: F006, F039, K061, K069, K100	1.0 mg/L regulatory level	
Arsenic - 7440-38-2		Included in waste streams: F032, F034, F035, F039, K031, K060, K084, K101, K102, K161, K171, K172, K176	5.0 mg/L regulatory level	

Chemical Name	RCRA - Halogenated Organic Compounds	RCRA - P Series Wastes	RCRA - F Series Wastes	RCRA - K Series Wastes
Beryllium - 7440-41-7		P015		

This product contains one or more substances that are listed with the State of California as a hazardous waste.

Chemical Name	California Hazardous Waste
Copper	Toxic
Zinc oxide	Toxic
Nickel	Toxic powder Ignitable powder
Lead	Toxic
Aluminum	Ignitable powder
Manganese	Ignitable powder
Cobalt	Toxic powder Ignitable powder
Zirconium	Ignitable powder

14. TRANSPORT INFORMATION

DOT	Not regulated
TDG	Not regulated
MEX	Not regulated

15. REGULATORY INFORMATION

International Inventories

TSCA	Complies
DSL	Complies
EINECS	Complies
ENCS	Complies
IECSC	Complies
KECL	Complies
PICCS	Complies
AICS	Complies

Legend

TSCA - United States Toxic Substances Control Act Section 8(b) Inventory
DSL/NDSL - Canadian Domestic Substances List/Non-Domestic Substances List

U.S. Federal Regulations

Section 313 of Title III of the Superfund Amendments and Reauthorization Act of 1986 (SARA). This product contains a chemical or chemicals which are subject to the reporting requirements of the Act and Title 40 of the Code of Federal Regulations, Part 372:

Chemical Name	CAS-No	Weight %	SARA 313 - Threshold Values %
Copper	7440-50-8	99.99	1.0
Aluminum	7429-90-5	13.5	1.0
Arsenic	7440-38-2	0.5	0.1
Beryllium	7440-41-7	2	0.1
Cadmium and compounds (as Cd)	7440-43-9	1	0.1
Chromium	7440-47-3	4	1.0
Cobalt	7440-48-4	2.7	0.1
Lead	7439-92-1	16	0.1
Manganese	7439-96-5	5	1.0
Nickel	7440-02-0	33	0.1
Thallium	7440-28-0	3.4	1.0
Zinc oxide	1314-13-2	40	1.0

SARA 311/312 Hazard Categories

Acute Health Hazard	Yes
Chronic Health Hazard	Yes
Fire Hazard	No
Sudden Release of Pressure Hazard	No
Reactive Hazard	No

Clean Water Act

This product contains the following substances which are regulated pollutants pursuant to the Clean Water Act (40 CFR 122.21 and 40 CFR 122.42):

Chemical Name	CWA - Reportable Quantities	CWA - Toxic Pollutants	CWA - Priority Pollutants	CWA - Hazardous Substances
Copper		X	X	
Antimony		X	X	
Arsenic		X	X	
Beryllium		X	X	
Cadmium and compounds (as Cd)		X	X	
Lead		X	X	
Nickel		X	X	
Silver		X	X	
Thallium		X	X	
Phosphorus	1 lb			X

CERCLA

This material, as supplied, contains one or more substances regulated as a hazardous substance under the Comprehensive Environmental Response Compensation and Liability Act (CERCLA) (40 CFR 302):

Chemical Name	Hazardous Substances RQs	Extremely Hazardous Substances RQs	RQ
Copper	5000 lb		RQ 5000 lb final RQ RQ 2270 kg final RQ
Antimony	5000 lb		RQ 5000 lb final RQ RQ 2270 kg final RQ
Arsenic	1 lb		RQ 1 lb final RQ RQ 0.454 kg final RQ
Beryllium	10 lb		RQ 10 lb final RQ RQ 4.54 kg final RQ
Chromium			RQ 5000 lb final RQ RQ 2270 kg final RQ
Cadmium and compounds (as Cd)	10 lb		RQ 10 lb final RQ RQ 4.54 kg final RQ
Lead	10 lb		RQ 10 lb final RQ RQ 4.54 kg final RQ
Nickel	100 lb		RQ 100 lb final RQ RQ 45.4 kg final RQ
Silver	1000 lb		RQ 1000 lb final RQ RQ 454 kg final RQ
Thallium	1000 lb		RQ 1000 lb final RQ RQ 454 kg final RQ
Sulfur dioxide		500 lb	
Phosphorus	1 lb	1 lb	RQ 1 lb final RQ RQ 0.454 kg final RQ

U.S. State Regulations

California Proposition 65

This product contains the following Proposition 65 chemicals:

Chemical Name	CAS-No	California Prop. 65
Arsenic	7440-38-2	Carcinogen
Beryllium	7440-41-7	Carcinogen
Cadmium and compounds (as Cd)	7440-43-9	Carcinogen Developmental Male Reproductive
Cobalt	7440-48-4	Carcinogen
Lead	7439-92-1	Carcinogen Developmental Female Reproductive Male Reproductive
Nickel	7440-02-0	Carcinogen

U.S. State Right-to-Know Regulations

Chemical Name	New Jersey	Massachusetts	Pennsylvania	Illinois	Rhode Island
Copper	X	X	X	X	X
Aluminum	X	X	X		X
Antimony	X	X	X	X	X
Arsenic	X	X	X	X	X
Beryllium	X	X	X	X	X
Chromium		X			X
Cadmium and compounds (as Cd)	X	X	X	X	X
Cobalt	X	X	X	X	X
Lead	X	X	X	X	X
Iron oxide	X	X	X		X
Magnesium	X	X	X		X
Manganese	X	X	X	X	X
Silicon	X	X	X		X
Nickel	X	X	X	X	X
Zinc oxide	X	X	X		X
Tellurium	X	X	X		X
Silver	X	X	X		X
Thallium	X	X	X		X
Tin	X	X	X		X
Zirconium	X	X	X		X
Sulfur dioxide	X	X	X		X
Phosphorus	X	X	X	X	X

International Regulations

Chemical Name	Carcinogen Status	Exposure Limits
Copper		Mexico: TWA= 1 mg/m³ Mexico: TWA= 0.2 mg/m³ Mexico: STEL= 2 mg/m³
Aluminum		Mexico: TWA= 10 mg/m³
Antimony		Mexico: TWA 0.5 mg/m³
Arsenic	A1	Mexico: TWA 0.01 mg/m³
Beryllium	A2	Mexico: TWA 0.002 mg/m³
Chromium		Mexico: TWA 0.5 mg/m³
Cadmium and compounds (as Cd)	A2	Mexico: TWA 0.01 mg/m³ Mexico: TWA 0.002 mg/m³
Cobalt	A3	Mexico: TWA= 0.1 mg/m³
Lead	A3	Mexico: TWA= 0.15 mg/m³
Iron oxide		Mexico: TWA 5 mg/m³ Mexico: STEL 10 mg/m³
Manganese		Mexico: TWA 0.2 mg/m³ Mexico: TWA 1 mg/m³ Mexico: STEL 3 mg/m³
Silicon		Mexico: TWA 10 mg/m³ Mexico: STEL 20 mg/m³
Nickel		Mexico: TWA 1 mg/m³
Zinc oxide		Mexico: TWA 5 mg/m³ Mexico: TWA 10 mg/m³ Mexico: STEL 10 mg/m³
Tellurium		Mexico: TWA 0.1 mg/m³
Silver		Mexico: TWA 0.1 mg/m³
Tin		Mexico: TWA 2 mg/m³ Mexico: STEL 4 mg/m³
Zirconium		Mexico: TWA 5 mg/m³ Mexico: STEL 10 mg/m³
Sulfur dioxide		Mexico: TWA 2 ppm Mexico: TWA 5 mg/m³ Mexico: STEL 5 ppm Mexico: STEL 10 mg/m³
Phosphorus		Mexico: TWA 0.1 mg/m³ Mexico: STEL 0.3 mg/m³

Canada

This product has been classified in accordance with the hazard criteria of the Controlled Products Regulations (CPR) and the MSDS contains all the information required by the CPR.

WHMIS Hazard Class
Non-controlled

Chemical Name	NPRI
Aluminum	X
Arsenic	X
Chromium	X
Cadmium and compounds (as Cd)	X
Cobalt	X
Lead	X
Nickel	X
Sulfur dioxide	X
Phosphorus	X

Legend
NPRI - National Pollutant Release Inventory

16. OTHER INFORMATION

Prepared By
Product Stewardship
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Latham, NY 12110
1-800-572-6501

Issuing Date 23-Nov-2011
Revision Date

Revision Note Initial Release.

General Disclaimer
The information provided on this MSDS is correct to the best of our knowledge, information and belief at the date of its publication. The information given is designed only as a guide for safe handling, use, processing, storage, transportation, disposal and release and is not to be considered as a warranty or quality specification. The information relates only to the specific material designated and may not be valid for such material used in combination with any other material or in any process, unless specified in the text.

End of Safety Data Sheet

Copper Alloy Composite Sheet

ThyssenKrupp Materials NA, Inc.
22355 West Eleven Mile Road
Southfield, MI 48034
248.233.5681

Rem = Remaining Percent
Nominal Amount Identified When Available
Percent Maximum, unless shown as Range or Minimum

Issued November 23, 2011

Copper Alloy UNS No.	Name	Copper %	Ag Silver %	Al Alumi-num %	As Arsenic %	Be Beryl-lium %	Bi Bismuth %	Cd Cadmium %	Co Cobalt %	Cr Chro-mium %	Fe Iron %	Mg Mag-nesium %	Mn Man-ganese %	Ni Nickel %	O Oxygen %	P Phos-phorus %	Pb Lead %	S Sulfur %	Sb Antimony %	Se Selenium %	Si Silicon %	Sn Tin %	Te Tellur-ium %	Ti Titanium %	Zn Zinc %	Zr Zirco-nium %
C10100	Oxygen Free Electronic Copper	99.99 min.	0.0025	-	0.0005	-	0.0001	0.0001	-	-	0.001	-	0.00005	0.001	0.0005	0.0003	0.0005	0.0015	0.0004	0.0003	-	0.0002	0.0002	-	-	0.0001
C10200	OF Copper	99.95 min. (a)	-	-	-	-	-	-	-	-	-	-	-	-	0.001	-	-	-	-	-	-	-	-	-	-	-
C10300	Oxygen Free Extra Low Phosphorus	99.95 min. (a), (b)	-	-	-	-	-	-	-	-	-	-	-	-	-	.001-.005	-	-	-	-	-	-	-	-	-	-
C10400	Silver Bearing OFHC Copper	99.95 min. (a)	0.027	-	-	-	-	-	-	-	-	-	-	-	0.001	-	-	-	-	-	-	-	-	-	-	-
C10700	Silver Bearing OFHC Copper	99.95 min. (a)	0.085	-	-	-	-	-	-	-	-	-	-	-	0.001	-	-	-	-	-	-	-	-	-	-	-
C10800	Oxygen Free Low Phosphorus	99.95 min. (a), (b)	-	-	-	-	-	-	-	-	-	-	-	-	-	.005-.012	-	-	-	-	-	-	-	-	-	-
C11000	Electrolytic Tough Pitch Copper	99.90 min. (a)	-	-	-	-	-	-	-	-	-	-	-	-	0.04	-	-	-	-	-	-	-	-	-	-	-
C11020	FRHC	99.90 min. (a)	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
C11300	Silver Bearing Copper	99.90 min. (a)	0.027 min	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
C11400	Silver Bearing Copper	99.90 min. (a)	0.034 min	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
C11500	Silver Bearing Copper	99.90 min. (a)	0.054 min	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
C11600	Silver Bearing Copper	99.90 min. (a)	0.085 min	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
C12000	Phosphorized Copper DLP	99.90 min. (a)	-	-	-	-	-	-	-	-	-	-	-	-	-	.004-.012	-	-	-	-	-	-	-	-	-	-
C12100	Phosphorized Copper DLP	99.90 min. (a)	.014 min	-	-	-	-	-	-	-	-	-	-	-	-	.005-.012	-	-	-	-	-	-	-	-	-	-
C12200	Phosphorized Copper	99.90 min. (a)	-	-	-	-	-	-	-	-	-	-	-	-	-	.015-.040	-	-	-	-	-	-	-	-	-	-
C12900	FRSTP	99.88 min. (a)	0.054	-	0.012	-	0.003	-	-	-	-	-	-	0.05	-	-	0.004	-	0.003	-	-	-	0.025	-	-	-
C14200	Arsenical Copper DPA	99.40 min. (a)	-	-	.15-.50	-	-	-	-	-	-	-	-	-	-	.015-.040	-	-	-	-	-	-	-	-	-	-
C14420	Cadmium Copper Deoxidized	99.90 min. (c)	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	.04-.15	.005-.05	-	-	-
C14500	Tellurium Copper	99.90 min. (a), (d)	-	-	-	-	-	-	-	-	-	-	-	-	-	.004-.012	-	-	-	-	-	-	.40-.7	-	-	-
C14520	DPTE	99.90 min. (a), (d)	-	-	-	-	-	-	-	-	-	-	-	-	-	.004-.020	-	-	-	-	-	-	.40-.7	-	-	-
C14530	DPTE	99.90 min. (e)	-	-	-	-	-	-	-	-	-	-	-	-	-	.001-.010	-	-	-	-	-	.003-.023	.003-.023	-	-	-
C14700	OFHC Sulfur copper	99.90 min. (a), (b), (f)	-	-	-	-	-	-	-	-	-	-	-	-	-	.002-.005	-	.20-.50	-	-	-	-	-	-	-	-
C15000	Amzirc(Zirconium Cu)AMPCO 910 EXTR	Rem (Nominal 99.9%) (a)	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	.10-.20
C15500	DPTE	99.75 min. (a)	.027-.10	-	-	-	-	-	-	-	-	.08-.13	-	-	-	.040-.080	-	-	-	-	-	-	-	-	-	-
C16200	Cadmium Copper	Rem (Nominal 99.0%) (a)	-	-	-	-	-	.7-1.2	-	-	0.02	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
C16500	Cadmium Copper	Rem (Nominal 98.6%) (a)	-	-	-	-	-	.6-1.0	-	-	0.02	-	-	-	-	-	-	-	-	-	-	.50-.7	-	-	-	-
C17000	Beryllium Copper (g)	Rem (Nominal 98.3%) (a)	-	0.2	-	1.60-1.85	-	-	.2 min (g)	-	-	-	-	-	-	-	-	-	-	-	0.2	-	-	-	-	-
C17200	Beryllium Copper (g)	Rem (Nominal 98.1%) (a)	-	0.2	-	1.80-2.00	-	-	.2 min (g)	-	-	-	-	-	-	-	-	-	-	-	0.2	-	-	-	-	-
C17300	Beryllium Copper (g)	Rem (Nominal 97.7%) (a)	-	0.2	-	1.80-2.00	-	-	.2 min (g)	-	-	-	-	-	-	-	.20-.6	-	-	-	0.2	-	-	-	-	-
C17410	Beryllium Copper	Rem (Nominal 98.6%) (a)	-	0.2	-	.15-.50	-	-	.35-.6	-	0.2	-	-	-	-	-	-	-	-	-	0.2	-	-	-	-	-
C17500	Beryllium Copper	Rem (Nominal 96.9%) (a)	-	0.2	-	.4-.7	-	-	2.4-2.7	-	0.1	-	-	-	-	-	-	-	-	-	0.2	-	-	-	-	-
C17510	Beryllium Copper	Rem (Nominal 97.8%) (a)	-	0.2	-	.2-.6	-	-	0.3	-	0.1	-	-	1.4-2.2	-	-	-	-	-	-	0.2	-	-	-	-	-
C18000	Ni Chromium Cop. AMPCO 940 EXTR.	Remaining (Rem) (a)	-	-	-	-	-	-	-	.10-.80	0.15	-	-	1.8-3.0 (h)	-	-	-	-	-	-	-	-	-	-	-	-
C18135	High Copper Alloy	Rem (Nominal 99.2%) (a)	-	-	-	-	-	.20-.6	-	.20-.60	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
C18140	High Copper Alloy	Remaining (Rem) (a)	-	-	-	-	-	-	-	.15-.45	-	-	-	-	-	-	-	-	-	-	.005-.05	-	-	-	-	.05-.25
C18150	High Copper AMPCO 972 EXTR.	Rem (Nominal 98.9%) (a)	-	-	-	-	-	-	-	.50-1.5	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	.05-.25
C18200	Chromium Copper AMPCO 97 EXTR.	Rem (Nominal 99.1%) (a)	-	-	-	-	-	-	-	.6-1.2	0.1	-	-	-	-	-	0.05	-	-	-	0.1	-	-	-	-	-
C18700	Leaded Copper	99.5 min. (a) & (i)	-	-	-	-	-	-	-	-	-	-	-	-	-	-	.8-1.5	-	-	-	-	-	-	-	-	-
C19100	Chromium Copper	Rem (Nominal 98.2%) (a)	-	-	-	-	-	-	-	-	0.2	-	-	.9-1.3	-	.15-.35	0.1	-	-	-	-	-	.35-.6	-	0.5	-
C19150	High Copper Alloy	Rem (Nominal 97.4%) (a)	-	-	-	-	-	-	-	-	0.05	-	-	.8-1.2	-	.15-.35	.50-1.0	-	-	-	-	0.05	-	-	-	-
C19400	High Copper Alloy	97.0 min.	-	-	-	-	-	-	-	-	2.1-2.6	-	-	-	-	.015-.15	0.03	-	-	-	-	-	-	-	.05-.20	-
C19500	High Copper Alloy	96.0 min.	-	0.02	-	-	-	-	.30-1.3	-	1.0-2.0	-	-	-	-	.01-.35	0.02	-	-	-	-	-	-	-	0.2	-
C19700	High Copper Alloy	Remaining (Rem)	-	-	-	-	-	-	0.05	-	.30-1.2	.01-.20	0.05	0.05	-	.10-.40	0.05	-	-	-	-	0.2	-	-	0.2	-
C19900	High Copper Alloy	Remaining (Rem)	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	2.9-3.5	-	-
C21000	Gilding	94.0-96.0	-	-	-	-	-	-	-	-	0.05	-	-	-	-	-	0.05	-	-	-	-	-	-	-	Rem	-
C22000	Commercial Bronze	89.0-91.0	-	-	-	-	-	-	-	-	0.05	-	-	-	-	-	0.05	-	-	-	-	-	-	-	Rem	-

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Copper Alloy UNS No.	Name	Copper %	Ag Silver %	Al Alumi-num %	As Arsenic %	Be Beryl-lium %	Bi Bismuth %	Cd Cadmium %	Co Cobalt %	Cr Chro-mium %	Fe Iron %	Mg Mag-nesium %	Mn Man-ganese %	Ni Nickel %	O Oxygen %	P Phos-phorus %	Pb Lead %	S Sulfur %	Sb Antimony %	Se Selenium %	Si Silicon %	Sn Tin %	Te Tellur-ium %	Ti Titanium %	Zn Zinc %	Zr Zirco-nium %
C22600	Jewelry Bronze	86.0-89.0	-	-	-	-	-	-	-	-	0.05	-	-	-	-	-	0.05	-	-	-	-	-	-	-	Rem	-
C23000	Red Brass	84.0-86.0	-	-	-	-	-	-	-	-	0.05	-	-	-	-	-	0.05	-	-	-	-	-	-	-	Rem	-
C24000	Low Brass	78.5-81.5	-	-	-	-	-	-	-	-	0.05	-	-	-	-	-	0.05	-	-	-	-	-	-	-	Rem	-
C26000	Cartridge Bras	68.5-71.5	-	-	-	-	-	-	-	-	0.05	-	-	-	-	-	0.07	-	-	-	-	-	-	-	Rem	-
C26800	Yellow Brass	64.0-68.5	-	-	-	-	-	-	-	-	0.05	-	-	-	-	-	0.09	-	-	-	-	-	-	-	Rem	-
C27000	Yellow Brass	63.0-68.5	-	-	-	-	-	-	-	-	0.07	-	-	-	-	-	0.09	-	-	-	-	-	-	-	Rem	-
C27200	Yellow Brass	62.0-65.0	-	-	-	-	-	-	-	-	0.07	-	-	-	-	-	0.07	-	-	-	-	-	-	-	Rem	-
C27400	Yellow Brass	61.0-64.0	-	-	-	-	-	-	-	-	0.05	-	-	-	-	-	0.09	-	-	-	-	-	-	-	Rem	-
C28000	Muntz Metal	59.0-63.0	-	-	-	-	-	-	-	-	0.07	-	-	-	-	-	0.09	-	-	-	-	-	-	-	Rem	-
C31400	Leaded Commercial Bronze	87.5-90.5	-	-	-	-	-	-	-	-	0.1	-	-	0.7	-	-	1.3-2.5	-	-	-	-	-	-	-	Rem	-
C31600	High strength Commercial Bronze	87.5-90.5	-	-	-	-	-	-	-	-	0.1	-	-	.7-1.2	-	.04-.10	1.3-2.5	-	-	-	-	-	-	-	Rem	-
C32000	Hardware Bronze	83.5-86.5	-	-	-	-	-	-	-	-	0.1	-	-	0.25	-	-	1.5-2.2	-	-	-	-	-	-	-	Rem	-
C33000	Low Leaded Tube Brass	65.0-68.0	-	-	-	-	-	-	-	-	0.07	-	-	-	-	-	.25-.7	-	-	-	-	-	-	-	Rem	-
C33200	Free Cutting Tube Brass	65.0-68.0	-	-	-	-	-	-	-	-	0.07	-	-	-	-	-	1.5-2.5	-	-	-	-	-	-	-	Rem	-
C33500	Low Leaded Brass	62.0-65.0	-	-	-	-	-	-	-	-	0.15 (j)	-	-	-	-	-	.25-.7	-	-	-	-	-	-	-	Rem	-
C34000	Medium Leaded Brass	62.0-65.0	-	-	-	-	-	-	-	-	0.15 (j)	-	-	-	-	-	.8-1.5	-	-	-	-	-	-	-	Rem	-
C34200	High Leaded Brass	62.0-65.0	-	-	-	-	-	-	-	-	0.15 (j)	-	-	-	-	-	1.5-2.5	-	-	-	-	-	-	-	Rem	-
C34500	High Leaded Brass	62.0-65.0	-	-	-	-	-	-	-	-	0.15	-	-	-	-	-	1.5-2.5	-	-	-	-	-	-	-	Rem	-
C35000	Medium Leaded Brass	60.0-63.0	-	-	-	-	-	-	-	-	0.15 (j)	-	-	-	-	-	.8-2.0	-	-	-	-	-	-	-	Rem	-
C35300	High Leaded Brass	60.0-63.0	-	-	-	-	-	-	-	-	0.15 (j)	-	-	-	-	-	1.5-2.5	-	-	-	-	-	-	-	Rem	-
C35600	Extra High Leaded Brass	60.0-63.0	-	-	-	-	-	-	-	-	0.15 (j)	-	-	-	-	-	2.0-3.0	-	-	-	-	-	-	-	Rem	-
C36000	Free Cutting Brass	60.0-63.0	-	-	-	-	-	-	-	-	0.35	-	-	-	-	-	2.5-3.0	-	-	-	-	-	-	-	Rem	-
C36500	Leaded Muntz Metal	58.0-61.0	-	-	-	-	-	-	-	-	0.15	-	-	-	-	-	.25-.7	-	-	-	-	0.25	-	-	Rem	-
C37000	Free Cutting Muntz Metal	59.0-62.0	-	-	-	-	-	-	-	-	0.15	-	-	-	-	-	.8-1.5	-	-	-	-	-	-	-	Rem	-
C37700	Forging Brass	58.0-61.0	-	-	-	-	-	-	-	-	0.3	-	-	-	-	-	1.5-2.5	-	-	-	-	-	-	-	Rem	-
C38000	Architectural Bronze Low Leaded	55.0-60.0	-	0.5	-	-	-	-	-	-	0.35	-	-	-	-	-	1.5-2.5	-	-	-	-	0.3	-	-	Rem	-
C38500	Architectural Bronze	55.0-59.0	-	-	-	-	-	-	-	-	0.35	-	-	-	-	-	2.5-3.5	-	-	-	-	-	-	-	Rem	-
C40400	Architectural Bronze	Remaining (Rem)	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	.35-.7	-	-	2.0-3.0	-
C40500	Architectural Bronze	94.0-96.0	-	-	-	-	-	-	-	-	0.05	-	-	-	-	-	0.05	-	-	-	-	.7-1.3	-	-	Rem	-
C41100	Bearing Bronze	89.0-92.0	-	-	-	-	-	-	-	-	0.05	-	-	-	-	-	0.09	-	-	-	-	.30-.7	-	-	Rem	-
C42500	Contact Bronze	87.0-90.0	-	-	-	-	-	-	-	-	0.05	-	-	-	-	0.35	0.05	-	-	-	-	1.5-3.0	-	-	Rem	-
C43500	Trumpet Metal	79.0-83.0	-	-	-	-	-	-	-	-	0.05	-	-	-	-	-	0.09	-	-	-	-	.6-1.2	-	-	Rem	-
C44300	Arsenical Admiralty	70.0-73.0	-	-	.02-.06	-	-	-	-	-	0.06	-	-	-	-	-	0.07	-	-	-	-	.8-1.2 (k)	-	-	Rem	-
C44400	Antimonial Admiralty	70.0-73.0	-	-	-	-	-	-	-	-	0.06	-	-	-	-	-	0.07	-	.02-.10	-	-	.8-1.2 (k)	-	-	Rem	-
C44500	Phosphorized Admiralty	70.0-73.0	-	-	-	-	-	-	-	-	0.06	-	-	-	-	.02-.10	0.07	-	-	-	-	.8-1.2 (k)	-	-	Rem	-
C46200	Naval Brass	62.0-65.0	-	-	-	-	-	-	-	-	0.1	-	-	-	-	-	0.2	-	-	-	-	.50-1.0	-	-	Rem	-
C46400	Naval Brass	59.0-62.0	-	-	-	-	-	-	-	-	0.1	-	-	-	-	-	0.2	-	-	-	-	.50-1.0	-	-	Rem	-
C46500	Arsenical Naval Brass	59.0-62.0	-	-	.02-.06	-	-	-	-	-	0.1	-	-	-	-	-	0.2	-	-	-	-	.50-1.0	-	-	Rem	-
C48200	Leaded Naval Brass	59.0-62.0	-	-	-	-	-	-	-	-	0.1	-	-	-	-	-	.40-1.0	-	-	-	-	.50-1.0	-	-	Rem	-
C48500	Leaded Naval Brass	59.0-62.0	-	-	-	-	-	-	-	-	0.1	-	-	-	-	-	1.3-2.2	-	-	-	-	.50-1.0	-	-	Rem	-
C50500	Phosphor Bronze (E)	Rem (Nominal 98.7%)	-	-	-	-	-	-	-	-	0.1	-	-	-	-	.03-.35	0.05	-	-	-	-	1.0-1.7	-	-	0.3	-
C51000	Phosphor Bronze (A)	Rem (Nominal 94.8%)	-	-	-	-	-	-	-	-	0.1	-	-	-	-	.03-.35	0.05	-	-	-	-	4.2-5.8	-	-	0.3	-
C51100	Phosphor Bronze	Rem (Nominal 95.6%)	-	-	-	-	-	-	-	-	0.1	-	-	-	-	.03-.35	0.05	-	-	-	-	3.5-4.9	-	-	0.3	-
C52100	Phosphor Bronze (C)	Rem (Nominal 92.0%)	-	-	-	-	-	-	-	-	0.1	-	-	-	-	.03-.35	0.05	-	-	-	-	7.0-9.0	-	-	0.2	-
C52400	Phosphor Bronze (D)	Rem (Nominal 90.0%)	-	-	-	-	-	-	-	-	0.1	-	-	-	-	.03-.35	0.05	-	-	-	-	9.0-11.0	-	-	0.2	-
C53400	Phosphor Bronze (B-1)	Rem (Nominal 94.2%)	-	-	-	-	-	-	-	-	0.1	-	-	-	-	.03-.35	.8-1.2	-	-	-	-	3.5-5.8	-	-	0.3	-
C54400	Phosphor Bronze (B-2)	Rem (Nominal 88.0%)	-	-	-	-	-	-	-	-	0.1	-	-	-	-	.01-.50	3.0-4.0	-	-	-	-	3.5-4.5	-	-	1.5-4.5	-
C61000	Aluminum Bronze	Rem (Nominal 92.0%) (a)	-	6.0-8.5	-	-	-	-	-	-	0.5	-	-	-	-	-	0.02	-	-	-	0.1	-	-	-	0.2	-
C61300	Aluminum Bronze	Rem (Nominal 90.3%) (a)	-	6.0-7.5	-	-	-	-	-	-	2.0-3.0	-	0.2	0.15 (h)	-	0.015	0.01	-	-	-	0.1	.20-.50	-	-	0.1 (l)	-
C61400	Aluminum Bronze (D) AMPCO 8	Rem (Nominal 91.0%) (a)	-	6.0-8.0	-	-	-	-	-	-	1.5-3.5	-	1.0	-	-	0.015	0.01	-	-	-	-	-	-	-	0.2	-
C62300	Aluminum Bronze AMPCO 15	Rem (Nominal 87.0%) (a)	-	8.5-10.0	-	-	-	-	-	-	2.0-4.0	-	0.5	1.0 (h)	-	-	-	-	-	-	0.25	0.6	-	-	-	-

Copper Alloy Composite Sheet

ThyssenKrupp Materials NA, Inc.
22355 West Eleven Mile Road
Southfield, MI 48034
248.233.5681

Issued November 23, 2011

Copper Alloy UNS No.	Name	Copper %	Ag Silver %	Al Alumi-num %	As Arsenic %	Be Beryl-lium %	Bi Bismuth %	Cd Cadmium %	Co Cobalt %	Cr Chro-mium %	Fe Iron %	Mg Mag-nesium %	Mn Man-ganese %	Ni Nickel %	O Oxygen %	P Phos-phorus %	Pb Lead %	S Sulfur %	Sb Antimony %	Se Selenium %	Si Silicon %	Sn Tin %	Te Tellur-ium %	Ti Titanium %	Zn Zinc %	Zr Zirco-nium %
C62400	Aluminum Bronze AMPCO 18 EXTR.	Rem (Nominal 86.0%) (a)	-	10.0-11.5	-	-	-	-	-	-	2.0-4.5	-	0.3	-	-	-	-	-	-	-	0.25	0.2	-	-	-	-
C62500	Aluminum Bronze	Rem (Nominal 82.7%) (a)	-	12.5-13.5	-	-	-	-	-	-	3.5-5.5	-	2.0	-	-	-	-	-	-	-	-	-	-	-	-	-
C63000	Aluminum Nickel Bronze AMPCO 45	Rem (Nominal 82.0%) (a)	-	9.0-11.0	-	-	-	-	-	-	2.0-4.0	-	1.5	4.0-5.5 (h)	-	-	-	-	-	-	0.25	0.2	-	-	0.3	-
C64200	Aluminum Bronze	Rem (Nominal 91.2%) (a)	-	6.3-7.6	0.09	-	-	-	-	-	0.3	-	0.1	.25 (h)	-	-	0.05	-	-	-	1.5-2.2	0.2	-	-	0.5	-
C65100	Low Silicon Bronze (B)	Rem (Nominal 98.5%) (a)	-	-	-	-	-	-	-	-	0.8	-	0.7	-	-	-	0.05	-	-	-	.8-2.0	-	-	-	1.5	-
C65500	High Silicon Bronze (A)	Rem (Nominal 97.0%) (a)	-	-	-	-	-	-	-	-	0.8	-	.50-1.3	.6 (h)	-	-	0.05	-	-	-	2.8-3.8	-	-	-	1.5	-
C66100	High Silicon Bronze A	Rem (Nominal 96.4%) (a)	-	-	-	-	-	-	-	-	0.25	-	1.5	-	-	-	.20-.8	-	-	-	2.8-3.5	-	-	-	1.5	-
C66700	Manganese Brass	Rem (Nominal 70.0%) (a)	-	-	-	-	-	-	-	-	0.1	-	.8-1.5	-	-	-	0.07	-	-	-	-	-	-	-	Rem	-
C66800	Manganese Brass	Rem (Nominal 61.5%) (a)	-	0.25	-	-	-	-	-	-	0.35	-	2.0-3.5	.25 (h)	-	-	0.5	-	-	-	.50-1.5	0.3	-	-	Rem	-
C67300	Manganese Bronze (B)	Rem (Nominal 60.5%) (a)	-	0.25	-	-	-	-	-	-	0.5	-	2.0-3.5	.25 (h)	-	-	.40-3.0	-	-	-	.50-1.5	0.3	-	-	Rem	-
C67400	Manganese Bronze (B)	Rem (Nominal 58.5%) (a)	-	.50-2.0	-	-	-	-	-	-	0.35	-	2.0-3.5	.25 (h)	-	-	0.5	-	-	-	.50-1.5	0.3	-	-	Rem	-
C68100	Bronze, Low Fuming	Rem (Nominal 58.0%) (a)	-	0.01	-	-	-	-	-	-	.25-1.2	-	.01-.50	-	-	-	0.05	-	-	-	.04-.15	.75-1.1	-	-	Rem	-
C68700	Aluminum Brass-Arsenical	Rem (Nominal 77.5%) (a)	-	1.8-2.5	.02-.06	-	-	-	-	-	0.06	-	-	-	-	-	0.07	-	-	-	-	-	-	-	Rem	-
C69400	Silicon Red Brass	Rem (Nominal 81.5%) (a)	-	-	-	-	-	-	-	-	0.2	-	-	-	-	-	0.3	-	-	-	3.5-4.5	-	-	-	Rem	-
C70200	Silicon Red Brass	Remaining (Rem)	-	-	-	-	-	-	-	-	0.1	-	0.4	2.0-3.0 (h)	-	-	0.05	-	-	-	-	-	-	-	-	-
C70600	Cupro Nickel, 10%	Rem (Nominal 88.6%) (a)	-	-	-	-	-	-	-	-	1.0-1.8	-	1.0	9-11.0 (h)	-	-	0.05	-	-	-	-	-	-	-	1.0	-
C71000	Cupro Nickel, 20%	Rem (Nominal 79.0%) (a)	-	-	-	-	-	-	-	-	1	-	1.0	19-23 (h)	-	-	0.05	-	-	-	-	-	-	-	1.0	-
C71500	Curpo Nickel, 30%	Rem (Nominal 69.5%) (a)	-	-	-	-	-	-	-	-	.4-1.0	-	1.0	29-33 (h)	-	-	0.05	-	-	-	-	-	-	-	1	-
C71581	Copper-Nickel, 30%	Remaining (Rem)	-	-	-	-	-	-	-	-	.4-.7	-	1.0	29-32 (h)	-	-	0.02	-	-	-	-	-	-	-	-	-
C72500	Curpo Nickel, 9%	Rem (Nominal 88.2%) (a)	-	-	-	-	-	-	-	-	0.6	-	0.2	8.5-10.5(h)	-	-	0.05	-	-	-	-	1.8-2.5	-	-	0.5	-
C73500	Copper-Nickel, 30%	70.5-73.5 (a)	-	-	-	-	-	-	-	-	0.25	-	0.5	16.5-19.5(h)	-	-	0.09	-	-	-	-	-	-	-	Rem	-
C74000	Copper-Nickel, 30%	69.0-73.5 (a)	-	-	-	-	-	-	-	-	0.25	-	0.5	9-11 (h)	-	-	0.05	-	-	-	-	-	-	-	Rem	-
C74500	Nickel Silver, 10%	63.5-66.5 (a)	-	-	-	-	-	-	-	-	0.25	-	0.5	9-11 (h)	-	-	0.09 (m)	-	-	-	-	-	-	-	Rem	-
C75200	Nickel Silver, 18%	63.5-66.5 (a)	-	-	-	-	-	-	-	-	0.25	-	0.5	16.5-19.5(h)	-	-	0.05	-	-	-	-	-	-	-	Rem	-
C75700	Nickel Silver, 12%	63.5-66.5 (a)	-	-	-	-	-	-	-	-	0.25	-	0.5	11-13 (h)	-	-	0.05	-	-	-	-	-	-	-	Rem	-
C76200	Nickel Silver, 12%	57.0-61.0 (a)	-	-	-	-	-	-	-	-	0.25	-	0.5	11-13.5 (h)	-	-	0.09	-	-	-	-	-	-	-	Rem	-
C77000	Nickel Silver, 18%	53.5-56.5 (a)	-	-	-	-	-	-	-	-	0.25	-	0.5	16.5-19.5(h)	-	-	0.05	-	-	-	-	-	-	-	Rem	-
C77300	Nickel Silver	46.0-50.0 (a)	-	0.01	-	-	-	-	-	-	-	-	-	9-11 (h)	-	0.25	0.05	-	-	-	.04-.25	-	-	-	Rem	-
C78200	Leaded Nickel Silver	63.0-67.0 (a)	-	-	-	-	-	-	-	-	0.35	-	0.5	7-9 (h)	-	-	1.5-2.5	-	-	-	-	-	-	-	Rem	-
C79200	Leaded Nickel Silver, 12%	59.0-66.5 (a)	-	-	-	-	-	-	-	-	0.25	-	0.5	11-13 (h)	-	-	.8-1.4	-	-	-	-	-	-	-	Rem	-
C79600	Leaded Nickel Silver, 10%	43.5-46.5 (a)	-	-	-	-	-	-	-	-	-	-	1.5-2.5	9-11 (h)	-	-	.8-1.2	-	-	-	-	-	-	-	Rem	-
C79800	Nickel Silver	45.5-48.5 (a)	-	-	-	-	-	-	-	-	0.25	-	1.5-2.5	9-11 (h)	-	-	1.5-2.5	-	-	-	-	-	-	-	Rem	-
C86300	Manganese Bronze Leaded MB (Alloy)	60.0-66.0 (n)	-	5.0-7.5	-	-	-	-	-	-	2.0-4.0	-	2.5-5.0	1.0 (h)	-	-	0.2	-	-	-	-	0.2	-	-	22-28	-
C90500	Copper Tin Alloys	86.0-89.0 (n)	-	0.005	-	-	-	-	-	-	0.2	-	-	1.0 (h)	-	.05 (o)	0.3	0.05	0.2	-	0.005	9.0-11.0	-	-	1.0-3.0	-
C92200	Copper Tin Lead Alloys	86.0-90.0 (n)	-	0.005	-	-	-	-	-	-	0.25	-	-	1.0 (h)	-	.05 (o)	1.0-2.0	0.05	0.25	-	0.005	5.5-6.5	-	-	3.0-5.0	-
C92500	Copper Tin Lead Alloys	85.0-88.0 (n)	-	0.005	-	-	-	-	-	-	0.3	-	-	.8-1.5 (h)	-	.3 (o)	1.0-1.5	0.05	0.25	-	0.005	10.0-12.0	-	-	0.5	-
C93200	Bearing Bronze	81.0-85.0 (n)	-	0.005	-	-	-	-	-	-	0.2	-	-	1.0 (h)	-	.15 (o)	6.0-8.0	0.08	0.35	-	0.005	6.3-7.5	-	-	1.0-4.0	-
C94000	Lead Tin Bronze	69.0-72.0	-	0.005	-	-	-	-	-	-	0.25	-	-	.5-1.0 (h)	-	.05 (o)	14.0-16.0	.08 (p)	0.5	-	0.005	12-14	-	-	0.5	-
C95200	Aluminum Bronze	86.0 min	-	8.5-9.5	-	-	-	-	-	-	2.5-4.0	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
C95400	Aluminum Bronze AMPCO 18 Cast	83.0 min	-	10-11.5	-	-	-	-	-	-	3.0-5.0	-	0.50	1.5 (h)	-	-	-	-	-	-	-	-	-	-	-	-
C95510	Aluminum Bronze	78.0 min	-	9.7-10.9	-	-	-	-	-	-	2.0-3.5	-	1.5	4.5-5.5 (h)	-	-	-	-	-	-	-	0.20	-	-	0.30	-
C95900	Aluminum Bronze	Remaining (Rem)	-	12-13.5	-	-	-	-	-	-	3.0-5.0	-	1.5	.50 (h)	-	-	-	-	-	-	-	-	-	-	-	-
C97300	Copper Nickel Zinc Alloys	53.0-58.0	-	0.005	-	-	-	-	-	-	1.5	-	0.50	11-14 (h)	-	0.05	8.0-11.0	0.08	0.35	-	0.15	1.5-3.0	-	-	17.0-25.0	-

FOOTER NOTES:

(a) Cu value includes Ag
(b) Cu value includes P
(c) Cu value includes Te + Sn
(d) Cu value includes Te + P
(e) Cu value includes Ag + Sn + Te + Se
(f) Cu value includes S
(g) Ni + Co, 0.20% min.; Ni + Fe + Co, 0.6% max.
(h) Ni includes Co
(i) Includes Pb
(j) Fe 0.10% max. for flat products
(k) Sn 0.90% min for tubular products
(l) When the product is for subsequent welding applications and is so specificed by the purchaser, Cr, Cd, Zr, and Zn shall each be 0.05%
(m) Pb .05% max for rod, wire and tube
(n) Cu min., Cu may be calculated as Cu + Ni
(o) P 1.5% max for continous castings
(p) S .25% max for continuous castings

Material Safety Data Sheet

Section 1 — **Product Identification & Use**

Material Name	**ALUMINUM ALLOYS** (Series 1,2,3,5,6,7 thousand)	Supplier	**Samuel, Son & Co. LTD.**
Synonyms	Includes all sheet products, plate, strip, bar, slab, ingot, and tubular products	Address	2360 Dixie Road Mississauga, Ontario L4Y 1Z7
WHMIS Class	D2A, D2B	Phone	(905) 279-5460
Material Use	Manufacture of Articles	Toll Free	1-800-26SAMUEL
		Fax	(905) 279-9658

Section 2 — **Hazardous Ingredients** (OF=oxide fumes/DF=dust and fume/TD=Ti dioxide)

ELEMENT	C.A.S.#	% weight	OSHA PEL (mg/m)	TLV (mg/m3)
Aluminum	7429-90-5	90-99.7	N/A	10.0 OF/5.0 DF
Chromium	7440-47-3	<0.01-0.4	1.0 chrome metal	0.2 fume, 0.1 dust
Metal Copper	7440-50-8	<0.05-6.0	0.1 fume 1.0 dust	0.2 fume 1.0 dust
Iron	1309-37-1	<0.35-1.0	10 OF	5 OF
Magnesium	1309-48A	<0.03A.9	15 OF	10 OF
Manganese	7439-96-5	<0.02-1.5	5c dust 5c fume	5c dust 1 fume
Silicon	7440-21-3	<0.25-0.2	N/A	I0 total dust
Titanium	7440-32-6	<0.02-0.2	15 TD	10 TD
Zinc	1314-13-2	,0.05-6.1	15 OF	10 dust 5 fume
Bismuth	7440-69-9	<0.40-0.7	N/A	N/A
Boron	7440A2-8	.06 max	15 oxide fume	10 oxide fume
Lead	7439-92-1	<0.40-0.7	0.05 DF	0.15 DF
Vanadium	7440-62-2	0.05 max	0.05c dust, 0.ic fume	0.05 dust & 0.05 fume

Note:

Aluminum alloys will be comprised of various combinations of the elements shown above. In addition, other alloying elements may be present in minute quantities. No permissable exposure limits (PEL) or treshold limit values (TLV) exist for aluminum alloys. Values shown are applicable to component elements.

Section 3 — **Physical Data**

Physical state: Solid Odour: N/a Evaporation Rate: N/a Boiling point: N/a Vapour pressure: N/a
Vapour density: N/a Freezing point: N/a Coefficient wtr/oil distribution: N/a Ph: N/a
Odour threshold: N/a Boiling point: N/a Appearance: slvr gry Specific Gravity:H20=1(approx. 2.5-2.9)

Section 4 — **Fire & Explosion Data**

Means of extiction: Dry Powder or Sand *NOTE: do not use water or Halogen on molten Aluminum Flash

Section 5 — **Reactivity Data**

Not applicable Chemical Stability: yes Incompatibility to other substances: yes
Reactivity & under what condition: Sodium Hydroxide& Halogen ACIDS in contact with Aluminum may generate explosive Hydrogen Mixtures. Hazardous Decomposition Products: extreme heat may produce toxic or irritating airborne particulate, including Alloy Oxide

Section 6 — **Toxicological Properties of Material**

Route of entry:Prolonged skin contact with coated products may cause skin irritation in sensitive individuals Inhalation of alloy particulate or elemental oxide fumes generated during welding, burning, grinding or machining may pose acute or chronic effects.
Acute exposure: Inhalation of overexposure may cause metal fume fever characterised by fever and chills (flu like symptoms) appears to 6 hours after exposure with no know long term effects.
Chronic exposure: Chronic inhalation of alloy fume may cause a benign pneumonconconiosis (siderosis)

with few or no symptoms. Chronic inhalation of fumes may affect the digestive system, nervous system, respiratory system, muscles and joints.
Sensitisation to product: **Unknown** Synergistic materials: **Unknown** Reproductive effects: **No known effect**
Teratogenicity: **No known effect** Mutagenicity: **No known effect**
Carcinogenicity of material: IARC lists Hexavalent Chromium compounds under its group 1 category. Confirmed Human Carcinogen
Note: welding fume may also contain
contaminants from fluxes or welding consumables.

Section 7 **Preventive Measures**

Personal Protective Equipment: Dependent upon process being performed on material.
Each operation must be addressed for suitable equipment and or engineering controls.
Gloves: Leather faced/ cut protection Eyes: Safety glasses or face shield as appropriate
Footwear: Safety shoes/ boots where required Other: Barrier cream may be used when handling
Respiratory: Approved respiratory protection where applicable.
Engineering Controls (eg. Ventilation, enclosures):General or local exhaust ventilation during welding.
Leak and spill procedures: N/a
Water disposal: N/a
Storage Requirements: Keep stored material dry to prevent corrosion.
Special Shipping Information: N/a

Section 8 **First-Aid Measures**

Skin: Wash affected area with soap and water. Seek medical attention if irritation persists.
Eye: For irritation from any coating material flush eyes with plenty of water.
Seek medical attention if irritation persists.
Inhalation: For overexposure to alloy fumes remove to fresh air.
Seek medical attention for adverse symtons
Ingestion: N/a

Section 9 **Preparation Date of MSDS**

Prepared by	Samuel, Son & Co. Ltd.
Phone Number	1-800-267-2683
Date	January 2012

The information contained is based on the data considered accurate, however, no warranty is expressed or implied regarding the accuracy of these data or the results obtained from the use thereof.