

Safety Data Sheet

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

1.1 Product Identifier:

Product Name: Cobalt Based Alloys

Synonyms Alloy (X); CO (X); Cobalt (X); CoCrMo; ECY(X); F(X); FSX-414; GRADE(X); GX(X); Haynes (X); HS(X); L-605; MAR M (X); MERL (X); MM(X); Nicrallium (x); PT(X); PWA (X); RM-(x); Star (X); Stellite (X); Stoodly (X); Triballoy® (x); WI (X); X-(X)

1.2 Relevant identified uses of the substance or mixture and uses advised against:

Relevant identified use(s): Cast ingots and billets at varying weights and dimensions. Ingots and billets are sold and distributed to downstream processors who remelt the superalloys into products used within various downstream applications.

1.3 Details of the supplier of the safety data sheet:

Manufacturer: Ross & Catherall.
Forge Lane,
Killamarsh,
Sheffield,
S21 1BA
UK

Telephone (General): +44 (0) 114 248 6404 ext 345

Telephone (Direct Dial): +44 (0) 7990 442080

1.4 Emergency telephone number:

Manufacturer: +44 (0) 114 248 6404

Section 2: Hazards Identification

EU/EEC:

According to: Regulation (EC) No 1272/2008 (CLP)/REACH 1907/2006 [amended by 2022/586]

2.1 Classification of the substance or mixture:

CLP: Skin Sensitisation 1 - H317
Respiratory Sensitisation 1 – H334
Carcinogenicity 2 - H351
Reproductive Toxicity 2 - H361fd
Specific Target Organ Toxicity Repeated Exposure 1 - H372
Specific Target Organ Toxicity Repeated Exposure 2 - H373

2.2 Label Elements:

CLP: 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.
H361fd - Suspected of damaging fertility. Suspected of damaging the unborn child.

H372 - Causes damage to organs through prolonged or repeated exposure.
 H373 - May cause damage to organs through prolonged or repeated exposure.

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 or fume.
 P264 - Wash 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.
 P284 - In case of inadequate ventilation wear respiratory protection.

Response P304+P340 - IF INHALED: Remove person to fresh air and keep comfortable for breathing.
 P342+P311 - If experiencing respiratory symptoms: Call Medical services.
 P302+P352 - IF ON SKIN: Wash with plenty of water.
 P321 - Specific treatment, see supplemental first aid information.
 P362+P364 - Take off contaminated clothing and wash it before reuse.
 P333+P313 - If skin irritation or rash occurs: Get medical advice/attention.
 P305+P351+P338 - IF IN EYES: Rinse cautiously with water for several minutes. Remove contact lenses, if present and easy to do. Continue rinsing.
 P337+P317 - If eye irritation persists: Get medical advice/attention.
 P308+P313 - IF exposed or concerned: Get medical advice/attention.

Storage/Disposal P405 - Store locked up.
 P501 - Dispose of content and/or container in accordance with local, regional, national, and/or international regulations.

2.3 Other Hazards
CLP:

May form combustible dust concentrations in air.
 Heating above the melting point releases metallic oxides which may cause metal fume fever by inhalation.
 The symptoms are shivering, fever, malaise, and muscular pain.
 According to Regulation (EC) No. 1272/2008 (CLP) this material is considered hazardous.

United Kingdom (UK):

According to: Regulation (UK) No 2015/21 (CLP)/REACH 2021/904 Excluding Northern Ireland (NI)

Note: Under the Post Brexit Northern Ireland Protocol, EU CLP and REACH regulations apply to NI.

2.1 Classification of the substance or mixture:

CLP: Skin Sensitization 1 - H317
 Respiratory Sensitization 1 – H334
 Carcinogenicity 2 - H351
 Reproductive Toxicity 2 - H361fd
 Specific Target Organ Toxicity Repeated Exposure 1 - H372
 Specific Target Organ Toxicity Repeated Exposure 2 - H373

2.2 Label Elements:

CLP: **DANGER**



Hazard statements

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 H334 - May cause allergy or asthma symptoms or breathing difficulties if inhaled.
 H351 - Suspected of causing cancer.
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 H372 - Causes damage to organs through prolonged or repeated exposure.
 H373 - May cause damage to organs through prolonged or repeated exposure.

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 P202 - Do not handle until all safety precautions have been read and understood.
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 P264 - Wash thoroughly after handling.
 P270 - Do not eat, drink or smoke when using this product.
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 P280 - Wear protective gloves/protective clothing/eye protection/face protection.
 P284 - In case of inadequate ventilation wear respiratory protection.

Response

P304+P340 - IF INHALED: Remove person to fresh air and keep comfortable for breathing.
 P342+P311 - If experiencing respiratory symptoms: Call Medical services.
 P302+P352 - IF ON SKIN: Wash with plenty of water.
 P321 - Specific treatment, see supplemental first aid information.
 P362+P364 - Take off contaminated clothing and wash it before reuse.
 P333+P313 - If skin irritation or rash occurs: Get medical advice/attention.
 P305+P351+P338 - IF IN EYES: Rinse cautiously with water for several minutes. Remove contact lenses, if present and easy to do. Continue rinsing.
 P337+P317 - If eye irritation persists: Get medical advice/attention.
 P308+P313 - IF exposed or concerned: Get medical advice/attention.
 P405 - Store locked up.
 P501 - Dispose of content and/or container in accordance with local, regional, national, and/or international regulations.

Storage/Disposal

2.3

Other Hazards

CLP:

May form combustible dust concentrations in air.
 Heating above the melting point releases metallic oxides which may cause metal fume fever by inhalation.
 The symptoms are shivering, fever, malaise, and muscular pain.
 According to Regulation (UK) No. 2015/21 (CLP) this material is considered hazardous.

United Nations (UN) GHS Revision 9E:

According to: UN Globally Harmonized System of Classification and Labelling of Chemicals (GHS): Ninth Revised Edition

2.1 Classification of the substance or mixture:

UN GHS:

Skin Sensitisation 1 - H317
 Respiratory Sensitisation 1 – H334
 Carcinogenicity 2 - H351
 Reproductive Toxicity 2 - H361fd
 Specific Target Organ Toxicity Repeated Exposure 1 - H372
 Specific Target Organ Toxicity Repeated Exposure 2 - H373

2.2 Label Elements:

UN GHS:

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.
 H361fd - Suspected of damaging fertility. Suspected of damaging the unborn child.
 H372 - Causes damage to organs through prolonged or repeated exposure.
 H373 - May cause damage to organs through prolonged or repeated exposure.

Precautionary statements

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 P202 - Do not handle until all safety precautions have been read and understood.
 P260 - Do not breathe dust or fume.
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Response

P304+P340 - IF INHALED: Remove person to fresh air and keep comfortable for breathing.
 P342+P311 - If experiencing respiratory symptoms: Call Medical services.
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 P321 - Specific treatment, see supplemental first aid information.
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 P333+P313 - If skin irritation or rash occurs: Get medical advice/attention.
 P305+P351+P338 - IF IN EYES: Rinse cautiously with water for several minutes. Remove contact lenses, if present and easy to do. Continue rinsing.
 P337+P317 - If eye irritation persists: Get medical advice/attention.
 P308+P313 - IF exposed or concerned: Get medical advice/attention.

Storage/Disposal

P405 - Store locked up.
 P501 - Dispose of content and/or container in accordance with local, regional, national, and/or international regulations.

2.3

Other Hazards

UN GHS:

May form combustible dust concentrations in air.
 Heating above the melting point releases metallic oxides which may cause metal fume fever by inhalation.
 The symptoms are shivering, fever, malaise, and muscular pain.
 According to the Globally Harmonized System for Classification and Labelling (GHS) this product is considered hazardous.

United States (US):

According to: OSHA 29 CFR 1910.1200 HCS

2.1

Classification of the substance or mixture:

OSHA HCS 2012: Skin Sensitisation 1 – H317
 Eye Irritation 2 – H320
 Respiratory Sensitisation 1 – H334
 Carcinogenicity 2 – H351
 Reproductive Toxicity 2 – H361fd
 Specific Target Organ Toxicity Repeated Exposure 1 – H372
 Combustible Dust
 Hazards Not Otherwise Classified - Health Hazards - Metal fume fever

2.2

Label Elements:

OSHA HCS 2012: **DANGER**



Hazard statements

H317 - May cause an allergic skin reaction. H320 - Causes serious eye irritation.
 H334 - May cause allergy or asthma symptoms or breathing difficulties if inhaled.
 H351 - Suspected of causing cancer.
 H361fd - Suspected of damaging fertility or the unborn child.
 H372 - Causes damage to organs through prolonged or repeated exposure.
 Not Coded - May form combustible dust concentrations in air.

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 or fume.
 P264 - Wash 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.
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Response

P304+P340 - IF INHALED: Remove person to fresh air and keep comfortable for breathing.
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 P337+P317 - If eye irritation persists: Get medical advice/attention.
 P308+P313 - IF exposed or concerned: Get medical advice/attention.

Storage/Disposal

P405 - Store locked up.
 P501 - Dispose of content and/or container in accordance with local, regional, national, and/or international regulations.

SDS 03 – Cobalt Based Alloys

2.3	Other Hazards OSHA HCS 2012:	<p>May form combustible dust concentrations in air. Heating above the melting point releases metallic oxides which may cause metal fume fever by inhalation. The symptoms are shivering, fever, malaise, and muscular pain. Under United States Regulations (29 CFR 1910.1200 - Hazard Communication Standard), this product is considered hazardous.</p>
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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
Cobalt (powder)	CAS: 7440-48-4 EC Number: 231-158-0 EU Index: 027-001-00-9	35% TO 65%	Ingestion/Oral- Rat LD50 • 6171 mg/kg	EU CLP: Annex VI, Table 3.1: Resp. Sens. 1, H334; Skin Sens. 1, H317; Aquatic Chronic 1, H410 (M=1) UK CLP: MCL: Resp. Sens. 1, H334; Skin Sens. 1, H317; Aquatic Chronic 1, H410 (M=1) UN GHS Revision 9: Eye Irrit. 2; Resp. Sens. 1; Skin Sens. 1; Carc. 2 (Inhl); STOT RE 2 (Lung / Inhl); Aquatic Acute 2; Aquatic Chronic 2 OSHA HCS 2012: Eye Irrit. 2; Resp. Sens. 1; Skin Sens. 1; Carc. 2 (Inhl); STOT RE 2 (Lung / Inhl)	NDA
Nickel, massive, ≥ 1 mm	CAS: 7440-02-0 EC Number: 231-111-4	0% TO 50%	NDA	EU CLP: Annex VI, Table 3.1: Skin Sens. 1, H317; Carc. 2, H351 (Inhl); STOT RE 1, H372 (Lungs / Orl/Dermal/Inhl); Aquatic Chronic 3, H412 UK CLP: MCL: Skin Sens. 1, H317; Carc. 2, H351 (Inhl); STOT RE 1, H372 (Lungs / Orl/Dermal/Inhl); Aquatic Chronic 3, H412 UN GHS Revision 9: Flam. Sol. 1; Resp. Sens. 1B; Skin Sens. 1A; Carc. 2 (Inhl); STOT RE 2 (Lungs / Orl, Inhl); Aquatic Acute 3; Aquatic Chronic 3 OSHA HCS 2012: Flam. Sol. 1; Comb. Dust; Resp. Sens. 1B; Skin Sens. 1A; Carc. 2 (Inhl); STOT RE 2 (Lungs / Orl, Inhl)	NDA
Chromium, massive	CAS: 7440-47-3 EC Number: 231-157-5	15% TO 40%	NDA	EU CLP: Not Classified UK CLP: Not Classified UN GHS Revision 9: Not Classified OSHA HCS 2012: Comb. Dust	NDA
Molybdenum (powder)	CAS: 7439-98-7 EC Number: 231-107-2	0% TO 30%	NDA	EU CLP: Flam. Sol. 1, H228; Repr. 2, H361 (Orl); Aquatic Chronic 4, H413 UK CLP: Flam. Sol. 1, H228; Repr. 2, H361 (Orl); Aquatic Chronic 4, H413 UN GHS Revision 9: Flam. Sol. 1; Repr. 2 (Orl); Aquatic Chronic 4 OSHA HCS 2012: Flam. Sol. 1; Comb. Dust; Repr. 2 (Orl)	NDA
Tungsten, powder	CAS: 7440-33-7 EC Number: 231-143-9	0% TO 25%	NDA	EU CLP: Flam. Sol. 1, H228; Self-heat. 2; Repr. 2, H361fd (Orl); EUH029 UK CLP: : Flam. Sol. 1, H228; Self-heat. 2; Repr. 2, H361fd (Orl); EUH029 UN GHS Revision 9: Flam. Sol. 1; Self-heat. 2; Repr. 2 (Orl) OSHA HCS 2012: Flam. Sol. 1; Self-heat. 2; Repr. 2 (Orl)	NDA

SDS 03 – Cobalt Based Alloys

Tantalum	CAS: 7440-25-7 EC Number: 231-135-5	0% TO 15%	NDA	EU CLP: Acute Tox. 4, H302 UK CLP: Acute Tox. 4, H302 UN GHS Revision 9: Acute Tox. 4 (Orl) OSHA HCS 2012: Acute Tox. 4 (Orl); Comb. Dust	NDA
Iron	CAS: 7439-89-6 EC Number: 231-096-4	0% TO 10%	NDA	EU CLP: Acute Tox. 4, H302; Aquatic Chronic 4, H413 UK CLP: Acute Tox. 4, H302; Aquatic Chronic 4, H413 UN GHS Revision 9: Acute Tox. 4 (Orl); Aquatic Chronic 4 OSHA HCS 2012: Acute Tox. 4 (Orl)	NDA
Aluminium powder, stabilized	CAS: 7429-90-5 EC Number: 231-072-3	0% TO 6%	NDA	EU CLP: Annex VI, Table 3.1: Flam. Sol. 1, H228; Water -react. 2, H261 UK CLP: Flam. Sol. 1, H228; Water -react. 2, H261 UN GHS Revision 9: Flam. Sol. 1; Water-react. 2; STOT RE 1 (Lungs / Inhl); OSHA HCS 2012: Flam. Sol. 1; Water-react. 2; Comb. Dust; STOT RE 1 (Lungs / Inhl)	NDA
Titanium, massive	CAS: 7440-32-6 EINECS: 231-142-3	0% TO 5%	NDA	EU CLP: Pyr. Sol. 1, H250 UK CLP: Pyr. Sol. 1, H250 UN GHS Revision 9: Pyr. Sol. 1 OSHA HCS 2012: Pyr. Sol. 1; Comb. Dust	NDA
Silicon	CAS: 7440-21-3 EC Number: 231-130-8	0% TO 5%	Ingestion/Oral- Rat LD50 • 3160 mg/kg	EU CLP: Flam. Sol. 2, H228 UK CLP: Flam. Sol. 2, H228 UN GHS Revision 9: Flam. Sol. 2; Acute Tox. 5 (Orl) OSHA HCS 2012: Flam. Sol. 2	NDA
Niobium	CAS: 7440-03-1 EC Number: 231-113-5	0% TO 3%	NDA	EU CLP: Not Classified UK CLP: Not Classified UN GHS Revision 9: Not Classified OSHA HCS 2012: Not Classified	NDA
Manganese (powder)	CAS: 7439-96-5 EC Number: 231-105-1	0% TO 3%	Ingestion/Oral- Rat LD50 • 9 g/kg	EU CLP: Flam. Sol. 2, H228; Eye Irrit. 2, H319; Repr. 2, H361 (Orl); STOT RE 1 (CNS, Lungs / Inhl) UK CLP: Flam. Sol. 2, H228; Eye Irrit. 2, H319; Repr. 2, H361 (Orl); STOT RE 1 (CNS, Lungs / Inhl) UN GHS Revision 9: Flam. Sol. 2; Skin Irrit. 3; Eye Irrit. 2; Repr. 2 (Orl); STOT RE 1 (CNS, Lungs/ Inhl) OSHA HCS 2012: Flam. Sol. 2; Skin Irrit. 3; Eye Irrit. 2; Repr. 2 (Orl); STOT RE 1 (CNS, Lungs/ Inhl); Hazard Not Otherwise Classified - Health Hazard - Metal fume fever	NDA
Carbon (animal or vegetable origin)	CAS: 7440-44-0 EC Number: 231-153-3	0% TO 3%	NDA	EU CLP: Not Classified UK CLP: Not Classified UN GHS Revision 9: Pyr. Sol. 1 OSHA HCS 2012: Pyr. Sol. 1; Comb. Dust	NDA
Vanadium	CAS: 7440-62-2 EC Number: 231-171-1	0% TO 2%	NDA	EU CLP: Aquatic Chronic 3, H412 UK CLP: Aquatic Chronic 3, H412 UN GHS Revision 9: Aquatic Acute 3; Aquatic Chronic 3 OSHA HCS 2012: Not Classified	NDA
Hafnium	CAS: 7440-58-6 EINECS: 231-166-4	0% TO 2%	NDA	EU CLP: Eye Irrit. 2 UK CLP: Eye Irrit. 2 UN GHS Revision 9: Eye Irrit. 2; Skin Irrit. 3 OSHA HCS 2012: Comb. Dust; Eye Irrit. 2	NDA

See Section 16 for full text of H-statements.

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:	Wash skin with soap and water. 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 Medical Personnel:	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.
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Section 5: Firefighting Measures**5.1 Extinguishing media:**

Suitable Extinguishing Media: Use dry powder extinguishing agent.

Unsuitable Extinguishing Media: No data available.

5.2 Special hazards arising from the substance or mixture:

Unusual Fire and Explosion Hazards Metal powder dispersed in air may cause fire and explosion. Molten metal can ignite combustibles. Molten metal will react violently with water.

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: Ventilate enclosed areas. Do not walk-through spilled material. Wear appropriate personal protective equipment, avoid direct contact. Do not touch damaged containers or spilled material unless wearing appropriate protective clothing.

Emergency Procedures: ELIMINATE all ignition sources (no smoking, flares, sparks or flames in immediate area). As an immediate precautionary measure, isolate spill or leak area for at least 25 meters (75 feet) in all directions. If tank, rail car or tank truck is involved in a fire, ISOLATE for 800 meters (1/2 mile) in all directions; also, consider initial evacuation for 800 meters (1/2 mile) in all directions. Keep unauthorised personnel away.

6.2 Environmental precautions:

Avoid run off to waterways and sewers.

6.3 Methods and material for containment and cleaning up:

Containment/Clean-up Measures:

Avoid generating dust.
 Solid ingot/billet should be picked up and recycled.
 Where possible allow molten material to solidify naturally.
 Residue from cutting or grinding should be swept or vacuumed and placed in suitable containers.
 Use clean non sparking tools to collect material.
 Dust deposits should not be allowed to accumulate on surfaces, as these may form an explosive mixture if they are released into the atmosphere in sufficient concentration.
 Avoid dispersal of dust in the air (i.e., clearing dust surfaces with compressed air).

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:

Under normal conditions, exposure to cast ingots/billets presents few health hazards in itself. Ingots/billets may be heavy. Use proper material handling equipment to reduce the risks of strains and sprains. Do not place any part of the body where it might be struck by or caught between the ingot/billet and another object. Thermal cutting and melting of ingots/billets may produce fumes and dust containing the component elements which may present potentially significant health hazards. Use only with adequate ventilation. Minimize dust generation and accumulation. Routine housekeeping should be instituted to ensure that dusts do not accumulate on surfaces. Dry powders can build static electricity charges when subjected to the friction of transfer and mixing operations. Provide adequate precautions, such as electrical grounding and bonding, or inert atmospheres. To avoid possible explosion, ingots/billets need to be clean and dry when loaded into molten metal or preferably loaded into an empty furnace. Nickel can react with carbon monoxide in reducing atmospheres to form nickel carbonyl, an extremely toxic gas. Cobalt causes a dermatitis of the allergic sensitivity type at points in friction. Cobalt toxicity also results in a progressive diffuse, interstitial pneumonia with a non-productive cough, dyspnoea on exertion, interstitial fibrosis and cell damage. Other workers have experienced a sensitized respiratory disease characterized by cough, wheezing and shortness of breath where upon removal from the environment, the symptoms subside. Wear appropriate personal protective equipment, avoid direct contact. Do not breathe dust or fumes. Avoid contact with skin, eyes, and 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 well-ventilated place. Keep container tightly closed. Keep away from incompatible materials.

7.3 Specific end use(s):

Refer to Section 1.2 - Relevant identified uses.

SDS 03 – Cobalt Based Alloys

Section 8: Exposure Controls/Personal Protection:						
8.1 Control parameters:						
Exposure Limits/Guidelines						
	Result	ACGIH	Europe	NIOSH	OSHA	United Kingdom
Manganese (powder) (7439-96-5)	STELs	Not established	Not established	3 mg/m ³ STEL	Not established	Not Stated EH 40
	TWAs	0.02 mg/m ³ TWA (respirable fraction); 0.1 mg/m ³ TWA (inhalable fraction)	Not established	1 mg/m ³ TWA (fume)	Not established	0.2 mg/m ³ TWA (as Mn) (Inhalable) 0.05 mg/m ³ TWA (as Mn) (respirable)
	Ceilings	Not established	Not established	Not established	5 mg/m ³ Ceiling (fume)	Not established
Tantalum (7440-25-7)	STELs	Not established	Not established	10 mg/m ³ STEL (dust)	Not established	10 mg/m ³ STEL
	TWAs	Not established	Not established	5 mg/m ³ TWA (dust)	5 mg/m ³ TWA	5 mg/m ³ TWA
Aluminium powder, stabilised (7429-90-5)	STELs	Not established	Not established	Not established	Not established	Not Stated EH 40
	TWAs	1 mg/m ³ TWA (respirable fraction)	Not established	10 mg/m ³ TWA (total dust); 5 mg/m ³ TWA (respirable dust)	15 mg/m ³ TWA (total dust); 5 mg/m ³ TWA (respirable fraction)	10 mg/m ³ TWA (inhalable dust); 4 mg/m ³ TWA (respirable dust)
Nickel, massive, ≥ 1 mm (7440-02-0)	STELs	Not established	Not established	Not established	Not established	1.5 mg/m ³ STEL (calculated)
	TWAs	1.5 mg/m ³ TWA (inhalable fraction)	Not established	0.015 mg/m ³ TWA	1 mg/m ³ TWA	0.5 mg/m ³ TWA
Silicon (7440-21-3)	STELs	Not established	Not established	Not established	Not established	Not Stated EH40
	TWAs	Not established	Not established	10 mg/m ³ TWA (total dust); 5 mg/m ³ TWA (respirable dust)	15 mg/m ³ TWA (total dust); 5 mg/m ³ TWA (respirable fraction)	10 mg/m ³ TWA (inhalable dust); 4 mg/m ³ TWA (respirable dust)
Tungsten, powder (7440-33-7)	STELs	10 mg/m ³ STEL	Not established	10 mg/m ³ STEL	Not established	10 mg/m ³ STEL
	TWAs	5 mg/m ³ TWA	Not established	5 mg/m ³ TWA	Not established	5 mg/m ³ TWA
Vanadium (7440-62-2)	Ceilings	Not established	Not established	0.05 mg/m ³ Ceiling (except Vanadium metal and Vanadium carbide, dust and fume, as V, 15 min) <i>as Vanadium compounds</i>	0.5 mg/m ³ Ceiling (respirable dust, as V ₂ O ₅); 0.1 mg/m ³ Ceiling (fume, as V ₂ O ₅)	Not established
	STELs	Not established	Not established	3 mg/m ³ STEL (listed under Ferrovandium dust)	Not established	Not established
	TWAs	Not established	Not established	1 mg/m ³ TWA (listed under Ferrovandium dust)	Not established	Not established
Hafnium (7440-58-6)	TWAs	0.5 mg/m ³ TWA	Not established	0.5 mg/m ³ TWA	0.5 mg/m ³ TWA	Not established

SDS 03 – Cobalt Based Alloys

Molybdenum (powder) (7439-98-7)	TWAs	10 mg/m ³ TWA (inhalable fraction); 3 mg/m ³ TWA (respirable fraction)	Not established	Not established	Not established	10 mg/m ³
	STELs	Not established	Not established	Not established	Not established	20 mg/m ³
Chromium, massive (7440-47-3)	TWAs	0.5 mg/m ³ TWA	2 mg/m ³ TWA	0.5 mg/m ³ TWA	1 mg/m ³ TWA	0.5 mg/m ³ TWA 0.025 mg/m ³ (process generated)
	STELs	Not established	Not established	Not established	Not established	Not Stated EH40
Cobalt (powder) (7440-48-4)	STELs	Not established	Not established	Not established	Not established	Not Stated EH40
	TWAs	0.02 mg/m ³ TWA	Not established	0.05 mg/m ³ TWA (dust and fume)	0.1 mg/m ³ TWA (dust and fume)	0.1 mg/m ³ TWA

8.2 Exposure controls:

Engineering Measures/Controls

Use a local exhaust when cutting, grinding, welding, or melting. It is recommended that dust control equipment such as local exhaust ventilation and material transport systems involved in handling of this product contain explosion relief vents or an explosion suppression system or an oxygen-deficient environment. 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). Use only appropriately classified electrical equipment.

Personal Protective Equipment Respiratory

For limited exposure, use P95 or N95 respirator. 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 respirators if exposure limits are exceeded or symptoms are experienced.

Eye/Face

Wear safety goggles.

Skin/Body

Wear appropriate gloves. Wear long sleeves and/or protective coveralls.

Environmental Exposure Controls

Follow best practice for site management and disposal of waste. Controls should be engineered to prevent release to the environment, including procedures to prevent spills, atmospheric release and release to waterways.

Key to abbreviations:

ACGIH = American Conference of Governmental Industrial Hygiene
 NIOSH = National Institute of Occupational Safety and Health
 OSHA = Occupational Safety and Health Administration
 STEL = Short Term Exposure Limits are based on 15-minute exposures
 TWA = Time-Weighted Averages are based on 8h/day, 40h/week exposures

Section 9: Physical and Chemical Properties			
9.1 Information on Basic Physical and Chemical Properties:			
Material Description			
Physical Form	Solid	Appearance/Description	Metallic grey solid with no odour.
Colour	Metallic grey.	Odour	Odourless
Odour Threshold	Data lacking		
General Properties			
Boiling Point	Data lacking	Melting Point/Freezing Point	2700 °F (1482.2222 °C)
Decomposition Temperature	Data lacking	pH	Data lacking
Specific Gravity/Relative Density	= 8 Water=1	Water Solubility	Negligible < 0.1 %
Viscosity	Data lacking	Explosive Properties	Data lacking
Oxidizing Properties:	Data lacking		
Volatility			
Vapour Pressure	Data lacking	Vapour Density	Data lacking
Evaporation Rate	Data lacking	Volatiles (Wt.)	0 %
Volatiles (Vol.)	0 %		
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:	No dangerous reaction known under conditions of normal use.
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	Cast Ingot/billet is stable at ordinary temperature; however, caution should be taken with acids, bases, and oxidizers. Molten metal will react violently with water.
10.6 Hazardous decomposition products	Under normal conditions, exposure to cast ingots presents few health hazards in itself. Thermal cutting and melting of ingots/billets may produce fumes containing the component elements and breathing those fumes may present potentially significant health hazards.

Section 11: Toxicological Information:		
11.1 Information on toxicological effects		
Components		
Nickel, massive, ≥ 1 mm (0% TO 50%)	7440-02-0	Acute Toxicity: Ingestion/Oral-Rat TDLo • 200 mg/kg; Nutritional and Gross Metabolic: Gross Metabolite Changes: Weight loss or decreased weight gain ; Behavioural: Somnolence (general depressed activity) ; Multi-dose Toxicity: Ingestion/Oral-Rat TDLo 500 mg/kg 5 Day(s)-Intermittent; Lungs, Thorax, or Respiration: Fibrosis, focal (pneumoconiosis) ; Related to Chronic Data: Death in the Other Multiple Dose data type field ; Inhalation-Rabbit TClO • 1 mg/m ³ 6 Hour(s) 13 Week(s)-Intermittent; Lungs, Thorax, or Respiration: Other changes ; Lungs, Thorax, or Respiration: Changes in lung weight ; Blood: Haemorrhage ; Inhalation-Rat TClO • 0.4 mg/m ³ 40 Week(s)-Intermittent; 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 ; Reproductive: Ingestion/Oral-Rat TDLo • 158 mg/kg (multigeneration); Reproductive Effects: Effects on Embryo or Foetus: Fetotoxicity (except death, e.g., stunted foetus) ; Reproductive Effects: Effects on Embryo or Foetus: Foetal death ; Tumorigenic / Carcinogen: Inhalation-Guinea Pig TClO • 15 mg/m ³ 91 Week(s)-Intermittent; Tumorigenic: Equivocal tumorigenic agent by RTECS criteria ; Lungs, Thorax, or Respiration: Tumours ; Lungs, Thorax, or Respiration: Bronchogenic carcinoma
Manganese (powder) (0% TO 3%)	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. Multi-dose Toxicity: Inhalation-Human TClO • 0.5 mg/m ³ 39 Week(s)-Intermittent; Brain and Coverings: Other degenerative changes ; Peripheral Nerve and Sensation: Sensory change involving peripheral nerve ; Behavioural: Irritability ; Inhalation-Mouse TClO • 0.7 mg/m ³ 24 Hour(s) 22 Week(s)-Continuous; Lungs, Thorax, or Respiration: Fibrosis (interstitial) ; Immunological Including Allergic: Decrease in cellular immune response ; Inhalation-Rat TClO • 0.3 mg/m ³ 5 Hour(s) 26 Week(s)-Intermittent; Lungs, Thorax, or Respiration: Fibrosis (interstitial) ; Immunological Including Allergic: Decrease in cellular immune response ; Reproductive: Ingestion/Oral-Mouse TDLo • 322.5 mg/kg (43D male); Reproductive Effects: Paternal Effects: Spermatogenesis ; Ingestion/Oral-Rat TDLo • 50 mg/kg (20D post); Reproductive Effects: Specific Developmental Abnormalities: Central nervous system ; Reproductive Effects: Effects on New-born: Biochemical and metabolic ; Reproductive Effects: Effects on New-born: Behavioural ; Ingestion/Oral-Rat TDLo • 90 mg/kg (18D post); Reproductive Effects: Effects on New-born: Growth statistics (e.g., reduced weight gain) ; Reproductive Effects: Effects on New-born: Biochemical and metabolic ; Reproductive Effects: Effects on New-born: Other postnatal measures or effects not listed.
Titanium, massive (0% TO 5%)	7440-32-6	Reproductive: Ingestion/Oral-Rat TDLo • 158 mg/kg (multigeneration); Reproductive Effects: Effects on Embryo or Foetus: Fetotoxicity (except death, e.g., stunted foetus) ; Reproductive Effects: Effects on Embryo or Foetus: Foetal death
Cobalt (powder) (35% TO 65%)	7440-48-4	Acute Toxicity: Ingestion/Oral-Rat LD50 • 6171 mg/kg; behavioural: Somnolence (general depressed activity) ; behavioural: Ataxia ; Gastrointestinal: Hypermotility, diarrhoea . Multi-dose Toxicity: Inhalation-Rabbit TClO • 10 mg/m ³ 2 Hour(s) 56 Day(s)-Intermittent; behavioural: Food intake (animal) ; Lungs, Thorax, or Respiration: Emphysema ; Liver: Fatty liver degeneration ; Inhalation-Rat TClO • 0.09 mg/m ³ 24 Hour(s) 8 Week(s)-Continuous; Lungs, Thorax, or Respiration: Other changes ; Kidney, Ureter, and Bladder: Urine volume decreased ; Biochemical: Enzyme inhibition, induction, or change in blood or tissue levels: Dehydrogenases ; Inhalation-Rat TClO • 2 mg/m ³ 4 Day(s)-Intermittent; Lungs, Thorax, or Respiration: Fibrosing alveolitis
Aluminium powder, stabilized (0% TO 6%)	7429-90-5	Multi-dose Toxicity: Inhalation-Man TClO • 4 mg/m ³ 1 Year(s)-Intermittent; Lungs, Thorax, or Respiration: Cough ; Lungs, Thorax, or Respiration: Dyspnoea ; Nutritional and Gross Metabolic: Gross Metabolite Changes: Weight loss or decreased weight gain ; Inhalation-Rat TClO • 206 mg/m ³ 5 Hour(s) 30 Day(s)-Intermittent; Lungs, Thorax, or Respiration: Fibrosis (interstitial) ; Endocrine: Hypoglycaemia ; Blood: Changes in serum composition (e.g., TP, bilirubin cholesterol)
Tungsten, powder (0% TO 25%)	7440-33-7	Irritation: Eye-Rabbit • 500 mg 24 Hour(s) • Mild irritation; Skin-Rabbit • 500 mg 24 Hour(s) • Mild irritation; Reproductive: Ingestion/Oral-Rat TDLo • 1160 µg/kg (30W pre/1-20D preg); Reproductive Effects: Specific Developmental Abnormalities: Musculoskeletal system ; Ingestion/Oral-Rat TDLo • 1210 µg/kg (35W pre); Reproductive Effects: Effects on Fertility: Post-implantation mortality ; Reproductive Effects: Specific Developmental Abnormalities: Musculoskeletal system .
Tantalum (0% TO 15%)	7440-25-7	Acute Toxicity: Ingestion/Oral-Mouse LD50 • 595 mg/kg
Silicon (0% TO 5%)	7440-21-3	Acute Toxicity: Ingestion/Oral-Rat LD50 • 3160 mg/kg. Irritation: Eye-Rabbit • 3 mg • Mild irritation

SDS 03 – Cobalt Based Alloys

Vanadium (0% TO 2%)	7440-62-2	Multi-dose Toxicity: Ingestion/Oral-Rat TDLo • 225 mg/kg 15 Day(s)-Continuous; Nutritional and Gross Metabolic: Gross Metabolite Changes: Weight loss or decreased weight gain
Iron (0% TO 10%)	7439-89-6	Acute Toxicity: Ingestion/Oral-Rat LD50 • 750 mg/kg; Blood: Changes in serum composition (e.g., TP, bilirubin cholesterol) ; Biochemical: Enzyme inhibition, induction, or change in blood or tissue levels: Transaminases ; Ingestion/Oral-Child TDLo • 77 mg/kg; behavioural: Irritability ; Gastrointestinal: Nausea or vomiting ; Blood: Normocytic anaemia . Multi-dose Toxicity: Ingestion/Oral-Rat TDLo • 105 mg/kg 5 Week(s)-Continuous; Liver: Tumours; Tumorigenic: Active as anti-cancer agent; Tumorigenic: Protects against induction of experimental tumours
Molybdenum (powder) (0% TO 30%)	7439-98-7	Mutagen: Cytogenetic analysis • Inhalation-Rat • 19500 µg/m ³ ; Reproductive: Ingestion/Oral-Mouse TDLo • 448 mg/kg (multigeneration); Reproductive Effects: Effects on Embryo or Foetus: Fetotoxicity (except death, e.g., stunted foetus) ; Reproductive Effects: Effects on Embryo or Foetus: Foetal death ; Ingestion/Oral-Rat TDLo • 5800 µg/kg (30W pre/1-20D preg); Reproductive Effects: Specific Developmental Abnormalities: Musculoskeletal system ; Ingestion/Oral-Rat TDLo • 6050 µg/kg (35W pre); Reproductive Effects: Effects on Fertility: Pre-implantation mortality ; Reproductive Effects: Effects on Fertility: Post-implantation mortality . Reproductive Effects: Specific Developmental Abnormalities: Musculoskeletal system

GHS Properties	Classification
Acute toxicity	EU/CLP • Data lacking UK CLP • Data lacking UN GHS 9 • Data lacking OSHA HCS 2012 • Data lacking
Skin corrosion/Irritation	EU/CLP • Data lacking UK CLP • Data lacking UN GHS 9 • Data lacking OSHA HCS 2012 • Data lacking
Serious eye damage/Irritation	EU/CLP • Data lacking UK CLP • Data lacking UN GHS 9 • Eye Irritation 2 OSHA HCS 2012 • Eye Irritation 2
Skin sensitisation	EU/CLP • Skin Sensitiser 1 UK CLP • Skin Sensitiser 1 UN GHS 9 • Skin Sensitiser 1 OSHA HCS 2012 • Skin Sensitizer 1
Respiratory sensitisation	EU/CLP • Respiratory Sensitiser 1 UK CLP • Respiratory Sensitiser 1 UN GHS 9 • Respiratory Sensitiser 1 OSHA HCS 2012 • Respiratory Sensitiser 1
Aspiration Hazard	EU/CLP • Data lacking UK CLP • Data lacking UN GHS 9 • Data lacking OSHA HCS 2012 • Data lacking
Carcinogenicity	EU/CLP • Carcinogenicity 2; Suspected of causing cancer UK CLP • Carcinogenicity 2; Suspected of causing cancer UN GHS 9 • Carcinogenicity 2 OSHA HCS 2012 • Carcinogenicity 2
Germ Cell Mutagenicity	EU/CLP • Data lacking UK CLP • Data lacking UN GHS 9 • Data lacking OSHA HCS 2012 • Data lacking
Toxicity for Reproduction	EU/CLP • Toxic to Reproduction 2 UK CLP • Toxic to Reproduction 2 UN GHS 9 • Toxic to Reproduction 2 OSHA HCS 2012 • Toxic to Reproduction 2
STOT-SE	EU/CLP • Data lacking UK CLP • Data lacking UN GHS 9 • Data lacking OSHA HCS 2012 • Data lacking
STOT-RE	EU/CLP • Specific Target Organ Toxicity Repeated Exposure 1; Specific Target Organ Toxicity Repeated Exposure 2 UK CLP • Specific Target Organ Toxicity Repeated Exposure 1; Specific Target Organ Toxicity Repeated Exposure 2 UN GHS 3 • Specific Target Organ Toxicity Repeated Exposure 1 OSHA HCS 2012 • Specific Target Organ Toxicity Repeated Exposure 1

Potential Health Effects	
Inhalation	
Acute (Immediate)	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)	Repeated and prolonged exposure may cause sensitization of the respiratory system. Following sensitization of the respiratory system, cobalt exposure causes an obstructive lung disease with wheezing, cough, and shortness of breath. Chronic respiratory exposure results in reduced lung function, increased fibrotic changes on chest X-ray, production of scanty mucoid sputum, and shortness of breath. Chronic exposure to Nickel can cause effects such as rhinitis, sinusitis, nasal septal perforations and asthma have been reported in nickel refinery and nickel-plating workers.
Skin	
Acute (Immediate)	Exposure to dust may cause mechanical irritation. May cause skin sensitization. Symptoms include redness, and skin rash. Contact allergy to nickel is very common in human beings.
Chronic (Delayed)	No data available.
Eye	
Acute (Immediate)	Causes serious eye 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)	Excessive concentrations of nuisance dust in the workplace may cause mechanical irritation to mucous membranes.
Chronic (Delayed)	No data available.
Carcinogenic Effects	Repeated and prolonged exposure to fumes and dust created in processing this product may cause cancer.

Carcinogenic Effects			
	CAS	IARC	NTP
Nickel, massive, ≥ 1 mm	7440-02-0	Group 2B-Possible Carcinogen	Reasonably Anticipated to be Human Carcinogen
Cobalt (powder)	7440-48-4	Group 2B-Possible Carcinogen	Reasonably Anticipated to be Human Carcinogen

Reproductive Effects Repeated and prolonged exposure to fumes and dust created in processing this product may cause reproductive effects.

11.2 Other information:

Heating above the melting point releases metallic oxides which may cause metal fume fever by inhalation. The symptoms are shivering, fever, malaise and muscular pain.

Key to abbreviations

LD = Lethal Dose
 TC = Toxic Concentration
 TD = Toxic Dose

Section 12: Ecological Information:		
12.1 Toxicity:		
Components		
Nickel, massive, ≥ 1 mm (0% TO 50%)	7440-02-0	Aquatic Toxicity-Fish: 96 Hour(s) LC50 Oncorhynchus mykiss (Rainbow Trout) 0.06 mg/L 28 Day(s) NOEC Cyprinus carpio (Common Carp) 0.0035 µg/L Aquatic Toxicity-Crustacea: 7 Day(s) NOEC Americamysis bahia (Opossum Shrimp) 0.213 mg/L

SDS 03 – Cobalt Based Alloys

		Aquatic Toxicity-Algae and Other Aquatic Plant(s): 96 Hour(s) EC50 Pseudokirchneriella subcapitata (Green Algae) 0.233 mg/L
Cobalt (powder) (35% TO 65%)	7440-48-4	Aquatic Toxicity-Fish: 96 Hour(s) LC50 Pimephales promelas (Fathead Minnow) 3.4 mg/L Aquatic Toxicity-Crustacea: 48 Hour(s) LC50 Daphnia magna (Water Flea) 4.4 mg/L 28 Day(s) NOEC Daphnia magna (Water Flea) 0.0028 mg/L
Vanadium (0% TO 2%)	7440-62-2	Aquatic Toxicity-Fish: 96 Hour(s) LC50 Pimephales promelas (Fathead Minnow) 1.8 mg/L Aquatic Toxicity-Crustacea: 48 Hour(s) LC50 Daphnia magna (Water Flea) 1.55 mg/L 7 Day(s) NOEC Daphnia magna (Water Flea) 0.5 mg/L
Iron (0% TO 10%)	7439-89-6	Aquatic Toxicity-Fish: 96 Hour(s) LC50 Mudskipper (Periophthalmus waltoni) 0.00648 mg/L 7 Day(s) NOEC Brown Trout (Salmo trutta) 0.305 mg/L Aquatic Toxicity-Crustacea: 7 Day(s) NOEC Aquatic Sowbug, Isopod (Idotea balthica) 0.5 mg/L
Molybdenum (powder) (0% TO 30%)	7439-98-7	Aquatic Toxicity-Fish: 96 Hour(s) LC50 Rainbow Trout (Oncorhynchus mykiss) 800 mg/L Aquatic Toxicity-Crustacea: 48 Hour(s) LC50 Daphnia magna (Water Flea) >200 mg/L 28 Day(s) NOEC Daphnia magna (Water Flea) 0.67 mg/L
12.2 Persistence and degradability		Product in ingot/billet form is non-toxic to aquatic and terrestrial organisms. The product is persistent and would have low degradability.
12.3 Bio accumulative potential		Material data lacking.
12.4 Mobility in Soil		A low mobility would be expected in a landfill situation.
12.5 Results of PBT and vPvB assessment		No PBT and vPvB assessment has been conducted.
12.6 Other adverse effects		No studies have been found.

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	Not Applicable	Not Regulated	Not Applicable	Not Applicable	NDA
TDG	Not Applicable	Not Regulated	Not Applicable	Not Applicable	NDA
IMO/IMDG	Not Applicable	Not Regulated	Not Applicable	Not Applicable	NDA
IATA/ICAO	Not Applicable	Not Regulated	Not Applicable	Not Applicable	NDA
14.6 Special precautions for user	None specified.				
14.7 Transport in bulk according to Annex II of Marpol and the IBC Code	Data lacking.				

SDS 03 – Cobalt Based Alloys

Section 15: Regulatory Information:						
15.1 Safety, health and environmental regulations/legislation specific for the substance or mixture						
SARA Hazard Classifications		Acute, Chronic, Pressure (Sudden Release of)				
Inventory						
Component	CAS	UK MCL	UK SVHCs	EU EINECS	EU ELNICS	TSCA
Aluminium powder, stabilized	7429-90-5	Yes	No	Yes	No	Yes
Carbon (<i>animal or vegetable origin</i>)	7440-44-0	Yes	No	Yes	No	Yes
Chromium, massive	7440-47-3	Yes	No	Yes	No	Yes
Cobalt (powder)	7440-48-4	Yes	No	Yes	No	Yes
Hafnium	7440-58-6	Yes	No	Yes	No	Yes
Iron	7439-89-6	Yes	No	Yes	No	Yes
Manganese (powder)	7439-96-5	Yes	No	Yes	No	Yes
Molybdenum (powder)	7439-98-7	Yes	No	Yes	No	Yes
Nickel, massive, ≥ 1 mm	7440-02-0	Yes	No	Yes	No	Yes
Niobium	7440-03-1	Yes	No	Yes	No	Yes
Silicon	7440-21-3	Yes	No	Yes	No	Yes
Tantalum	7440-25-7	Yes	No	Yes	No	Yes
Titanium, massive	7440-32-6	Yes	No	Yes	No	Yes
Tungsten, powder	7440-33-7	Yes	No	Yes	No	Yes
Vanadium	7440-62-2	Yes	No	Yes	No	Yes
United States						
Labor						
U.S. - OSHA - Process Safety Management - Highly Hazardous Chemicals						
Hafnium				7440-58-6		Not Listed
Carbon (<i>animal or vegetable origin</i>)				7440-44-0		Not Listed
Chromium, massive				7440-47-3		Not Listed
Manganese (powder)				7439-96-5		Not Listed
Tantalum				7440-25-7		Not Listed
Cobalt (powder)				7440-48-4		Not Listed
Aluminium powder, stabilized				7429-90-5		Not Listed
Molybdenum (powder)				7439-98-7		Not Listed
Nickel, massive, ≥ 1 mm				7440-02-0		Not Listed
Silicon				7440-21-3		Not Listed
Tungsten, powder				7440-33-7		Not Listed
Vanadium				7440-62-2		Not Listed
Iron				7439-89-6		Not Listed
Titanium, massive				7440-32-6		Not Listed
Niobium				7440-03-1		Not Listed
U.S. - OSHA - Specifically Regulated Chemicals						
Hafnium				7440-58-6		Not Listed
<i>Carbon (animal or vegetable origin)</i>				7440-44-0		Not Listed
Chromium, massive				7440-47-3		Not Listed
Manganese (powder)				7439-96-5		Not Listed
Tantalum				7440-25-7		Not Listed
Cobalt (powder)				7440-48-4		Not Listed
Aluminium powder, stabilized				7429-90-5		Not Listed
Molybdenum (powder)				7439-98-7		Not Listed
Nickel, massive, ≥ 1 mm				7440-02-0		Not Listed
Silicon				7440-21-3		Not Listed

SDS 03 – Cobalt Based Alloys

Tungsten, powder	7440-33-7	Not Listed
Vanadium	7440-62-2	Not Listed
Iron	7439-89-6	Not Listed
Titanium, massive	7440-32-6	Not Listed
Niobium	7440-03-1	Not Listed
Environment		
U.S. - CAA (Clean Air Act) - 1990 Hazardous Air Pollutants		
Hafnium	7440-58-6	Not Listed
Carbon (<i>animal or vegetable origin</i>)	7440-44-0	Not Listed
Chromium, massive	7440-47-3	Not Listed
Manganese (powder)	7439-96-5	Not Listed
Tantalum	7440-25-7	Not Listed
Cobalt (powder)	7440-48-4	Not Listed
Aluminium powder, stabilized	7429-90-5	Not Listed
Molybdenum (powder)	7439-98-7	Not Listed
Nickel, massive, ≥ 1 mm	7440-02-0	Not Listed
Silicon	7440-21-3	Not Listed
Tungsten, powder	7440-33-7	Not Listed
Vanadium	7440-62-2	Not Listed
Iron	7439-89-6	Not Listed
Titanium, massive	7440-32-6	Not Listed
Niobium	7440-03-1	Not Listed
U.S. - CERCLA/SARA - Hazardous Substances and their Reportable Quantities		
Hafnium	7440-58-6	Not Listed
Carbon (<i>animal or vegetable origin</i>)	7440-44-0	Not Listed
Chromium, massive	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 (powder)	7439-96-5	Not Listed
Tantalum	7440-25-7	Not Listed
Cobalt (powder)	7440-48-4	Not Listed
Aluminium powder, stabilized	7429-90-5	Not Listed
Molybdenum (powder)	7439-98-7	Not Listed
Nickel, massive, ≥ 1 mm	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)
Silicon	7440-21-3	Not Listed
Tungsten, powder	7440-33-7	Not Listed
Vanadium	7440-62-2	Not Listed
Iron	7439-89-6	Not Listed
Titanium, massive	7440-32-6	Not Listed
Niobium	7440-03-1	Not Listed

SDS 03 – Cobalt Based Alloys

U.S. - CERCLA/SARA - Radionuclides and Their Reportable Quantities		
Hafnium	7440-58-6	Not Listed
Carbon (<i>animal or vegetable origin</i>)	7440-44-0	Not Listed
Chromium, massive	7440-47-3	Not Listed
Manganese (powder)	7439-96-5	Not Listed
Tantalum	7440-25-7	Not Listed
Cobalt (powder)	7440-48-4	Not Listed
Aluminium powder, stabilized	7429-90-5	Not Listed
Molybdenum (powder)	7439-98-7	Not Listed
Nickel, massive, ≥ 1 mm	7440-02-0	Not Listed
Silicon	7440-21-3	Not Listed
Tungsten, powder	7440-33-7	Not Listed
Vanadium	7440-62-2	Not Listed
Iron	7439-89-6	Not Listed
Titanium, massive	7440-32-6	Not Listed
Niobium	7440-03-1	Not Listed
U.S. - CERCLA/SARA - Section 302 Extremely Hazardous Substances EPCRA RQs		
Hafnium	7440-58-6	Not Listed
Carbon (<i>animal or vegetable origin</i>)	7440-44-0	Not Listed
Chromium, massive	7440-47-3	Not Listed
Manganese (powder)	7439-96-5	Not Listed
Tantalum	7440-25-7	Not Listed
Cobalt (powder)	7440-48-4	Not Listed
Aluminium powder, stabilized	7429-90-5	Not Listed
Molybdenum (powder)	7439-98-7	Not Listed
Nickel, massive, ≥ 1 mm	7440-02-0	Not Listed
Silicon	7440-21-3	Not Listed
Tungsten, powder	7440-33-7	Not Listed
Vanadium	7440-62-2	Not Listed
Iron	7439-89-6	Not Listed
Titanium, massive	7440-32-6	Not Listed
Niobium	7440-03-1	Not Listed
U.S. - CERCLA/SARA - Section 302 Extremely Hazardous Substances TPQs		
Hafnium	7440-58-6	Not Listed
Carbon (<i>animal or vegetable origin</i>)	7440-44-0	Not Listed
Chromium, massive	7440-47-3	Not Listed
Manganese (powder)	7439-96-5	Not Listed
Tantalum	7440-25-7	Not Listed
Cobalt (powder)	7440-48-4	Not Listed
Aluminium powder, stabilized	7429-90-5	Not Listed
Molybdenum (powder)	7439-98-7	Not Listed
Nickel, massive, ≥ 1 mm	7440-02-0	Not Listed
Silicon	7440-21-3	Not Listed
Tungsten, powder	7440-33-7	Not Listed
Vanadium	7440-62-2	Not Listed
Iron	7439-89-6	Not Listed
Titanium, massive	7440-32-6	Not Listed
Niobium	7440-03-1	Not Listed
U.S. - CERCLA/SARA - Section 313 - Emission Reporting		

SDS 03 – Cobalt Based Alloys

Hafnium	7440-58-6	Not Listed
Carbon (<i>animal or vegetable origin</i>)	7440-44-0	Not Listed
Chromium, massive	7440-47-3	1.0 % de minimis concentration
Manganese (powder)	7439-96-5	1.0 % de minimis concentration
Tantalum	7440-25-7	Not Listed
Cobalt (powder)	7440-48-4	0.1 % de minimis concentration
Aluminium powder, stabilized	7429-90-5	1.0 % de minimis concentration (dust or fume only)
Molybdenum (powder)	7439-98-7	Not Listed
Nickel, massive, ≥ 1 mm	7440-02-0	0.1 % de minimis concentration
Silicon	7440-21-3	Not Listed
Tungsten, powder	7440-33-7	Not Listed
Vanadium	7440-62-2	1.0 % de minimis concentration (except when contained in an alloy)
Iron	7439-89-6	Not Listed
Titanium, massive	7440-32-6	Not Listed
Niobium	7440-03-1	Not Listed

U.S. - CERCLA/SARA - Section 313 - PBT Chemical Listing

Hafnium	7440-58-6	Not Listed
Carbon (<i>animal or vegetable origin</i>)	7440-44-0	Not Listed
Chromium, massive	7440-47-3	Not Listed
Manganese (powder)	7439-96-5	Not Listed
Tantalum	7440-25-7	Not Listed
Cobalt (powder)	7440-48-4	Not Listed
Aluminium powder, stabilized	7429-90-5	Not Listed
Molybdenum (powder)	7439-98-7	Not Listed
Nickel, massive, ≥ 1 mm	7440-02-0	Not Listed
Silicon	7440-21-3	Not Listed
Tungsten, powder	7440-33-7	Not Listed
Vanadium	7440-62-2	Not Listed
Iron	7439-89-6	Not Listed
Titanium, massive	7440-32-6	Not Listed
Niobium	7440-03-1	Not Listed

United States - California Environment

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

Hafnium	7440-58-6	Not Listed
Carbon (<i>animal or vegetable origin</i>)	7440-44-0	Not Listed
Chromium, massive	7440-47-3	Not Listed
Manganese (powder)	7439-96-5	Not Listed
Tantalum	7440-25-7	Not Listed
Cobalt (powder)	7440-48-4	carcinogen, 7/1/1992 (powder)
Aluminium powder, stabilized	7429-90-5	Not Listed
Molybdenum (powder)	7439-98-7	Not Listed
Nickel, massive, ≥ 1 mm	7440-02-0	carcinogen, 10/1/1989 (metallic)
Silicon	7440-21-3	Not Listed
Tungsten, powder	7440-33-7	Not Listed
Vanadium	7440-62-2	Not Listed

SDS 03 – Cobalt Based Alloys

Iron	7439-89-6	Not Listed
Titanium, massive	7440-32-6	Not Listed
Niobium	7440-03-1	Not Listed
U.S. - California - Proposition 65 - Developmental Toxicity		
Hafnium	7440-58-6	Not Listed
Carbon (<i>animal or vegetable origin</i>)	7440-44-0	Not Listed
Chromium, massive	7440-47-3	Not Listed
Manganese (powder)	7439-96-5	Not Listed
Tantalum	7440-25-7	Not Listed
Cobalt (powder)	7440-48-4	Not Listed
Aluminium powder, stabilized	7429-90-5	Not Listed
Molybdenum (powder)	7439-98-7	Not Listed
Nickel, massive, ≥ 1 mm	7440-02-0	Not Listed
Silicon	7440-21-3	Not Listed
Tungsten, powder	7440-33-7	Not Listed
Vanadium	7440-62-2	Not Listed
Iron	7439-89-6	Not Listed
Titanium, massive	7440-32-6	Not Listed
Niobium	7440-03-1	Not Listed
U.S. - California - Proposition 65 - Maximum Allowable Dose Levels (MADL)		
Hafnium	7440-58-6	Not Listed
Carbon (<i>animal or vegetable origin</i>)	7440-44-0	Not Listed
Chromium, massive	7440-47-3	Not Listed
Manganese (powder)	7439-96-5	Not Listed
Tantalum	7440-25-7	Not Listed
Cobalt (powder)	7440-48-4	Not Listed
Aluminium powder, stabilized	7429-90-5	Not Listed
Molybdenum (powder)	7439-98-7	Not Listed
Nickel, massive, ≥ 1 mm	7440-02-0	Not Listed
Silicon	7440-21-3	Not Listed
Tungsten, powder	7440-33-7	Not Listed
Vanadium	7440-62-2	Not Listed
Iron	7439-89-6	Not Listed
Titanium, massive	7440-32-6	Not Listed
Niobium	7440-03-1	Not Listed
U.S. - California - Proposition 65 - No Significant Risk Levels (NSRL)		
Hafnium	7440-58-6	Not Listed
Carbon (<i>animal or vegetable origin</i>)	7440-44-0	Not Listed
Chromium, massive	7440-47-3	Not Listed
Manganese (powder)	7439-96-5	Not Listed
Tantalum	7440-25-7	Not Listed
Cobalt (powder)	7440-48-4	Not Listed
Aluminium powder, stabilized	7429-90-5	Not Listed
Molybdenum (powder)	7439-98-7	Not Listed
Nickel, massive, ≥ 1 mm	7440-02-0	Not Listed
Silicon	7440-21-3	Not Listed
Tungsten, powder	7440-33-7	Not Listed
Vanadium	7440-62-2	Not Listed
Iron	7439-89-6	Not Listed
Titanium, massive	7440-32-6	Not Listed
Niobium	7440-03-1	Not Listed

SDS 03 – Cobalt Based Alloys

U.S. - California - Proposition 65 - Reproductive Toxicity - Female		
Hafnium	7440-58-6	Not Listed
Carbon (<i>animal or vegetable origin</i>)	7440-44-0	Not Listed
Chromium, massive	7440-47-3	Not Listed
Manganese (powder)	7439-96-5	Not Listed
Tantalum	7440-25-7	Not Listed
Cobalt (powder)	7440-48-4	Not Listed
Aluminium powder, stabilized	7429-90-5	Not Listed
Molybdenum (powder)	7439-98-7	Not Listed
Nickel, massive, ≥ 1 mm	7440-02-0	Not Listed
Silicon	7440-21-3	Not Listed
Tungsten, powder	7440-33-7	Not Listed
Vanadium	7440-62-2	Not Listed
Iron	7439-89-6	Not Listed
Titanium, massive	7440-32-6	Not Listed
Niobium	7440-03-1	Not Listed
U.S. - California - Proposition 65 - Reproductive Toxicity - Male		
Hafnium	7440-58-6	Not Listed
Carbon (<i>animal or vegetable origin</i>)	7440-44-0	Not Listed
Chromium, massive	7440-47-3	Not Listed
Manganese (powder)	7439-96-5	Not Listed
Tantalum	7440-25-7	Not Listed
Cobalt (powder)	7440-48-4	Not Listed
Aluminium powder, stabilized	7429-90-5	Not Listed
Molybdenum (powder)	7439-98-7	Not Listed
Nickel, massive, ≥ 1 mm	7440-02-0	Not Listed
Silicon	7440-21-3	Not Listed
Tungsten, powder	7440-33-7	Not Listed
Vanadium	7440-62-2	Not Listed
Iron	7439-89-6	Not Listed
Titanium, massive	7440-32-6	Not Listed
Niobium	7440-03-1	Not Listed
15.2 Incompatible materials	No Chemical Safety Assessment has been carried out.	
15.3 Hazardous decomposition products	WARNING: This product contains a chemical known to the State of California to cause cancer.	

Section 16: Other Information:	
Relevant Phrases (code & full text)	H228 - Flammable solid H251 - Self-heating; may catch fire H260 - In contact with water releases flammable gases which may ignite spontaneously H302 - Harmful if swallowed H361 - Suspected of damaging fertility or the unborn child. H413 - May cause long lasting harmful effects to aquatic life
Revision Date	07 November 2022
Preparation Date	24 February 2016
Disclaimer/Statement of Liability	The information herein is given in good faith but no warranty, expressed or implied, is made.
Key to abbreviations	NDA = No Data Available