



Section 1: Identification of the Substance/Mixture and of the Company/Undertaking

1.1 Product identifier

Product Name • **Iron-base Alloy and Castings**

1.2 Current & Past Alloy in this Category:

(Alloys are listed by product code, Please contact your Cannon Sales Representative if you have questions regarding your particular material.)

15 5	347	Duplex Stainless
15 5	410	Invar
17 4	420	J190
17 4	431	Jethete M190
303	436	Low Alloy Steels
304	440A,B,C	LW AL
304V	718	N155
309	2205	N155
310	A286	Tool Steels
316	CA6NM	X5
	CD4MCU	

1.3 Relevant identified uses of the substance or mixture and uses advised against

- Relevant Identified use(s)
- Investment casting

1.4 Details of the supplier of the safety data sheet

Manufacturer • Cannon-Muskegon Corporation
 2875 Lincoln St.
 Muskegon, MI 49441-3313
 United States
 Tel: (+1) 231 759 2820
 Fax: (+1) 231 759 4975

1.5 Emergency telephone number • 800-424-9300 - CHEMTREC

Section 2: Hazards Identification

EU/EEC

According to: Regulation (EC) No 1272/2008 (CLP)/REACH 1907/2006 [amended by 453/2010]

According to: EU Directive 67/548/EEC (DSD) or 1999/45/EC (DPD)

REACH Registration Reference #:

Aluminium	01-2119529243-45-0259
Chromium	01-2119485652-31-0076
Cobalt	01-2119517392-44-0035
Copper	01-2119480154-42-0157
Hafnium	01-2119967822-27-0002
Iron	01-2119462838-24-0343
Manganese	01-2119449803-34-0166
Molybdenum	01-2119472304-43-0064
Nickel	01-2119438727-29-0102
Niobium	01-2119489003-42-0033
Rhenium	01-2120006550-73-0002

Silicon	01-2119480401-47-0219
Tantalum	01-2119974241-40-0007
Titanium	01-2119484878-14-0080
Tungsten	01-2119488910-30-0041

2.1 Classification of the substance or mixture

- CLP**
- Products do not present an inhalation, ingestion or skin contact health hazard under normal handling and use as it is in a metallic form. However, processes such as welding, grinding, burning, melting, or otherwise generating dust, fumes and gases may present a health hazard.
 - Acute Toxicity Oral 4 - H302
 - Skin Sensitization 1 - H317
 - Specific Target Organ Toxicity Single Exposure 3: Respiratory Tract Irritation - H335
 - Carcinogenicity 2 - H351
 - Specific Target Organ Toxicity Repeated Exposure 1 - H372
 - Specific Target Organ Toxicity Repeated Exposure 2 - H373
 - Hazardous to the aquatic environment Chronic 4 - H413
- DSD/DPD**
- Toxic (T)
 - Irritant (Xi)
 - Harmful (Xn)
 - Carcinogenic Substances - Category 3
 - R22, R37, R40, R43, R48/23, R53

2.2 Label Elements

CLP

DANGER



- Hazard statements**
- H302 - Harmful if swallowed
 - H317 - May cause an allergic skin reaction
 - H335 - May cause respiratory irritation
 - H351 - Suspected of causing cancer.
 - H372 - Causes damage to organs through prolonged or repeated exposure.
 - H373 - May cause damage to organs through prolonged or repeated exposure.
 - H413 - May cause long lasting harmful effects to aquatic life

Precautionary statements

- Prevention**
- P201 - Obtain special instructions before use.
 - P202 - Do not handle until all safety precautions have been read and understood.
 - P260 - Do not breathe dust.
 - P264 - Wash thoroughly after handling.
 - P270 - Do not eat, drink or smoke when using this product.
 - P271 - Use only outdoors or in a well-ventilated area.
 - P272 - Contaminated work clothing should not be allowed out of the workplace.
 - P273 - Avoid release to the environment.
 - P281 - Use personal protective equipment as required.
- Response**
- P304+P340 - IF INHALED: Remove victim to fresh air and keep at rest in a position comfortable for breathing.
 - P312 - Call a POISON CENTER or doctor/physician if you feel unwell.
 - P302+P352 - IF ON SKIN: Wash with plenty of soap and water.
 - P363 - Wash contaminated clothing before reuse.
 - P321 - Specific treatment, see supplemental first aid information.
 - P333+P313 - If skin irritation or rash occurs: Get medical advice/attention.
 - P301+P312 - IF SWALLOWED: Immediately call a POISON CENTER or doctor/physician if you feel unwell.

P330 - Rinse mouth.

P308+P313 - IF exposed or concerned: Get medical advice/attention.

Storage/Disposal • P403+P233 - Store in a well-ventilated place. Keep container tightly closed.
P501 - Dispose of content and/or container in accordance with local, regional, national, and/or international regulations.

Supplemental information • 34-48 percent of this product consists of an ingredient of unknown toxicity.

DSD/DPD



Risk phrases • R22 - Harmful if swallowed.
R37 - Irritating to respiratory system.
R40 - Limited evidence of a carcinogenic effect.
R43 - May cause sensitization by skin contact.
R48/23 - Toxic: danger of serious damage to health by prolonged exposure through inhalation.
R53 - May cause long-term adverse effects in the aquatic environment.

Safety phrases • S24 - Avoid contact with skin.
S36 - Wear suitable protective clothing.
S37 - Wear suitable gloves.
S45 - In case of accident or if you feel unwell, seek medical advice immediately (show the label where possible).
S53 - Avoid exposure - obtain special instructions before use.

2.3 Other Hazards

CLP • According to Regulation (EC) No. 1272/2008 (CLP) this material is considered hazardous.

DSD/DPD • According to European Directive 1999/45/EC this material is considered dangerous.

United States (US)

According to: OSHA 29 CFR 1910.1200 HCS

2.1 Classification of the substance or mixture

OSHA HCS 2012

- Acute Toxicity Oral 4
- Skin Sensitization 1A
- Respiratory Sensitization 1B
- Specific Target Organ Toxicity Single Exposure 3: Respiratory Tract Irritation
- Carcinogenicity 2
- Reproductive Toxicity 2
- Specific Target Organ Toxicity Repeated Exposure 1
- Specific Target Organ Toxicity Repeated Exposure 2

2.2 Label elements

OSHA HCS 2012

DANGER



Hazard statements • Harmful if swallowed
May cause an allergic skin reaction
May cause allergy or asthma symptoms or breathing difficulties if inhaled
May cause respiratory irritation
Suspected of causing cancer.
Suspected of damaging fertility or the unborn child.

Causes damage to organs through prolonged or repeated exposure.
 May cause damage to organs through prolonged or repeated exposure.

Precautionary statements

- Prevention** • Obtain special instructions before use.
 Do not handle until all safety precautions have been read and understood.
 Do not breathe dust.
 Wash thoroughly after handling.
 Do not eat, drink or smoke when using this product.
 Use only outdoors or in a well-ventilated area.
 Contaminated work clothing should not be allowed out of the workplace.
 Wear protective gloves, clothing, and eye/face protection,
 In case of inadequate ventilation wear respiratory protection.
- Response** • IF INHALED: If breathing is difficult, remove victim to fresh air and keep at rest in a position comfortable for breathing.
 If experiencing respiratory symptoms: Call a POISON CENTER or doctor/physician.
 If on skin: Wash with plenty of water.
 Wash contaminated clothing before reuse.
 Specific treatment, see supplemental first aid information.
 If skin irritation or rash occurs: Get medical advice/attention.
 IF SWALLOWED: Immediately call a POISON CENTER or doctor/physician if you feel unwell.
 Rinse mouth.
 IF exposed or concerned: Get medical advice/attention.

- Storage/Disposal** • Store in a well-ventilated place. Keep container tightly closed.
 Dispose of content and/or container in accordance with local, regional, national, and/or international regulations.

- Supplemental information** • 34-48 percent of this product consists of an ingredient of unknown toxicity.

2.3 Other hazards

- OSHA HCS 2012** • Under United States Regulations (29 CFR 1910.1200 - Hazard Communication Standard), this product is considered hazardous.

Section 3 - Composition/Information on Ingredients

3.1 Substances

- Material does not meet the criteria of a substance.

3.2 Mixtures

Composition					
Chemical Name	Identifiers	%	LD50/LC50	Classifications According to Regulation/Directive	Comments
Iron	CAS:7439-89-6 EC Number:231-096-4	46% TO 66%	Ingestion/Oral-Rat LD50 • 750 mg/kg	EU DSD/DPD: Xn; R22; R53 EU CLP: Acute Tox. 4, H302; Aquatic Chronic 4, H413 OSHA HCS 2012: Acute Tox. 4 (orl)	NDA
Chromium	CAS:7440-47-3 EC Number:231-157-5	15% TO 26%	NDA	EU DSD/DPD: Xi, R37 EU CLP: STOT SE 3: Resp. Irrit., H335 OSHA HCS 2012: STOT SE 3: Resp. Irrit.	NDA
Nickel	CAS:7440-02-0 EC Number:231-111-4	19% TO 22%	NDA	EU DSD/DPD: T, R48/23; Xi; R43; Carc. Cat. 3, Xn, R40; R52/53 EU CLP: Skin Sens. 1, H317; Carc. 2, H351 (Inhl); STOT RE 1, H372 (Lungs; Orl, Dermal, Inhl); Aquatic Chronic 3, H412 OSHA HCS 2012: Flam. Sol. 1; Comb. Dust; Resp.	NDA

				Sens. 1B; Skin Sens. 1A; Carc. 2 (Inhl); STOT RE 2 (Lungs, Oral, Inhl)	
Molybdenum	CAS:7439-98-7 EC Number:231-107-2	0% TO 4%	NDA	EU DSD/DPD: Xi, R36/37/38 EU CLP: Skin Irrit. 2, H319; Eye Irrit. 2, H315; STOT SE 3: Resp. Irrit., H335 OSHA HCS 2012: Skin Irrit. 2; Eye Irrit. 2; STOT SE 3: Resp. Irrit.	NDA
Manganese	CAS:7439-96-5 EC Number:231-105-1	0% TO 2%	Ingestion/Oral-Rat LD50 • 9 g/kg	EU DSD/DPD: T, R48/23; Repr. Cat. 3, R63 EU CLP: STOT RE 1 (CNS), H372; Repr. 2, H361 OSHA HCS 2012: Eye Irrit. 2; Repr. 2; STOT RE 1 (CNS)	NDA

See Section 16 for full text of H-statements and R-phrases.

Section 4 - First Aid Measures

4.1 Description of first aid measures

- Inhalation** • Move victim to fresh air. Give artificial respiration if victim is not breathing. Administer oxygen if breathing is difficult. If signs/symptoms continue, get medical attention.
- Skin** • In case of contact with substance, immediately flush skin with running water for at least 20 minutes. If skin irritation occurs: Get medical advice/attention.
- Eye** • In case of contact with substance, immediately flush eyes with running water for at least 20 minutes. If eye irritation persists: Get medical advice/attention.
- Ingestion** • Rinse mouth. Do not give anything by mouth to an unconscious person. Get medical attention if symptoms occur.

4.2 Most important symptoms and effects, both acute and delayed

- Refer to Section 11 - Toxicological Information.

4.3 Indication of any immediate medical attention and special treatment needed

- Notes to Physician** • All treatments should be based on observed signs and symptoms of distress in the patient. Consideration should be given to the possibility that overexposure to materials other than this product may have occurred.

Section 5 - Firefighting Measures

5.1 Extinguishing media

- Suitable Extinguishing Media** • Use special mixtures of dry chemical, or sand.

- Unsuitable Extinguishing Media** • Do not use water.

5.2 Special hazards arising from the substance or mixture

- Unusual Fire and Explosion Hazards** • Solid, massive form of material is not combustible. Fire and explosion hazards are moderate when material is in the form of dust and exposed to heat or flames, or by chemical reaction.

- Hazardous Combustion Products** • No data available

5.3 Advice for firefighters

- Wear positive pressure self-contained breathing apparatus (SCBA). Structural firefighters' protective clothing will only provide limited protection.

Section 6 - Accidental Release Measures

6.1 Personal precautions, protective equipment and emergency procedures

Personal Precautions • Special precautions are not necessary for solid castings. If large quantities of dust are spilled: Ventilate enclosed areas. Wear appropriate personal protective equipment, avoid direct contact. Do not touch damaged containers or spilled material unless wearing appropriate protective clothing.

Emergency Procedures • Use normal clean up procedures.

6.2 Environmental precautions

- Prevent entry into waterways, sewers, basements or confined areas.

6.3 Methods and material for containment and cleaning up

Containment/Clean-up Measures • Carefully shovel or sweep up spilled material and place in suitable container. Residues should be evaluated for metal leachability and consignable waste standards. Do not use compressed air for cleanup.

6.4 Reference to other sections

- Refer to Section 8 - Exposure Controls/Personal Protection and Section 13 - Disposal Considerations.

Section 7 - Handling and Storage

7.1 Precautions for safe handling

Handling • Use only with adequate ventilation. Minimize dust generation and accumulation. Routine housekeeping should be instituted to ensure that dusts do not accumulate on surfaces. Wear appropriate personal protective equipment, avoid direct contact. Do not breathe dust or fumes. Avoid contact with skin, eyes or clothing. Wash thoroughly with soap and water after handling and before eating, drinking, or using tobacco.

7.2 Conditions for safe storage, including any incompatibilities

Storage • Store in a cool, dry place. Keep away from incompatible materials.

7.3 Specific end use(s)

- Refer to Section 1.2 - Relevant identified uses.

Section 8 - Exposure Controls/Personal Protection

8.1 Control parameters

	Exposure Limits/Guidelines					
	Result	ACGIH	Europe	France	Germany DFG	Germany TRGS
Manganese (7439-96-5)	TWAs	0.02 mg/m ³ TWA (respirable fraction); 0.1 mg/m ³ TWA (inhalable fraction)	Not established	1 mg/m ³ TWA [VME] (fume, as Mn)	Not established	0.5 mg/m ³ TWA AGW (The risk of damage to the embryo or fetus can be excluded when AGW and BGW values are observed, inhalable fraction)
	Ceilings	Not established	Not established	Not established	1.6 mg/m ³ Peak (Ceiling factor 1 for Permanganates, inhalable fraction); 0.16 mg/m ³ Peak (Ceiling factor 1 for Permanganates, respirable fraction)	Not established
	MAKs	Not established	Not established	Not established	0.2 mg/m ³ TWA MAK (inhalable fraction); 0.02 mg/m ³ TWA MAK (respirable fraction)	Not established
Molybdenum (7439-98-7)	TWAs	10 mg/m ³ TWA (inhalable fraction); 3	Not established	Not established	Not established	Not established

		mg/m3 TWA (respirable fraction)				
Chromium (7440-47-3)	TWAs	0.5 mg/m3 TWA	2 mg/m3 TWA	2 mg/m3 TWA [VME] (indicative limit)	Not established	2 mg/m3 TWA AGW (inhalable fraction, exposure factor 1)
Nickel (7440-02-0)	TWAs	1.5 mg/m3 TWA (inhalable fraction)	Not established	1 mg/m3 TWA [VME]; 1 mg/m3 TWA [VME] (metal gratings)	Not established	Not established
Exposure Limits/Guidelines (Con't.)						
	Result	Italy	Mexico	NIOSH	OSHA	United Kingdom
Manganese (7439-96-5)	STELs	Not established	3 mg/m3 STEL [LMPE-CT] (fume, as Mn)	3 mg/m3 STEL	Not established	1.5 mg/m3 STEL (calculated)
	TWAs	Not established	0.2 mg/m3 TWA LMPE-PPT; 1 mg/m3 TWA LMPE-PPT (fume, as Mn)	1 mg/m3 TWA (fume)	Not established	0.5 mg/m3 TWA (as Mn)
	Ceilings	Not established	Not established	Not established	5 mg/m3 Ceiling (fume)	Not established
Chromium (7440-47-3)	TWAs	0.5 mg/m3 TWA	0.5 mg/m3 TWA LMPE-PPT	0.5 mg/m3 TWA	1 mg/m3 TWA	0.5 mg/m3 TWA
	STELs	Not established	Not established	Not established	Not established	1.5 mg/m3 STEL (calculated)
Nickel (7440-02-0)	TWAs	Not established	1 mg/m3 TWA LMPE-PPT	0.015 mg/m3 TWA	1 mg/m3 TWA	0.5 mg/m3 TWA
	STELs	Not established	Not established	Not established	Not established	1.5 mg/m3 STEL (calculated)

Exposure Control Notations

United Kingdom

•Nickel (7440-02-0): **Skin:** (Potential for cutaneous absorption)

France

•Nickel (7440-02-0): **Carcinogens:** (Carcinogen category 2)

ACGIH

•Nickel (7440-02-0): **Carcinogens:** (A5 - Not Suspected as a Human Carcinogen)

•Manganese (7439-96-5): **Carcinogens:** (A4 - Not Classifiable as a Human Carcinogen)

•Chromium (7440-47-3): **Carcinogens:** (A4 - Not Classifiable as a Human Carcinogen)

Germany DFG

•Nickel (7440-02-0): **Carcinogens:** (Category 1 (causes cancer in man)) | **Sensitizers:** (respiratory and skin sensitizer (inhalable fraction, respiratory sensitization confirmed for water soluble Nickel compounds only))

•Manganese (7439-96-5): **Pregnancy:** (no risk to embryo/fetus if exposure limits adhered to (inhalable fraction, respirable fraction))

Exposure Limits Supplemental

ACGIH

•Nickel (7440-02-0): **TLV Basis - Critical Effects:** (dermatitis; pneumoconiosis)

•Manganese (7439-96-5): **TLV Basis - Critical Effects:** (CNS impairment)

•Chromium (7440-47-3): **TLV Basis - Critical Effects:** (skin and upper respiratory tract irritation)

8.2 Exposure controls

Engineering

Measures/Controls

- Good general ventilation should be used. Ventilation rates should be matched to conditions. If applicable, use process enclosures, local exhaust ventilation, or other engineering controls to maintain airborne levels below recommended exposure limits. If exposure limits have not been established, maintain airborne levels to an acceptable level. Ensure that dust handling systems (such as exhaust ducts, dust collectors, vessels and processing equipment) are designed in a manner to prevent the escape of dust into the work area (i.e., there is not leakage from the equipment).

Personal Protective Equipment

Respiratory

- For limited exposure use an N95 dust mask. For prolonged exposure use an air-purifying respirator with high efficiency particulate air (HEPA) filters. Follow the OSHA respirator regulations found in 29 CFR 1910.134 or European Standard EN 149. Use a NIOSH/MSHA or European Standard EN 149 approved respirator if exposure limits are exceeded or symptoms are experienced.

- Eye/Face** • Wear safety goggles.
- Hands** • Wear appropriate gloves.
- Skin/Body** • Wear long sleeves and/or protective coveralls.
- Environmental Exposure Controls** • Follow best practice for site management and disposal of waste.

Key to abbreviations

- ACGIH = American Conference of Governmental Industrial Hygiene
- OSHA = Occupational Safety and Health Administration
- BEI = Biological Exposure Indices
- STEL = Short Term Exposure Limits are based on 15-minute exposures
- MAK = Maximale Arbeitsplatz Konzentration is the maximum permissible concentration
- TLV = Threshold Limit Value determined by the American Conference of Governmental Industrial Hygienists (ACGIH)
- NIOSH = National Institute of Occupational Safety and Health
- TWA = Time-Weighted Averages are based on 8h/day, 40h/week exposures

Section 9 - Physical and Chemical Properties

9.1 Information on Physical and Chemical Properties

Material Description			
Physical Form	Solid	Appearance/Description	Solid metal alloy.
Color	Data lacking	Odor	Data lacking
Odor Threshold	Data lacking		
General Properties			
Boiling Point	2800 C(5072 F) (for nickel, alloys lower)	Melting Point/Freezing Point	1452 C(2645.6 F)
Decomposition Temperature	Data lacking	pH	Data lacking
Specific Gravity/Relative Density	7.7 to 9.2 Water=1	Water Solubility	Negligible < 0.1 %
Viscosity	Data lacking	Explosive Properties	Data lacking
Oxidizing Properties:	Data lacking		
Volatility			
Vapor Pressure	Data lacking	Vapor Density	Data lacking
Evaporation Rate	Data lacking		
Flammability			
Flash Point	Data lacking	UEL	Data lacking
LEL	Data lacking	Autoignition	Data lacking
Flammability (solid, gas)	Data lacking		
Environmental			
Octanol/Water Partition coefficient	Data lacking		

9.2 Other Information

- No additional physical and chemical parameters noted.

Section 10: Stability and Reactivity

10.1 Reactivity

- Molten metal reacts violently with water. Store away from oxidizers, can react violently.

10.2 Chemical stability

- Stable under normal temperatures and pressures.

10.3 Possibility of hazardous reactions

- Hazardous polymerization will not occur.

10.4 Conditions to avoid

- Avoid generating dust.

10.5 Incompatible materials

- Material may be incompatible with acids, bases, and oxidizers.

10.6 Hazardous decomposition products

- No data available

Section 11 - Toxicological Information

11.1 Information on toxicological effects

Components		
Nickel (19% TO 22%)	7440-02-0	Acute Toxicity: Ingestion/Oral-Rat TDLo • 200 mg/kg; <i>Nutritional and Gross Metabolic:Gross Metabolite Changes:Weight loss or decreased weight gain; Behavioral:Somnolence (general depressed activity);</i> Multi-dose Toxicity: Ingestion/Oral-Mouse TDLo • 500 mg/kg 5 Day(s)-Intermittent; <i>Lungs, Thorax, or Respiration:Fibrosis, focal (pneumoconiosis); Related to Chronic Data:Death in the Other Multiple Dose data type field;</i> Inhalation-Rabbit TClO • 1 mg/m ³ 6 Hour(s) 13 Week(s)-Intermittent; <i>Lungs, Thorax, or Respiration:Other changes; Lungs, Thorax, or Respiration:Changes in lung weight;</i> <i>Blood:Hemorrhage;</i> Inhalation-Rat TClO • 0.4 mg/m ³ 40 Week(s)-Intermittent; <i>Vascular:Thrombosis distant from injection site; Lungs, Thorax, or Respiration:Other changes; Related to Chronic Data:Death in the Other Multiple Dose data type field;</i> Reproductive: Ingestion/Oral-Rat TDLo • 158 mg/kg (multigenerations); <i>Reproductive Effects:Effects on Embryo or Fetus:Fetotoxicity (except death, e.g., stunted fetus); Reproductive Effects:Effects on Embryo or Fetus:Fetal death;</i> Tumorigen / Carcinogen: Inhalation-Guinea Pig TClO • 15 mg/m ³ 91 Week(s)-Intermittent; <i>Tumorigenic:Equivocal tumorigenic agent by RTECS criteria; Lungs, Thorax, or Respiration:Tumors; Lungs, Thorax, or Respiration:Bronchiogenic carcinoma</i>
Manganese (0% TO 2%)	7439-96-5	Acute Toxicity: Ingestion/Oral-Rat LD50 • 9 g/kg; Irritation: Eye-Rabbit • 500 mg 24 Hour(s) • Mild irritation; Skin-Rabbit • 500 mg 24 Hour(s) • Mild irritation; Reproductive: Ingestion/Oral-Rat TDLo • 90 mg/kg (18D post); <i>Reproductive Effects:Effects on Newborn:Growth statistics (e.g., reduced weight gain); Reproductive Effects:Effects on Newborn:Biochemical and metabolic; Reproductive Effects:Effects on Newborn:Other postnatal measures or effects</i>
Molybdenum (0% TO 4%)	7439-98-7	Reproductive: Ingestion/Oral-Rat TDLo • 5800 µg/kg (30W pre/1-20D preg); <i>Reproductive Effects:Specific Developmental Abnormalities:Musculoskeletal system</i>
Iron (46% TO 66%)	7439-89-6	Acute Toxicity: Ingestion/Oral-Rat LD50 • 750 mg/kg; <i>Blood:Changes in serum composition (e.g., TP, bilirubin cholesterol); Biochemical:Enzyme inhibition, induction, or change in blood or tissue levels:Transaminases;</i> Ingestion/Oral-Child TDLo • 77 mg/kg; <i>Behavioral:Irritability; Gastrointestinal:Nausea or vomiting; Blood:Normocytic anemia;</i> Multi-dose Toxicity: Ingestion/Oral-Rat TDLo • 105 mg/kg 5 Week(s)-Continuous; <i>Liver:Tumors;</i> <i>Tumorigenic:Active as anti-cancer agent; Tumorigenic:Protects against induction of experimental tumors</i>

GHS Properties	Classification
Respiratory sensitization	EU/CLP•Data lacking OSHA HCS 2012•Respiratory Sensitizer 1B
Serious eye damage/Irritation	EU/CLP•Data lacking OSHA HCS 2012•Data lacking
Acute toxicity	EU/CLP•Acute Toxicity - Oral 4 - ATEmix (oral) = 750 mg/kg OSHA HCS 2012•Acute Toxicity - Oral 4 - ATEmix (oral) = 750 mg/kg
Aspiration Hazard	EU/CLP•Data lacking OSHA HCS 2012•Data lacking
Carcinogenicity	EU/CLP•Carcinogenicity 2 OSHA HCS 2012•Carcinogenicity 2
Skin corrosion/Irritation	EU/CLP•Data lacking OSHA HCS 2012•Data lacking
Skin sensitization	EU/CLP•Skin Sensitizer 1 OSHA HCS 2012•Skin Sensitizer 1A
STOT-RE	EU/CLP•Specific Target Organ Toxicity Repeated Exposure 1; Specific Target Organ Toxicity Repeated Exposure 2 OSHA HCS 2012•Specific Target Organ Toxicity Repeated Exposure 1; Specific Target Organ Toxicity Repeated Exposure 2

STOT-SE	EU/CLP •Specific Target Organ Toxicity Single Exposure 3: Respiratory Tract Irritation OSHA HCS 2012 •Specific Target Organ Toxicity Single Exposure 3: Respiratory Tract Irritation
Toxicity for Reproduction	EU/CLP •Data lacking OSHA HCS 2012 •Toxic to Reproduction 2
Germ Cell Mutagenicity	EU/CLP •Data lacking OSHA HCS 2012 •Data lacking

Potential Health Effects

Inhalation

Acute (Immediate)

- May cause respiratory irritation. Processes such as cutting, grinding, crushing, or impact may result in generation of excessive amounts of airborne dusts in the workplace. Nuisance dust may affect the lungs but reactions are typically reversible.

Chronic (Delayed)

- May cause allergy or asthma symptoms or breathing difficulties if inhaled. Extended exposure to excessive concentrations of metal fumes and dusts can be associated with permanent changes in the lung function and pulmonary diseases.

Skin

Acute (Immediate)

- Exposure to dust may cause mechanical irritation. May cause skin sensitization. Symptoms include redness, and skin rash.

Chronic (Delayed)

- No data available.

Eye

Acute (Immediate)

- Exposure to dust may cause mechanical irritation. Excessive concentrations of nuisance dust in the workplace may reduce visibility and may cause unpleasant deposits in eyes.

Chronic (Delayed)

- No data available.

Ingestion

Acute (Immediate)

- Harmful if swallowed. Excessive concentrations of nuisance dust in the workplace may cause mechanical irritation to mucous membranes.

Chronic (Delayed)

- No data available

Other

Chronic (Delayed)

- Prolonged or repeated exposure to manganese can cause Manganism (Parkinson like disease).

Carcinogenic Effects

- Repeated and prolonged exposure may cause cancer.

Carcinogenic Effects			
	CAS	IARC	NTP
Nickel	7440-02-0	Group 2B-Possible Carcinogen	Reasonably Anticipated to be Human Carcinogen

Reproductive Effects • Repeated and prolonged exposure may cause reproductive effects.

Key to abbreviations

LD = Lethal Dose

TC = Toxic Concentration

TD = Toxic Dose

Section 12 - Ecological Information

12.1 Toxicity

Iron-base Alloy and Castings					
Dosage	Species	Duration	Results	Exposure Conditions	Comments

0.06 mg/L	Fish: Oncorhynchus mykiss (Rainbow Trout)	96 Hour(s)	LC50	NDA	Nickel (7440-02-0)
0.233 mg/L	Aquatic Plant(s): Pseudokirchneriella subcapitata (Green Algae)	96 Hour(s)	EC50	NDA	Nickel (7440-02-0)
0.0035 µg/L	Fish: Cyprinus carpio (Common Carp)	28 Day(s)	NOEC	NDA	Nickel (7440-02-0)
0.231 mg/L	Crustacea: Americamysis bahia (Opossum Shrimp)	7 Day(s)	NOEC	NDA	Nickel (7440-02-0)
0.00648 mg/L	Fish: Mudskipper(Periophthalmus waltoni)	96 Hour(s)	LC50	NDA	Iron (7439-89-6)
0.305 mg/L	Fish: Brown Trout (Salmo trutta)	7 Day(s)	NOEC	NDA	Iron (7439-89-6)
0.5 mg/L	Crustacea: Aquatic Sowbug, Isopod(Idotea balthica)	7 Day(s)	NOEC	NDA	Iron (7439-89-6)

- May cause long lasting harmful effects to aquatic life.

12.2 Persistence and degradability

- Material Data Lacking.

12.3 Bioaccumulative potential

- Material Data Lacking.

12.4 Mobility in Soil

- Material Data Lacking.

12.5 Results of PBT and vPvB assessment

- No PBT and vPvB assessment has been conducted.

12.6 Other adverse effects

- Metal castings do not present any ecological danger to the environment. The by-products formed through processing metal castings may cause adverse effects in the environment if released directly to the environment. Heavy metals may be present and can enter into biological pathways.

Section 13 - Disposal Considerations

13.1 Waste treatment methods

Product waste • Dispose of content and/or container in accordance with local, regional, national, and/or international regulations.

Packaging waste • Dispose of content and/or container in accordance with local, regional, national, and/or international regulations.

Section 14 - Transport Information

	14.1 UN number	14.2 UN proper shipping name	14.3 Transport hazard class(es)	14.4 Packing group	14.5 Environmental hazards
DOT	NDA	Not Regulated	NDA	NDA	NDA
IMO/IMDG	NDA	Not Regulated	NDA	NDA	NDA
IATA/ICAO	NDA	Not Regulated	NDA	NDA	NDA

14.6 Special precautions for user

- None specified.

14.7 Transport in bulk according to Annex II of MARPOL 73/78 and the IBC Code

- Data lacking.

Section 15 - Regulatory Information

15.1 Safety, health and environmental regulations/legislation specific for the substance or mixture

SARA Hazard Classifications

• Acute, Chronic

State Right To Know				
Component	CAS	MA	NJ	PA
Chromium	7440-47-3	Yes	Yes	Yes
Iron	7439-89-6	No	No	No
Manganese	7439-96-5	Yes	Yes	Yes
Molybdenum	7439-98-7	Yes	Yes	Yes
Nickel	7440-02-0	Yes	Yes	Yes

Inventory				
Component	CAS	EU EINECS	EU ELNICS	TSCA
Chromium	7440-47-3	Yes	No	Yes
Iron	7439-89-6	Yes	No	Yes
Manganese	7439-96-5	Yes	No	Yes
Molybdenum	7439-98-7	Yes	No	Yes
Nickel	7440-02-0	Yes	No	Yes

Europe

Other

EU - CLP (1272/2008) - Annex VI - Table 3.2 - Classification

•Chromium	7440-47-3	Not Listed
•Manganese	7439-96-5	Not Listed
•Molybdenum	7439-98-7	Not Listed
•Nickel	7440-02-0	Carc.Cat.3; R40 R43 T; R48/23
•Iron	7439-89-6	Not Listed

EU - CLP (1272/2008) - Annex VI - Table 3.2 - Concentration Limits

•Chromium	7440-47-3	Not Listed
•Manganese	7439-96-5	Not Listed
•Molybdenum	7439-98-7	Not Listed
•Nickel	7440-02-0	Not Listed
•Iron	7439-89-6	Not Listed

EU - CLP (1272/2008) - Annex VI - Table 3.2 - Labelling

•Chromium	7440-47-3	Not Listed
•Manganese	7439-96-5	Not Listed
•Molybdenum	7439-98-7	Not Listed
•Nickel	7440-02-0	T R:40-43-48/23 S:(2)-36/37/39-45
•Iron	7439-89-6	Not Listed

EU - CLP (1272/2008) - Annex VI - Table 3.2 - Notes - Substances and Preparations

•Chromium	7440-47-3	Not Listed
•Manganese	7439-96-5	Not Listed
•Molybdenum	7439-98-7	Not Listed
•Nickel	7440-02-0	S, 7
•Iron	7439-89-6	Not Listed

EU - CLP (1272/2008) - Annex VI - Table 3.2 - Safety Phrases

•Chromium	7440-47-3	Not Listed
•Manganese	7439-96-5	Not Listed
•Molybdenum	7439-98-7	Not Listed
•Nickel	7440-02-0	S:(2)-36/37/39-45
•Iron	7439-89-6	Not Listed

United States

Labor

U.S. - OSHA - Process Safety Management - Highly Hazardous Chemicals

•Chromium	7440-47-3	Not Listed
•Manganese	7439-96-5	Not Listed
•Molybdenum	7439-98-7	Not Listed
•Nickel	7440-02-0	Not Listed
•Iron	7439-89-6	Not Listed

U.S. - OSHA - Specifically Regulated Chemicals

•Chromium	7440-47-3	Not Listed
•Manganese	7439-96-5	Not Listed
•Molybdenum	7439-98-7	Not Listed
•Nickel	7440-02-0	Not Listed
•Iron	7439-89-6	Not Listed

Environment**U.S. - CAA (Clean Air Act) - 1990 Hazardous Air Pollutants**

•Chromium	7440-47-3	Not Listed
•Manganese	7439-96-5	Not Listed
•Molybdenum	7439-98-7	Not Listed
•Nickel	7440-02-0	Not Listed
•Iron	7439-89-6	Not Listed

U.S. - CERCLA/SARA - Hazardous Substances and their Reportable Quantities

•Chromium	7440-47-3	5000 lb final RQ (no reporting of releases of this hazardous substance is required if the diameter of the pieces of the solid metal released is >100 µm); 2270 kg final RQ (no reporting of releases of this hazardous substance is required if the diameter of the pieces of the solid metal released is >100 µm)
•Manganese	7439-96-5	Not Listed
•Molybdenum	7439-98-7	Not Listed
•Nickel	7440-02-0	100 lb final RQ (no reporting of releases of this hazardous substance is required if the diameter of the pieces of the solid metal released is >100 µm); 45.4 kg final RQ (no reporting of releases of this hazardous substance is required if the diameter of the pieces of the solid metal released is >100 µm)
•Iron	7439-89-6	Not Listed

U.S. - CERCLA/SARA - Radionuclides and Their Reportable Quantities

•Chromium	7440-47-3	Not Listed
•Manganese	7439-96-5	Not Listed
•Molybdenum	7439-98-7	Not Listed
•Nickel	7440-02-0	Not Listed
•Iron	7439-89-6	Not Listed

U.S. - CERCLA/SARA - Section 302 Extremely Hazardous Substances EPCRA RQs

•Chromium	7440-47-3	Not Listed
•Manganese	7439-96-5	Not Listed
•Molybdenum	7439-98-7	Not Listed
•Nickel	7440-02-0	Not Listed
•Iron	7439-89-6	Not Listed

U.S. - CERCLA/SARA - Section 302 Extremely Hazardous Substances TPQs

•Chromium	7440-47-3	Not Listed
•Manganese	7439-96-5	Not Listed
•Molybdenum	7439-98-7	Not Listed
•Nickel	7440-02-0	Not Listed
•Iron	7439-89-6	Not Listed

U.S. - CERCLA/SARA - Section 313 - Emission Reporting

•Chromium	7440-47-3	1.0 % de minimis concentration
•Manganese	7439-96-5	1.0 % de minimis concentration
•Molybdenum	7439-98-7	Not Listed
•Nickel	7440-02-0	0.1 % de minimis concentration

•Iron	7439-89-6	Not Listed
U.S. - CERCLA/SARA - Section 313 - PBT Chemical Listing		
•Chromium	7440-47-3	Not Listed
•Manganese	7439-96-5	Not Listed
•Molybdenum	7439-98-7	Not Listed
•Nickel	7440-02-0	Not Listed
•Iron	7439-89-6	Not Listed
U.S. - RCRA (Resource Conservation & Recovery Act) - Basis for Listing - Appendix VII		
•Chromium	7440-47-3	Included in waste streams: F032, F034, F035, F037, F038, F039
•Manganese	7439-96-5	Not Listed
•Molybdenum	7439-98-7	Not Listed
•Nickel	7440-02-0	Included in waste streams: F006, F039
•Iron	7439-89-6	Not Listed
U.S. - RCRA (Resource Conservation & Recovery Act) - Constituents for Detection Monitoring		
•Chromium	7440-47-3	(total)
•Manganese	7439-96-5	Not Listed
•Molybdenum	7439-98-7	Not Listed
•Nickel	7440-02-0	(total)
•Iron	7439-89-6	Not Listed
U.S. - RCRA (Resource Conservation & Recovery Act) - D Series Wastes - Max Conc of Contaminants for the Tox Characteristic		
•Chromium	7440-47-3	5.0 mg/L regulatory level
•Manganese	7439-96-5	Not Listed
•Molybdenum	7439-98-7	Not Listed
•Nickel	7440-02-0	Not Listed
•Iron	7439-89-6	Not Listed
U.S. - RCRA (Resource Conservation & Recovery Act) - Hazardous Constituents - Appendix VIII to 40 CFR 261		
•Chromium	7440-47-3	hazardous constituent - no waste number
•Manganese	7439-96-5	Not Listed
•Molybdenum	7439-98-7	Not Listed
•Nickel	7440-02-0	hazardous constituent - no waste number
•Iron	7439-89-6	Not Listed
U.S. - RCRA (Resource Conservation & Recovery Act) - List for Hazardous Constituents		
•Chromium	7440-47-3	(total)
•Manganese	7439-96-5	Not Listed
•Molybdenum	7439-98-7	Not Listed
•Nickel	7440-02-0	(total)
•Iron	7439-89-6	Not Listed
U.S. - RCRA (Resource Conservation & Recovery Act) - Phase 4 LDR Rule - Universal Treatment Standards		
•Chromium	7440-47-3	2.77 mg/L (total, wastewater); 0.60 mg/L TCLP (total, nonwastewater)
•Manganese	7439-96-5	Not Listed
•Molybdenum	7439-98-7	Not Listed
•Nickel	7440-02-0	3.98 mg/L (wastewater); 11.0 mg/L TCLP (nonwastewater)
•Iron	7439-89-6	Not Listed
U.S. - RCRA (Resource Conservation & Recovery Act) - TSD Facilities Ground Water Monitoring		
•Chromium	7440-47-3	(total)
•Manganese	7439-96-5	Not Listed
•Molybdenum	7439-98-7	Not Listed
•Nickel	7440-02-0	(total)
•Iron	7439-89-6	Not Listed

United States - California

Environment

U.S. - California - Proposition 65 - Carcinogens List

•Chromium	7440-47-3	Not Listed
•Manganese	7439-96-5	Not Listed

•Molybdenum	7439-98-7	Not Listed
•Nickel	7440-02-0	carcinogen, initial date 10/1/89 (metallic)
•Iron	7439-89-6	Not Listed
U.S. - California - Proposition 65 - Developmental Toxicity		
•Chromium	7440-47-3	Not Listed
•Manganese	7439-96-5	Not Listed
•Molybdenum	7439-98-7	Not Listed
•Nickel	7440-02-0	Not Listed
•Iron	7439-89-6	Not Listed
U.S. - California - Proposition 65 - Maximum Allowable Dose Levels (MADL)		
•Chromium	7440-47-3	Not Listed
•Manganese	7439-96-5	Not Listed
•Molybdenum	7439-98-7	Not Listed
•Nickel	7440-02-0	Not Listed
•Iron	7439-89-6	Not Listed
U.S. - California - Proposition 65 - No Significant Risk Levels (NSRL)		
•Chromium	7440-47-3	Not Listed
•Manganese	7439-96-5	Not Listed
•Molybdenum	7439-98-7	Not Listed
•Nickel	7440-02-0	Not Listed
•Iron	7439-89-6	Not Listed
U.S. - California - Proposition 65 - Reproductive Toxicity - Female		
•Chromium	7440-47-3	Not Listed
•Manganese	7439-96-5	Not Listed
•Molybdenum	7439-98-7	Not Listed
•Nickel	7440-02-0	Not Listed
•Iron	7439-89-6	Not Listed
U.S. - California - Proposition 65 - Reproductive Toxicity - Male		
•Chromium	7440-47-3	Not Listed
•Manganese	7439-96-5	Not Listed
•Molybdenum	7439-98-7	Not Listed
•Nickel	7440-02-0	Not Listed
•Iron	7439-89-6	Not Listed

United States - Pennsylvania

Labor

U.S. - Pennsylvania - RTK (Right to Know) - Environmental Hazard List

•Chromium	7440-47-3	
•Manganese	7439-96-5	
•Molybdenum	7439-98-7	Not Listed
•Nickel	7440-02-0	
•Iron	7439-89-6	Not Listed

U.S. - Pennsylvania - RTK (Right to Know) - Special Hazardous Substances

•Chromium	7440-47-3	
•Manganese	7439-96-5	Not Listed
•Molybdenum	7439-98-7	Not Listed
•Nickel	7440-02-0	
•Iron	7439-89-6	Not Listed

15.2 Chemical Safety Assessment

- No Chemical Safety Assessment has been carried out.

15.3 Other Information

- WARNING: This product contains a chemical known to the State of California to cause cancer.

Section 16 - Other Information

Relevant Phrases (code & full text)

- H315 - Causes skin irritation
- H319 - Causes serious eye irritation

H361 - Suspected of damaging fertility or the unborn child.

H412 - Harmful to aquatic life with long lasting effects

R36/37/38 - Irritating to eyes, respiratory system and skin.

R52/53 - Harmful to aquatic organisms, may cause long-term adverse effects in the aquatic environment.

R63 - Possible risk of harm to the unborn child.

Revision Date

- 28/August/2015

Preparation Date

- 01/January/1993

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Key to abbreviations

NDA = No Data Available
