

Product Maraging Steel  
 Revision Date 08/05/2016  
 Revision 1



## Safety Data Sheet (SDS)

### SECTION 1: IDENTIFICATION OF THE SUBSTANCE/PREPARATION AND OF THE COMPANY/UNDERTAKING

Product Name	Maraging Steel
Identifier Uses	Metal powder for additive layer manufacture.
Supplier	Renishaw plc Brooms Road Stone Business Park Stone, Staffordshire ST15 0SH United Kingdom Tel: +44 (0) 1785 285000 (during UK office hours 09:00 to 17:00 UTC).
Contact Person	msds@renishaw.com
Emergency Telephone	999 / 911 or local emergency number.

### SECTION 2: HAZARDS IDENTIFICATION

Appearance	Powder.
Color	Grey.
Odor	Odourless.

Pictogram(s)



Signal Word

Danger

Hazard Statements

H317 May cause an allergic skin reaction  
 H334 May cause allergy or asthma symptoms or breathing difficulties if inhaled.  
 H351 Suspected of causing cancer of the lungs/respiratory tract.  
 H372 Causes damage to organs (respiratory tract and lungs) through prolonged or repeated exposure by inhalation

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/fume/ gas/mist/vapours/spray.  
 P264 Wash hands thoroughly after handling.  
 P270 Do not eat, drink or smoke when using this product.  
 P272 Contaminated work clothing should not be allowed out of the workplace.  
 P280 Wear protective gloves/ protective clothing/eye protection/face protection.  
 P281 Use personal protective equipment as required.  
 P285 In case of inadequate ventilation wear respiratory protection.

Response  
 P302 + P352 IF ON SKIN: Wash with plenty of soap and water.  
 P304 + P341 IF INHALED: If breathing is difficult, remove victim to fresh air and keep at rest in a position comfortable for breathing.  
 P308 + P313 IF exposed or concerned: Get medical advice/ attention.  
 P314 Get medical advice/ attention if you feel unwell.

P333 + P313 If skin irritation or rash occurs: Get medical advice/attention.  
 P342 + P311 If experiencing respiratory symptoms: Call a POISON CENTRE or doctor/physician  
 P363 Wash contaminated clothing before reuse.  
 Storage  
 P405 Store locked up.

Contains	nickel cobalt
GHS Classification	
Physical and Chemical Hazards	Not classified
Human Health	Resp. Sens 1 - H334, Skin. Sens 1 - H317, Carc. 2 - H351, STOT RE 1 - H372
Environment	Not classified
OSHA Regulatory Status	This product is Hazardous under the OSHA Hazard communication Standard.
Inhalation	May cause allergy or asthma symptoms or breathing difficulties if inhaled.
Ingestion	No specific symptoms noted.
Skin Contact	Can cause mechanical irritation or allergic skin reaction.
Eye Contact	Dust can cause mechanical irritation.
Routes of Exposure	No information available.
Other Hazards	Dust clouds may be explosive. Dust can irritate the eyes. High dust levels may irritate the respiratory system.

### SECTION 3: COMPOSITION/INFORMATION ON INGREDIENTS

Name	Product Identifier	GHS Classification	%
iron	CAS-No.: 7439-89-6 EC No.: 231-096-4		60-100%
chromium	CAS-No.: 7440-47-3 EC No.: 231-157-5		10-30%
nickel	CAS-No.: 7440-02-0 EC No.: 231-111-4	Skin. Sens 1 - H317, Carc. 2 - H351, STOT RE 1 - H372	1-10%
cobalt	CAS-No.: 7440-48-4 EC No.: 231-158-0	Skin. Sens 1 - H317, Resp. Sens 1 - H334, Aquatic Chronic 4 - H413	1-10%

Composition Comments No information available.

### SECTION 4: FIRST AID MEASURES

#### Description of First Aid Measures

General Information	Provide general first aid, rest, warmth and fresh air. As a general rule, in case of doubt or if symptoms persist, always call a doctor. Seek medical attention for all burns and eye injuries, regardless how minor they may seem. First aid personnel must be aware of own risk during rescue.
Inhalation	If inhaled, remove to fresh air. Check for clear airway, breathing, and presence of pulse. If breathing is difficult, provide oxygen. Loosen any tight clothing on neck or chest. Provide cardiopulmonary resuscitation where pulse or respiration are absent. Get prompt medical attention. (Show the label where possible).
Ingestion	DO NOT induce vomiting! Rinse mouth thoroughly. Get medical attention if discomfort occurs. Never give anything by mouth to a person who is unconscious or is having convulsions.
Skin Contact	Remove contaminated clothing, shoes and jewelry and wash before reuse. Wash skin with soap and water for several minutes. Get medical attention if irritation develops or persists.
Eye Contact	Do not rub eye. Avoid contaminating unaffected eye. Remove contact lenses if present and easy to do so. Rinse with a gentle stream of water or saline for at least 15 minutes. Hold eye lids open. Get prompt medical attention.

#### Most Important Symptoms and Effects, Both Acute and Delayed

General Information	The severity of the symptoms described will vary dependent on the concentration and the length of exposure. Most important symptoms and effects, both acute and delayed: May cause allergic skin reaction. May cause allergy or asthma symptoms or breathing difficulties if inhaled. Causes damage to organs through prolonged or repeated exposure. Suspected of
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Inhalation	causing cancer.
Ingestion	May cause allergy or asthma symptoms or breathing difficulties if inhaled.
Skin Contact	No specific symptoms noted.
Eye Contact	Can cause mechanical irritation or allergic skin reaction.
Routes of Exposure	Dust can cause mechanical irritation.
	No information available.

**Most Important Symptoms and Effects, Both Acute and Delayed**

Notes To The Physician	Treat symptomatically.
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**SECTION 5: FIRE-FIGHTING MEASURES**

Auto Ignition Temperature (°C)	No information available.
Flammability Limit - Lower(%)	No information available.
Flammability Limit - Upper(%)	No information available.
Flash Point	No information available.
Extinguishing Media	Use ONLY Class D – Dry Powder - extinguishers with spin applicators for smother effect application. Use gentle surface application of Class D extinguishing agent or dry inert granular material (e.g., sand) to cover and ring the burning material. Use fire-extinguishing media appropriate for surrounding materials.
Hazardous Combustion Products	Decomposition of this product may yield metallic oxides.
Unusual Fire & Explosion Hazards	Dust clouds may be explosive. Dust accumulation on floor, ledges and beams can present a risk.
Special Fire Fighting Procedures	Gently smother burning material with dry sand or other inert substance, or special powder (Class D – Dry Powder) extinguishers with spin applicator. Gently cover and ring the burning material. Apply extinguishing media carefully to avoid creating airborne dust. Do not disturb the material until completely cool. If possible, fight fire from protected position. Keep up-wind to avoid fumes. Ventilate closed spaces before entering them. Avoid breathing fire vapours.
Protective Equipment for Firefighters	Fire-fighters should wear appropriate protective equipment and self-contained breathing apparatus (SCBA) with a full face-piece operated in positive pressure mode. Clothing for fire-fighters (including helmets, protective boots and gloves) conforming to MSHA/NIOSH standards will provide a basic level of protection for chemical incidents. (See also NFPA 1971/NFPA 1851.)

**SECTION 6: ACCIDENTAL RELEASE MEASURES**

Personal Precautions	Wear protective clothing as described in Section 8 of this safety data sheet. Avoid inhalation of vapours and contact with skin and eyes. Provide adequate ventilation. In case of inadequate ventilation, use respiratory protection. Do not smoke, eat or drink while using this product. Eliminate all sources of ignition. Wash hands after use. Read and follow manufacturer's recommendations. Do not touch or walk through spilled material. If necessary evacuate surrounding areas. Keep unnecessary and unprotected personnel from entering.
For Emergency Responders	Follow safe handling advice and personal protective equipment recommendations for normal use of product.
Environmental Precautions	Prevent any material from entering drains or waterways.
Spill Clean Up Methods	Prevent further leakage or spillage if safe to do so. Eliminate all ignition sources. Restrict non-essential personnel from the area. Collect any spilled material immediately by vacuuming or shoveling - use non sparking tools or equipment/natural bristle brushes. Take care not to raise dust. Place in labelled, dry, water-tight containers. In case of spills, beware of slippery floors and surfaces.

**SECTION 7: HANDLING AND STORAGE**

Handling	Use personal protective equipment, see Section 8. Avoid generation of dust clouds/accumulation of dust in work area. Ensure good dust ventilation during handling. Formation of sparks and static electricity must be prevented. Earth all equipment. Avoid prolonged or repeated contact.
Usage Description	Use only according to directions.
Storage Precautions	Keep locked up and out of reach of children. Avoid contact with incompatible materials, static, moisture, and flames. Keep away from heat, sparks and open flame. Avoid contact with oxidising agents. Store in

Specific End Use(s) tightly closed original container in a cool, dry and well-ventilated place.  
The identified uses for this product are detailed in Section 1.

**SECTION 8: EXPOSURE CONTROLS/PERSONAL PROTECTION**

Protective Equipment



Component	STD	TWA (8 Hrs)		STEL (15mins)		Notes
chromium	NIOSH		0.5mg/m3			chromium metal and chromium(II) and chromium(III) compounds.
chromium	WEL		0.5mg/m3			Chromium and Cr(II); Cr(III) compounds.
nickel	WEL		1mg/m3		3mg/m3	Nickel, organic compounds (as Ni).
nickel	NIOSH		0.015mg/m3			Nickel, metal - total dust.
cobalt	NIOSH		0.05mg/m3			Cobalt metal dust and fume (as Co).
cobalt	WEL		0.1mg/m3			Cobalt and compounds (as Co).

Ingredient Comments No information available.

Process Conditions  
Engineering Measures Ensure that eye flushing systems and safety showers are located close by in the work place. Provide adequate ventilation, including appropriate local extraction, to ensure that the defined occupational exposure limit is not exceeded. Use with adequate explosion-proof ventilation designed to handle metal particulates.

Respiratory Equipment A NIOSH approved dust mask or filtering facepiece is recommended in poorly ventilated areas or when permissible exposure limits may be exceeded. Respirators should be selected by and used under the direction of a trained health and safety professional following requirements found in OSHA's respirator standard (29 CFR 1910.134). Change filters frequently If the respirator is the sole means of protection, use a full-face supplied air respirator.

Hand Protection Use suitable protective gloves if there is a risk of skin contact. Suggested material: Nitrile rubber. Minimum layer thickness: 0.11 mm. Break through time: 480 min. Consult manufacturer for specific advice. Selection of the glove material depends on consideration of the penetration times, rates of diffusion and degradation, and concentration specific to the workplace. Where hand contact with the product may occur use gloves approved to relevant standards (e.g.US: F739). Use proper glove removal technique (without touching glove's outer surface) to avoid skin contact with this product. Dispose of contaminated gloves after use in accordance with applicable laws and good laboratory practices. Change gloves regularly.

Eye Protection Wear safety goggles or face shield to prevent any possibility of eye contact. Wear safety glasses with side shields (or goggles). Ensure compliance with OSHA's PPE standard (29 CFR 1910.132 and .133) for eye and face protection.

Hygiene Measures Observe normal hygiene standards. Keep container tightly closed. Do not eat, drink, or smoke while using this product. Immediately take off any contaminated clothing and launder before re-use. Wash hands and / or face before breaks and at the end of the shift. After work, wash the skin and apply skin cream.

**SECTION 9: PHYSICAL AND CHEMICAL PROPERTIES**

Information on Basic Physical and Chemical Properties

Appearance Powder.

Color	Grey.
Odor	Odourless.
Odor Threshold - Lower	No information available.
Odor Threshold - Upper	
pH-Value, Conc. Solution	No information available.
pH-Value, Diluted Solution	No information available.
Melting Point	No information available.
Initial Boiling Point and Boiling Range	No information available.
Flash Point	No information available.
Evaporation Rate	No information available.
Flammability State	No information available.
Flammability Limit - Lower(%)	No information available.
Flammability Limit - Upper(%)	No information available.
Vapor Pressure	No information available.
Vapor Density (air=1)	No information available.
Relative Density	No information available.
Bulk Density	No information available.
Solubility	Insoluble.
Decomposition Temperature	No information available.
Partition Coefficient; n-Octanol/Water	No information available.
Auto Ignition Temperature (°C)	No information available.
Viscosity	No information available.
Explosive Properties	No information available.
Oxidizing Properties	No information available.
Molecular Weight	No information available.
Volatile Organic Compound	No information available.
Other Information	Grey metallic powder < 1.0 mm.

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## SECTION 10: STABILITY AND REACTIVITY

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Reactivity	Stable product under recommended storage and handling conditions.
Hazardous Polymerization	Will not polymerise.
Polymerization Description	Not applicable.
Stability	Stable product under recommended storage and handling conditions.
Hazardous Polymerization	Will not polymerise.
Hazardous Decomposition Products	Decomposition of this product may yield metallic oxides. If heated, harmful vapours may be formed.
Conditions to Avoid	High temperatures and sources of ignition.

Materials to Avoid Avoid strong oxidising agents, bases, strong acids. See section 10.3.

## SECTION 11: TOXICOLOGICAL INFORMATION

Toxicological Information	Chronic overexposure may cause respiratory illness. Inhalation of metal fumes may cause metal fume fever.
Acute Toxicity (Oral LD50)	Chromium - LD50 Rat: 27.5 mg/kg. Iron - Oral LD50 Rat: 30000 mg/kg. Nickel - Oral LD50 Rat: >5000 mg/kg. Cobalt: Oral LD50 Rat: 6171 mg/kg.
Acute Toxicity (Dermal LD50)	No information available.
Acute Toxicity (Inhalation LC50)	No information available.
Skin Corrosion/Irritation	No information available.
Respiratory Sensitization	Contact with nickel compounds may result in allergic lung sensitization reactions. Cobalt: Repeated exposure may cause allergic respiratory reaction (asthma).
Skin Sensitization	Cobalt: Prolonged and/or repeated contact may cause irritation and/or dermatitis. May cause skin sensitization. Allergic skin sensitization reactions are the most frequent effect of exposure to nickel.
Reproductive Toxicity: Germ Cell Mutagenicity: Genotoxicity - In Vitro Genotoxicity - In Vivo	No information available.
Carcinogenicity: Carcinogenicity	Nickel is a possible human carcinogen. Chromium may cause cancers of the lungs, nasal cavity and paranasal sinuses.
NTP - Carcinogenicity	The product and its components are not listed.
OSHA - Carcinogenicity	The product and its components are not listed.
IARC Carcinogenicity	The product and its components are not listed.
Specific Target Organ Toxicity - Single Exposure: STOT - Single Exposure	No information available.
Specific Target Organ Toxicity - Repeated Exposure: STOT - Repeated Exposure	No information available.

## SECTION 12: ECOLOGICAL INFORMATION

Ecotoxicity	No Ecological information on the finished product.
Eco Toxicological Information	No ecological toxicity available on the overall finished product.
Acute Toxicity - Fish	Iron - 96 Hr LC50 <i>Morone saxatilis</i> : 13.6 mg/L. Nickel - 96 Hr LC50 <i>Oncorhynchus mykiss</i> : 31.7 mg/L. Cobalt - 96 Hr LC50 <i>Brachydanio rerio</i> : >100 mg/L.
Acute Toxicity - Aquatic Invertebrates	Nickel - 96 Hr EC50 water flea: 510 ug/L. Cobalt: - 48 Hr EC50 <i>Daphnia magna</i> : 3.2 mg/L.
Acute Toxicity - Aquatic Plants	Nickel - 72 Hr EC50 <i>Selenastrum capricornutum</i> : 0.18 mg/L. Cobalt - 72 Hr IC50 <i>Algae</i> , <i>Selenastrum capricornutum</i> : 0.05 – 0.26 mg/L.
Degradability	Will convert to aluminum oxide (alumina) during prolonged contact with water. The product is not biodegradable.
Bioaccumulative Potential	Will not bio-accumulate.
Mobility	No information available.
Results of PBT and vPvB Assessment	No information available.
Other Adverse Effects	Water reactive.

## SECTION 13: DISPOSAL CONSIDERATIONS

Waste Management	When handling waste, consideration should be made to the safety precautions applying to handling of the product. Waste product should be disposed of via a licensed operator or may be sent to a metals reclamation facility that is able to handle fines.
Disposal Methods	Dispose in accordance with all applicable federal, state and local laws and regulations.

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**SECTION 14: TRANSPORT INFORMATION**

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UN Number

UN No. (DOT/TDG)	Not applicable.
UN No. (IMDG)	Not applicable.
UN No. (IATA)	Not applicable.

Proper Shipping Name

DOT/TDG Proper Shipping Name	Not applicable.
IMDG Proper Shipping Name	Not applicable.
IATA Proper Shipping Name	Not applicable.

Transport Hazard Class(es)

DOT/TDG Class	Not applicable.
IMDG Class	Not applicable.
IATA Class	Not applicable.

Transport Labels	Not applicable
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Packing Group(s)

DOT Packing Group	Not applicable.
IMDG Packing Group	Not applicable.
IATA Packing Group	Not applicable.

Special Precautions for User

EMS	Not applicable.
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Environmentally Hazardous Substance/Marine Pollutant

ADR	No
IMDG	No
IATA	No

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**SECTION 15: REGULATORY INFORMATION**

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US Federal Regulations

SARA Section 302 Extremely Hazardous Substances Tier II Threshold Planning Quantities  
The Following Ingredients are Listed      None Listed.

CERCLA/Superfund, Hazardous Substances/Reportable Quantities (EPA)  
The Following Ingredients are Listed      chromium  
nickel

SARA Extremely Hazardous Substances EPCRA Reportable Quantities  
The Following Ingredients are Listed      None Listed.

SARA 313 Emission Reporting  
The Following Ingredients are Listed      chromium  
nickel  
cobalt

CAA Accidental Release Prevention  
The Following Ingredients are Listed      cobalt

OSHA Highly Hazardous Chemicals  
The Following Ingredients are Listed      cobalt

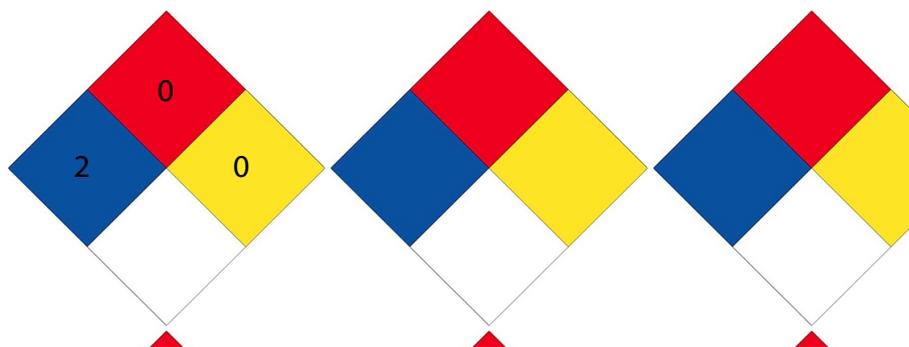
US State Regulations

California Proposition 65 Carcinogens and Reproductive Toxins  
The Following Ingredients are Listed      nickel  
cobalt

California Air Toxics "Hot Spots" (A-I) The Following Ingredients are Listed	nickel
California Air Toxics "Hot Spots" (A-II) The Following Ingredients are Listed	None Listed.
Massachusetts "Right To Know" List The Following Ingredients are Listed	chromium nickel cobalt
Rhode Island "Right To Know" List The Following Ingredients are Listed	chromium nickel cobalt
Minnesota "Right To Know" List The Following Ingredients are Listed	nickel cobalt
New Jersey "Right To Know" List The Following Ingredients are Listed	chromium nickel cobalt
Pennsylvania "Right To Know" List The Following Ingredients are Listed	chromium nickel cobalt

SECTION 16: OTHER INFORMATION

NATIONAL FIRE PROTECTION ASSOCIATION (NFPA)



HAZARDOUS MATERIAL INFORMATION SYSTEM (HMIS)

Health	2
Flammability	0
Physical Hazard	0
Personal Protection	E

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Revision	1

Disclaimer

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