

SAFETY DATA SHEET

Cobalt Alloy (cobalt-base superalloy; ingot and powder)

Prepared in accordance with the U.S. OSHA Hazard Communication Standard, 29 CFR 1910.1200 (as amended 20 May 2024), and Regulation (EC) No 1907/2006 (REACH), Annex II, as amended by Regulation (EU) 2020/878.

1. Identification of the substance/mixture and of the company/undertaking

1.1. Product identifier

Product name	Cobalt Alloy (cobalt-base superalloy)
Product forms	Ingot (massive form) and powder. This SDS covers both forms; where information differs by form it is stated.
Grades covered	Co 21, CO 25 (L-605), ECY 768, FSX-414 (VAC), MAR M 509, WI-52, X-40, X-45
Product type	Mixture (alloy)

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

Identified uses	Ingot: remelt stock for investment casting (industrial use). Powder: feedstock for additive manufacturing (industrial use).
Uses advised against	Consumer uses and supply to the general public. Uses other than those identified above. Restricted to professional/industrial users (see Section 15).

1.3. Details of the supplier of the safety data sheet

Manufacturer	SeAH Superalloy Technologies 2441 SeAH Drive Temple, TX 76504 United States Telephone: (254) 305-9997 E-mail: EHS@seahsuperalloys.com
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1.4. Emergency telephone number

24-hour emergency	(254) 305-9997
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2. Hazards identification

2.1. Classification of the substance or mixture

Classification is based on the calculation method applied to the constituent classifications in Section 3, using the highest concentration of each constituent across all grades covered by this SDS (worst case). The classification applies to all forms supplied. Massive ingot presents little hazard as supplied; the hazards are realized mainly when dust, powder or fume is generated or handled (grinding, cutting, machining, welding, melting, powder handling).

Regulation (EC) No 1272/2008 (CLP)

Skin Irrit. 2 – H315
Eye Irrit. 2 – H319
Resp. Sens. 1 – H334
Skin Sens. 1 – H317
Muta. 2 – H341
Carc. 1B – H350
Repr. 1B (fertility) / Repr. 2 (development) – H360Fd
STOT SE 3 (respiratory tract irritation) – H335
STOT RE 1 (lungs, inhalation) – H372
STOT RE 2 (central nervous system, inhalation) – H373
Aquatic Chronic 4 – H413

Aquatic Chronic 4 (H413) is derived from the cobalt content ($\geq 25\%$) by the summation method.

OSHA HCS 29 CFR 1910.1200 (2024)

Skin Corrosion/Irritation, Category 2
Serious Eye Damage/Eye Irritation, Category 2A
Respiratory Sensitization, Category 1
Skin Sensitization, Category 1
Germ Cell Mutagenicity, Category 2
Carcinogenicity, Category 1B
Reproductive Toxicity, Category 1B (fertility); Category 2 (development)
Specific Target Organ Toxicity – Single Exposure, Category 3 (respiratory tract irritation)
Specific Target Organ Toxicity – Repeated Exposure, Category 1 (lungs)
Specific Target Organ Toxicity – Repeated Exposure, Category 2 (central nervous system)
Combustible Dust (powder form and fines generated during processing)

Up to 58% of the mixture consists of ingredient(s) of unknown acute toxicity.

2.2. Label elements

Labelling according to Regulation (EC) No 1272/2008 (CLP)

Hazard pictograms

GHS07, GHS08



Signal word

DANGER

Hazard components

cobalt, nickel, chromium, tungsten, molybdenum, manganese

Hazard statements

H315 – Causes skin irritation.
H317 – May cause an allergic skin reaction.
H319 – Causes serious eye irritation.
H334 – May cause allergy or asthma symptoms or breathing difficulties if inhaled.
H335 – May cause respiratory irritation.
H341 – Suspected of causing genetic defects.
H350 – May cause cancer.
H360Fd – May damage fertility. Suspected of damaging the unborn child.
H372 – Causes damage to organs (lungs) through prolonged or repeated exposure by inhalation.
H373 – May cause damage to organs (central nervous system) through prolonged or repeated exposure by inhalation.
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/fume.
P264 – Wash hands and skin 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.

P280 – Wear protective gloves/protective clothing/eye protection/face protection.

P284 – In case of inadequate ventilation wear respiratory protection.

Precautionary statements (Response)

P302+P352 – IF ON SKIN: Wash with plenty of water.

P304+P340 – IF INHALED: Remove person to fresh air and keep comfortable for breathing.

P305+P351+P338 – IF IN EYES: Rinse cautiously with water for several minutes. Remove contact lenses, if present and easy to do. Continue rinsing.

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

P312 – Call a POISON CENTER/doctor if you feel unwell.

P314 – Get medical advice/attention if you feel unwell.

P332+P313 – If skin irritation occurs: Get medical advice/attention.

P333+P313 – If skin irritation or rash occurs: Get medical advice/attention.

P337+P313 – If eye irritation persists: Get medical advice/attention.

P342+P311 – If experiencing respiratory symptoms: Call a POISON CENTER/doctor.

P362+P364 – Take off contaminated clothing and wash it before reuse.

Precautionary statements (Storage)

P403+P233 – Store in a well-ventilated place. Keep container tightly closed.

P405 – Store locked up.

Precautionary statements (Disposal)

P501 – Dispose of contents/container in accordance with local, regional, national and international regulations.

Supplemental information

Restricted to professional users (REACH Annex XVII, entries 28–30). Ingot supplied in massive form may qualify for the labelling exemption of CLP Annex I, section 1.3.4.1; the classification and this SDS still apply.

The supplier label may show a selection of the precautionary statements above (CLP Article 28(3)).

Labelling according to OSHA HCS 29 CFR 1910.1200 (2024)

Hazard pictograms

Exclamation mark, Health hazard



Signal word

DANGER

Hazard statements

Causes skin irritation.

May cause an allergic skin reaction.

Causes serious eye irritation.

May cause allergy or asthma symptoms or breathing difficulties if inhaled.

May cause respiratory irritation.

Suspected of causing genetic defects.

May cause cancer.

May damage fertility. Suspected of damaging the unborn child.

Causes damage to organs (lungs) through prolonged or repeated exposure by inhalation.

May cause damage to organs (central nervous system) through prolonged or repeated exposure by inhalation.

May form combustible dust concentrations in air (powder form).

Precautionary statements (Prevention)

Obtain special instructions before use.

Do not handle until all safety precautions have been read and understood.

Do not breathe dust/fume.

Wash hands and skin 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/protective clothing/eye protection/face protection.

In case of inadequate ventilation wear respiratory protection.

Powder: keep away from heat, sparks, open flames and other ignition sources. Prevent dust accumulation and dust clouds.

Precautionary statements (Response)

IF ON SKIN: Wash with plenty of water. If skin irritation or rash occurs: Get medical advice/attention. Take off contaminated clothing and wash it before reuse.

IF INHALED: Remove person to fresh air and keep comfortable for breathing. If experiencing respiratory symptoms: Call a POISON CENTER/doctor.

IF IN EYES: Rinse cautiously with water for several minutes. Remove contact lenses, if present and easy to do. Continue rinsing. If eye irritation persists: Get medical advice/attention.

IF exposed or concerned: Get medical advice/attention. Call a POISON CENTER/doctor if you feel unwell.

Precautionary statements (Storage)

Store in a well-ventilated place. Keep container tightly closed. Store locked up.

Precautionary statements (Disposal)

Dispose of contents/container in accordance with local, regional, national and international regulations.

2.3. Other hazards

Processing hazards

Heating above the melting point generates metal oxide fume, which may cause metal fume fever (flu-like symptoms: chills, fever, malaise, muscle pain).

Molten metal reacts violently with water and moisture (steam explosion). Grinding, cutting, machining and welding of ingot can generate airborne particulate at exposure levels equivalent to those of the powder form.

Combustible dust

Powder and fine dust generated during processing can form explosive dust–air mixtures if dispersed in air in sufficient concentration near an ignition source.

PBT / vPvB

Not applicable – the constituents are inorganic elements; the PBT/vPvB criteria of REACH Annex XIII do not apply.

Endocrine disruption	None of the constituents is identified as having endocrine-disrupting properties under REACH Article 57(f), Regulation (EU) 2017/2100 or 2018/605 at $\geq 0.1\%$.
HNOC (OSHA)	None identified.

3. Composition/information on ingredients

3.1. Substances

Not applicable – this product is a mixture (alloy).

3.2. Mixtures

Composition				
Chemical name	Identifiers	% (w/w)	Classification – CLP (EC) No 1272/2008	Classification – OSHA HCS 2024
Cobalt	CAS: 7440-48-4 EC: 231-158-0 Index: 027-001-00-9	42.4 – 74.2	Annex VI: Carc. 1B, H350; Muta. 2, H341; Repr. 1B, H360F; Resp. Sens. 1, H334; Skin Sens. 1, H317; Aquatic Chronic 4, H413	Carc. 1B; Muta. 2; Repr. 1B; Resp. Sens. 1; Skin Sens. 1
Chromium	CAS: 7440-47-3 EC: 231-157-5	18 – 30	STOT SE 3, H335 (self-classification)	STOT SE 3 (respiratory tract irritation)
Tungsten	CAS: 7440-33-7 EC: 231-143-9	0 – 18	Skin Irrit. 2, H315; Eye Irrit. 2, H319 (self-classification)	Skin Irrit. 2; Eye Irrit. 2A
Nickel	CAS: 7440-02-0 EC: 231-111-4 Index: 028-002-00-7 (massive) 028-002-01-4 (powder)	0 – 12	Annex VI: Carc. 2, H351; STOT RE 1, H372; Skin Sens. 1, H317 (Note 7); powder only: Aquatic Chronic 3, H412	Carc. 2; Resp. Sens. 1; Skin Sens. 1; STOT RE 1 (lungs, inhalation)
Molybdenum	CAS: 7439-98-7 EC: 231-107-2	0 – 7	Repr. 2, H361d (self-classification)	Repr. 2
Tantalum	CAS: 7440-25-7 EC: 231-135-5	0 – 5	Not classified	Not classified
Niobium (Columbium)	CAS: 7440-03-1 EC: 231-113-5	0 – 3	Not classified	Not classified
Iron	CAS: 7439-89-6 EC: 231-096-4	0 – 3	Not classified	Not classified
Manganese	CAS: 7439-96-5 EC: 231-105-1	0 – 2	Eye Irrit. 2, H319; STOT RE 1 (CNS, inhalation), H372 (self-classification)	Eye Irrit. 2B; STOT RE 1 (CNS, inhalation)
Silicon	CAS: 7440-21-3 EC: 231-130-8	0 – 1	Not classified (massive); fine powder: Flam. Sol. 2, H228	Not classified (massive); fine powder: Flam. Sol. 2
Carbon	CAS: 7440-44-0 EC: 231-153-3	0.05 – 0.8	Not classified	Not classified
Zirconium	CAS: 7440-67-7 EC: 231-176-9 Index: 040-001-00-3	0 – 0.8	Annex VI (Zr powder, pyrophoric): Pyr. Sol. 1, H250; Water-react. 1, H260. Not applicable to Zr dissolved as an alloying element.	Not classified as an alloying element
Titanium	CAS: 7440-32-6 EC: 231-142-3	0 – 0.4	Repr. 2, H361 (self-classification)	Repr. 2
Aluminum	CAS: 7429-90-5 EC: 231-072-3 Index: 013-001-00-6 / 013-002-00-1	0 – 0.4	Annex VI (Al powder only): stabilized: Flam. Sol. 1, H228; Water-react. 2, H261; pyrophoric: Pyr. Sol. 1, H250; Water-react. 1, H260. Not applicable to Al dissolved as an alloying element.	Not classified as an alloying element

Concentration ranges reflect the range of compositions of the grades covered by this SDS (a group of substantially similar mixtures). Exact compositions are given on the certificate of analysis for each lot. No trade secret is claimed.

Note 7 (CLP Annex VI): alloys containing nickel are classified for skin sensitization when the nickel release rate exceeds 0.5 µg Ni/cm²/week (EN 1811). In the absence of EN 1811 data, this alloy is classified Skin Sens. 1.

Full text of H-statements: see Section 16.

4. First aid measures

4.1. Description of first aid measures

Inhalation	Remove person to fresh air and keep comfortable for breathing. If breathing is difficult, trained personnel may give oxygen; if not breathing, give artificial respiration. If respiratory symptoms (wheezing, coughing, shortness of breath) occur, call a poison center or doctor.
Skin	Remove contaminated clothing. Wash skin with plenty of soap and water. If skin irritation or rash occurs, get medical advice. For burns from hot or molten metal, cool with water and get immediate medical attention; do not attempt to remove solidified metal from the skin.
Eyes	Rinse cautiously with water for at least 15 minutes, holding eyelids open. Remove contact lenses if present and easy to do. Do not rub eyes. If irritation persists, get medical attention.
Ingestion	Rinse mouth with water. Do not induce vomiting. Never 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

Acute: irritation of the eyes, skin and respiratory tract from dust; metal fume fever from fume (onset 4–12 hours after exposure). Delayed: allergic skin reaction (dermatitis) and respiratory sensitization (asthma) in sensitized individuals; lung damage from prolonged or repeated inhalation; possible cancer and effects on fertility. See Section 11.

4.3. Indication of any immediate medical attention and special treatment needed

Treat symptomatically. Individuals with prior sensitization to nickel or cobalt may react to very low exposures. Consider biological monitoring for cobalt (urine) where exposure is suspected (see Section 8).

5. Firefighting measures

5.1. Extinguishing media

Suitable	Massive form: use media appropriate for the surrounding fire. Powder fires: Class D metal-fire extinguishing agent, dry sand, or dry powdered graphite; apply gently to avoid dispersing the powder.
Unsuitable	Do not use water, foam or halogenated agents on burning powder or molten metal (risk of steam explosion or hydrogen generation). Do not use a high-pressure stream that can disperse dust.

5.2. Special hazards arising from the substance or mixture

Massive metal is not combustible. Powder and fine dust are combustible and may form explosive dust clouds. Hazardous combustion products: metal oxide fumes (oxides of cobalt, nickel, chromium, tungsten, molybdenum, manganese and other constituents).

5.3. Advice for firefighters

Wear positive-pressure self-contained breathing apparatus (SCBA) and full protective clothing. Structural firefighter clothing provides only limited protection. Isolate the area and avoid creating dust clouds. Keep water away from molten metal.

6. Accidental release measures

6.1. Personal precautions, protective equipment and emergency procedures

Ingot: no special precautions beyond normal material handling. Powder or dust: evacuate non-essential personnel, eliminate ignition sources, avoid generating airborne dust, and wear the personal protective equipment described in Section 8 (including respiratory protection).

6.2. Environmental precautions

Prevent entry of powder or dust into drains, sewers, surface water and soil.

6.3. Methods and material for containment and cleaning up

Ingot Recover manually and return to a suitable container for reuse or recycling.

Powder / dust

Use non-sparking tools. Collect with a HEPA-filtered vacuum approved for combustible dust, or by gentle wet methods; do not dry sweep and do not use compressed air. Place in a closed, labeled container for reclaim or disposal.

6.4. Reference to other sections

See Section 8 for exposure controls and personal protection and Section 13 for disposal.

7. Handling and storage

7.1. Precautions for safe handling

Obtain special instructions before use. Use with adequate local exhaust ventilation where dust or fume is generated. Minimize dust generation and accumulation; implement housekeeping to prevent dust accumulation on surfaces. Do not breathe dust or fume. Avoid contact with skin and eyes. Wash hands before eating, drinking or smoking; do not eat, drink or smoke in work areas. Contaminated work clothing should not be taken home.

Powder: handle as a combustible metal dust (see NFPA 484 and NFPA 652). Bond and ground equipment and containers during transfer; use spark-proof tools; control ignition sources; consider inert-gas handling. Ensure dust collection systems are designed to prevent release of dust into the work area.

Molten metal: ensure tools, molds and charge materials are dry before contact with molten metal.

7.2. Conditions for safe storage, including any incompatibilities

Ingot Store in a dry place away from incompatible materials (strong acids, strong oxidizers).

Powder Store in tightly closed, labeled containers in a cool, dry, well-ventilated place away from ignition sources, moisture, strong acids and oxidizers. Store locked up.

7.3. Specific end use(s)

See Section 1.2.

8. Exposure controls/personal protection

8.1. Control parameters

Occupational exposure limits (mg/m ³)					
Constituent	Type	ACGIH TLV	EU (IOELV)	NIOSH REL	OSHA PEL
Cobalt 7440-48-4	TWA	0.02 (inhalable)	Not established	0.05 (dust & fume)	0.1 (dust & fume)
Chromium 7440-47-3	TWA	0.5 (metal)	2 (IOELV, metal)	0.5	1
Tungsten 7440-33-7	TWA	5 (metal & insoluble compounds)	Not established	5 (insoluble compounds)	Not established
	STEL	10	Not established	10	Not established

Occupational exposure limits (mg/m ³)					
Constituent	Type	ACGIH TLV	EU (IOELV)	NIOSH REL	OSHA PEL
Nickel 7440-02-0	TWA	1.5 (inhalable, elemental)	Not established	0.015	1
Molybdenum 7439-98-7	TWA	10 (inhalable); 3 (respirable) (metal & insoluble compounds)	Not established	Not established	15 (total dust, insoluble compounds)
Tantalum 7440-25-7	TWA	Not established (withdrawn 2010)	Not established	5 (metal & oxide dust)	5
	STEL	Not established	Not established	10	Not established
Niobium (Columbium) 7440-03-1	TWA	Not established	Not established	Not established	Not established
Iron 7439-89-6	TWA	5 (respirable, as iron oxide)	Not established	5 (iron oxide dust & fume, as Fe)	10 (iron oxide fume)
Manganese 7439-96-5	TWA	0.1 (inhalable); 0.02 (respirable)	Not established	1 (fume)	Not established
	STEL	Not established	Not established	3	Not established
	Ceiling	Not established	Not established	Not established	5 (fume)
Silicon 7440-21-3	TWA	Not established	Not established	10 (total); 5 (respirable)	15 (total); 5 (respirable)
Carbon 7440-44-0	TWA	Not established	Not established	Not established	Not established
Zirconium 7440-67-7	TWA	5	Not established	5	5
	STEL	10	Not established	10	Not established
Titanium 7440-32-6	TWA	Not established	Not established	Not established	Not established
Aluminum 7429-90-5	TWA	1 (respirable)	Not established	10 (total); 5 (respirable)	15 (total); 5 (respirable)

EU Member States set national occupational exposure limits that may be lower than, or additional to, the EU values shown; users in the EU must apply the national limits of their Member State. DNELs/PNECs have not been derived for the alloy; constituent DNELs are available from the REACH registration dossiers.

ACGIH carcinogen and sensitizer notations

Cobalt (7440-48-4): A3 – Confirmed animal carcinogen with unknown relevance to humans; DSEN (dermal sensitizer); RSEN (respiratory sensitizer).

Nickel (7440-02-0): A5 – Not suspected as a human carcinogen.

Chromium (7440-47-3): A4 – Not classifiable as a human carcinogen.

Iron oxide: A4 – Not classifiable as a human carcinogen.

Zirconium (7440-67-7): A4 – Not classifiable as a human carcinogen.

Aluminum (7429-90-5): A4 – Not classifiable as a human carcinogen.

ACGIH TLV basis (critical effects) and biological exposure indices

Cobalt: asthma; myocardial effects; pulmonary function. BEI®: cobalt in urine 15 µg/L (end of shift at end of workweek).

Nickel: dermatitis; pneumoconiosis.

Chromium: skin and upper respiratory tract irritation.

Tungsten: lower respiratory tract irritation.

Molybdenum: lower respiratory tract irritation.

Iron oxide: pneumoconiosis.

Manganese: CNS impairment.

Aluminum: pneumoconiosis; lower respiratory tract irritation; neurotoxicity.

8.2. Exposure controls

Engineering controls

Use local exhaust ventilation, process enclosure or other engineering controls to keep airborne concentrations below the exposure limits above. Powder handling should take place in enclosed or ventilated systems; dust collection systems must be designed for combustible metal dust.

Respiratory

Where exposure limits may be exceeded, or when handling powder or performing grinding, cutting, welding or melting: use a NIOSH-approved respirator with P100 filters (EU: FFP3 or P3 filter, EN 149 / EN 143). For higher or unknown concentrations use a powered air-purifying or supplied-air respirator. Use within a respiratory protection program meeting 29 CFR 1910.134 (EU: EN 529).

Eye / face

Safety glasses with side shields (ANSI Z87.1 / EN 166); chemical goggles when handling powder; face shield for molten metal.

Hands

Powder: nitrile gloves tested to EN ISO 374 (minimum 0.11 mm; replace when contaminated). Ingot: cut-resistant work gloves (EN 388). Molten metal: heat-resistant gloves (EN 407).

Skin / body

Long sleeves or coveralls. Antistatic, flame-resistant clothing for powder handling; molten-metal protective clothing for melting operations. Launder work clothing separately.

Environmental exposure controls

Filter exhaust air; prevent release of powder and dust to drains and the environment.

Acronyms

ACGIH: American Conference of Governmental Industrial Hygienists; BEI: Biological Exposure Index; IOELV: Indicative Occupational Exposure Limit Value;
NIOSH REL: National Institute for Occupational Safety and Health Recommended Exposure Limit; OSHA PEL: Permissible Exposure Limit; TWA: time-weighted average (8 h; NIOSH up to 10 h); STEL: short-term exposure limit (15 min); TLV: Threshold Limit Value.

9. Physical and chemical properties

9.1. Information on basic physical and chemical properties

Physical state	Solid
Color / appearance	Silver-gray metallic solid (ingot); gray metallic powder (powder)
Odor	Odorless
Odor threshold	Not applicable
Melting point / freezing point	Approx. 1,493 °C (2,719 °F) (upper limit of melting range; varies by grade)
Boiling point or range	Approx. 3,100 °C (5,612 °F) (estimated, major constituent)
Flammability	Massive form: not flammable. Powder: May form combustible dust (see Section 2.3).
Lower / upper explosion limit	Massive form: not applicable. Powder: minimum explosible concentration not determined

Flash point	Not applicable (solid)
Auto-ignition temperature	Massive form: not applicable. Powder: not determined
Decomposition temperature	Not applicable
pH	Not applicable (insoluble solid)
Kinematic viscosity	Not applicable (solid)
Solubility	Insoluble in water
Partition coefficient (log Kow)	Not applicable (inorganic)
Vapor pressure	Negligible at 20 °C
Density / relative density	7.7 – 9.2 (water = 1)
Relative vapor density	Not applicable
Particle characteristics	Ingot: not applicable (massive). Powder: particle size distribution per product specification and lot certificate of analysis

9.2. Other information

Powder explosion characteristics (Kst, Pmax, minimum ignition energy): not determined. Users should evaluate these for their process (NFPA 652 dust hazard analysis).

10. Stability and reactivity

10.1. Reactivity

Not reactive under normal conditions of use and storage. Molten metal reacts violently with water.

10.2. Chemical stability

Stable under normal conditions.

10.3. Possibility of hazardous reactions

Powder dispersed in air may form an explosive dust cloud. Contact of molten metal with water or moisture can cause a steam explosion. Hazardous polymerization will not occur.

10.4. Conditions to avoid

Generation and accumulation of dust; ignition sources near powder; contact of molten metal with water.

10.5. Incompatible materials

Strong acids, strong oxidizers, halogens.

10.6. Hazardous decomposition products

Metal oxide fumes when heated above the melting point. No hazardous decomposition products under normal conditions.

11. Toxicological information

11.1. Information on hazard classes as defined in Regulation (EC) No 1272/2008

Routes of exposure Inhalation of dust, powder or fume; skin and eye contact. Ingestion is not a likely route of occupational exposure.

Hazard class	Classification (CLP and OSHA HCS 2024) and basis
Acute toxicity	Not classified. Based on available constituent data the acute toxicity estimate exceeds the classification thresholds. Up to 58% of the mixture consists of ingredient(s) of unknown acute toxicity.
Skin corrosion / irritation	Category 2 (tungsten; worst-case composition)
Serious eye damage / irritation	Category 2 (CLP) / 2A (OSHA) (tungsten)
Respiratory sensitization	Category 1 (cobalt)
Skin sensitization	Category 1 (cobalt, nickel)

Hazard class	Classification (CLP and OSHA HCS 2024) and basis
Germ cell mutagenicity	Category 2 (cobalt)
Carcinogenicity	Category 1B (cobalt)
Reproductive toxicity	Category 1B – fertility (cobalt); Category 2 – development (molybdenum, titanium)
STOT – single exposure	Category 3 – respiratory tract irritation (chromium, $\geq 20\%$)
STOT – repeated exposure	Category 1 – lungs, inhalation (nickel, cobalt); Category 2 – central nervous system, inhalation (manganese)
Aspiration hazard	Not applicable (solid)

Toxicological data for constituents

Constituent	Endpoint	Data
Cobalt (42.4 – 74.2%) 7440-48-4	Acute toxicity	Ingestion / Oral – Rat: LD50: 6,171 mg/kg. Behavioral: somnolence; ataxia. Gastrointestinal: hypermotility, diarrhea.
	Multi-dose toxicity	Inhalation – Rat: TCLo: 2 mg/m ³ , 4 days (intermittent). Lungs, thorax or respiration: fibrosing alveolitis.
Tungsten (0 – 18%) 7440-33-7	Irritation	Eye – Rabbit: 500 mg, 24 h, mild irritation. Skin – Rabbit: 500 mg, 24 h, mild irritation.
	Reproductive	Ingestion / Oral – Rat: TDLo: 1,210 µg/kg (35 weeks pre-mating). Post-implantation mortality; musculoskeletal developmental abnormalities.
Molybdenum (0 – 7%) 7439-98-7	Reproductive	Ingestion / Oral – Rat: TDLo: 5,800 µg/kg (30 weeks pre-mating through days 1–20 of pregnancy). Specific developmental abnormality: musculoskeletal system.
Tantalum (0 – 5%) 7440-25-7	Acute toxicity	Ingestion / Oral – Mouse: LD50: 595 mg/kg.
Iron (0 – 3%) 7439-89-6	Acute toxicity	Inhalation – Rat: TCLo: 50 mg/m ³ , 60 h. Behavioral: excitement; altered fluid intake. Gastrointestinal: hypermotility, diarrhea. Inhalation – Rat: TCLo: 0.8 mg/m ³ . Lungs, thorax, respiration: emphysema.
	Multi-dose toxicity	Inhalation – Rat: TCLo: 500 µg/m ³ , 24 h/day, 61 days (continuous). Brain: degenerative changes; blood: changes in serum composition.
Manganese (0 – 2%) 7439-96-5	Acute toxicity	Ingestion / Oral – Rat: LD50: 9,000 mg/kg.
	Irritation	Eye – Rabbit: 500 mg, 24 h, mild irritation. Skin – Rabbit: 500 mg, 24 h, mild irritation.
	Reproductive	Ingestion / Oral – Rat: TDLo: 90 mg/kg (18 days pregnant). Effects on newborn: reduced weight gain; biochemical and metabolic effects.
Silicon (0 – 1%) 7440-21-3	Acute toxicity	Ingestion / Oral – Rat: LD50: 3,160 mg/kg.
	Irritation	Eye – Rabbit: 3 mg, mild irritation.
Titanium (0 – 0.4%) 7440-32-6	Reproductive	Ingestion / Oral – Rat: TDLo: 158 mg/kg (multigeneration study). Fetotoxicity; fetal death.
Aluminum (0 – 0.4%) 7429-90-5	Multi-dose toxicity	Inhalation – Human: TCLo: 4 mg/m ³ , 1 year (intermittent). Cough; dyspnea; weight loss. Inhalation – Rat: TCLo: 206 mg/m ³ , 5 h, 30 days (intermittent). Interstitial fibrosis.

Symptoms and effects

Inhalation	Acute: respiratory tract irritation; metal fume fever from fume. Chronic: asthma-like symptoms in sensitized individuals; permanent changes in lung function and pulmonary disease from prolonged or repeated inhalation of dust or fume.
Skin	Acute: irritation; mechanical abrasion from dust.

	Chronic: allergic contact dermatitis (redness, rash) in sensitized individuals.
Eyes	Serious eye irritation from dust; mechanical irritation.
Ingestion	May cause gastrointestinal irritation.
Other	Prolonged or repeated inhalation of manganese-containing fume or dust may cause manganism (Parkinson-like neurological effects).

Carcinogenicity listings

Cobalt (7440-48-4)	IARC: Group 2A – cobalt metal without tungsten carbide (Monograph 131, 2022) NTP: Reasonably anticipated to be a human carcinogen – cobalt and cobalt compounds that release cobalt ions in vivo OSHA: Not listed as a carcinogen
Nickel (7440-02-0)	IARC: Group 2B – metallic nickel NTP: Reasonably anticipated to be a human carcinogen – metallic nickel OSHA: Not listed as a carcinogen
Chromium (7440-47-3)	IARC: Group 3 – chromium metal (not classifiable) NTP: Not listed (metal) OSHA: Not listed as a carcinogen

11.2. Information on other hazards

Endocrine disruption	None of the constituents is identified as having endocrine-disrupting properties.
Other information	Heating above the melting point releases metal oxide fume, which may cause metal fume fever.

12. Ecological information

12.1. Toxicity

Massive alloy has very low solubility and low bioavailability. Powder, dust and processing by-products may release metal ions that can be harmful to aquatic organisms. The mixture is classified Aquatic Chronic 4 (H413) based on its cobalt content.

12.2. Persistence and degradability

Not applicable – metals are inorganic elements and are not subject to biodegradation.

12.3. Bioaccumulative potential

Not determined for the alloy.

12.4. Mobility in soil

Low mobility expected (insoluble solid).

12.5. Results of PBT and vPvB assessment

Not applicable (inorganic constituents).

12.6. Endocrine disrupting properties

None of the constituents is identified as having endocrine-disrupting properties for the environment.

12.7. Other adverse effects

None known.

13. Disposal considerations

13.1. Waste treatment methods

Recycling or reclaim of scrap, revert and powder is the preferred option. Waste powder, dust and processing residues must be evaluated for hazardous-waste status (USA: 40 CFR 262.11, including toxicity characteristic testing for chromium, D007). EU: assign the European Waste Catalogue code according to the process generating the waste. Dispose of contents and containers in accordance with local, regional, national and international regulations. Do not dispose of powder to drains.

14. Transport information

Ingot (massive form): not regulated as dangerous goods for transport by road, rail, sea or air (DOT, TDG, ADR/RID, IMDG, IATA).

Powder: Not regulated as dangerous goods

14.1. UN number or ID number

Not applicable (ingot & powder)

14.2. UN proper shipping name

Not applicable (ingot & powder)

14.3. Transport hazard class(es)

Not applicable (ingot & powder)

14.4. Packing group

Not applicable (ingot & powder)

14.5. Environmental hazards

Not a marine pollutant; does not meet the criteria for environmentally hazardous substances for transport.

14.6. Special precautions for user

None beyond those in Sections 6–8.

14.7. Maritime transport in bulk according to IMO instruments

Not applicable.

15. Regulatory information

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

United States

OSHA

Hazardous under 29 CFR 1910.1200 (see Section 2).

TSCA

All constituents of this alloy (cobalt, chromium, tungsten, nickel, molybdenum, tantalum, niobium, iron, manganese, silicon, carbon, zirconium, titanium, aluminum) are listed on the TSCA Inventory. Under TSCA, alloys are treated as mixtures; the alloy itself is not separately listed.

SARA 311/312 hazard categories (40 CFR 370)

Respiratory or skin sensitization; Germ cell mutagenicity; Carcinogenicity; Reproductive toxicity; Specific target organ toxicity (single or repeated exposure); Skin corrosion or irritation; Serious eye damage or eye irritation; Combustible dust (powder).

SARA Section 313 (40 CFR 372) – supplier notification. This product contains the following toxic chemicals subject to the reporting requirements of Section 313 of EPCRA:

Constituent	CAS No.	De minimis concentration
Chromium	7440-47-3	1.0%
Cobalt	7440-48-4	0.1%
Nickel	7440-02-0	0.1%
Manganese	7439-96-5	1.0% (applies only to grades containing $\geq$ 1% Mn)

The remaining constituents (tungsten, molybdenum, tantalum, niobium, iron, silicon, carbon, zirconium, titanium) are not listed under EPCRA Section 313. Aluminum (fume or dust) is listed, but aluminum is present below its 1.0% de minimis concentration.

CERCLA Reportable Quantities (40 CFR 302.4):

Constituent	CAS No.	Reportable Quantity
Chromium	7440-47-3	5,000 lbs (2,270 kg)
Nickel	7440-02-0	100 lbs (45.4 kg)

Reporting of releases of these metals is not required if the diameter of the pieces of solid metal released is larger than 100 micrometers (0.004 inches). This applies to ingot and scrap; it does not apply to powder or fine dust. The remaining constituents do not have a CERCLA Reportable Quantity.

California Proposition 65

WARNING: This product can expose you to chemicals including cobalt and nickel, which are known to the State of California to cause cancer. For more information go to www.P65Warnings.ca.gov.

European Union

REACH Annex XIV (authorisation)

No constituent is listed.

REACH Candidate List (SVHC)

No constituent is on the Candidate List as of 29 September 2026.

REACH Annex XVII (restrictions)

Entries 28–30 (CMR substances): this mixture may not be supplied to the general public; packaging must be marked "Restricted to professional users".

REACH registration

Not applicable – not placed on the EU/EEA market.

Constituents with a harmonized classification (CLP Annex VI, Table 3):

Constituent	CAS No.	Harmonized classification
Cobalt	7440-48-4	Carc. 1B H350; Muta. 2 H341; Repr. 1B H360F; Resp. Sens. 1 H334; Skin Sens. 1 H317; Aquatic Chronic 4 H413
Nickel	7440-02-0	Carc. 2 H351; STOT RE 1 H372; Skin Sens. 1 H317 (Note 7); powder: Aquatic Chronic 3 H412
Zirconium (powder)	7440-67-7	Pyr. Sol. 1 H250; Water-react. 1 H260
Aluminium (powder)	7429-90-5	Stabilized: Flam. Sol. 1 H228; Water-react. 2 H261. Pyrophoric: Pyr. Sol. 1 H250; Water-react. 1 H260

15.2. Chemical safety assessment

A chemical safety assessment has not been carried out for this mixture.

16. Other information

Revision

Rev 01 – 29 September 2026. Supersedes Rev 00 (25 September 2026).
Date of preparation / last revision (OSHA): 29 September 2026

Indication of changes

Section 1: product identifiers, identified uses and uses advised against, supplier contact and emergency information completed to Annex II / HCS 2024 format.

Section 2: mixture reclassified under CLP and HCS 2024 using the calculation method and worst-case composition. Carc. 2 / Repr. 2 replaced by Carc. 1B (H350), Muta. 2 (H341) and Repr. 1B/2 (H360Fd) due to cobalt content; skin/eye irritation and STOT SE 3 aligned between regimes; STOT RE target organs specified; combustible dust added; withdrawn precautionary statements P281, P285 and P304+P341 replaced.

Section 3: "Balance" replaced by a concentration range; iron EC number corrected (231-096-4); invalid "STOT SE 1B" removed; constituent classifications aligned between regimes; carbon and molybdenum ranges widened to cover all listed grades.

Section 8: exposure limits verified; ACGIH notations corrected (tantalum TLV withdrawn; molybdenum TLV and notation corrected); PPE made specific.

Sections 9–12: aligned to Regulation (EU) 2020/878 and HCS 2024 Appendix D (particle characteristics, endocrine-disrupting properties, hazardous decomposition products); carcinogen listings updated (IARC 2022; NTP).

Sections 14–16: transport information stated; SARA 311/312 categories updated to the 40 CFR 370 format; SARA 313, CERCLA, TSCA and REACH lists corrected to this alloy; EU restrictions added; H-statement list completed.

Classification procedure

Health and environmental hazards: calculation method (CLP Article 9(4); HCS Appendix A mixture rules) based on constituent classifications and the maximum concentration of each constituent across the grades covered. Carcinogenicity (OSHA): IARC/NTP evaluations per HCS Appendix F. Physical hazards: substance-level physical hazards of constituents do not transfer to the alloy; combustible dust per HCS 2024.

Full text of H-statements (Sections 2 and 3)

H228 – Flammable solid.

H250 – Catches fire spontaneously if exposed to air.

H260 – In contact with water releases flammable gases which may ignite spontaneously.

H261 – In contact with water releases flammable gas.

H315 – Causes skin irritation.

H317 – May cause an allergic skin reaction.

H319 – Causes serious eye irritation.

H334 – May cause allergy or asthma symptoms or breathing difficulties if inhaled.

H335 – May cause respiratory irritation.

H341 – Suspected of causing genetic defects.

H350 – May cause cancer.

H351 – Suspected of causing cancer.

H360F – May damage fertility.

H360Fd – May damage fertility. Suspected of damaging the unborn child.

H361 – Suspected of damaging fertility or the unborn child.

H361d – 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. H412 – Harmful to aquatic life with long lasting effects. H413 – May cause long lasting harmful effects to aquatic life.
Abbreviations	Carc.: Carcinogenicity; Muta.: Germ cell mutagenicity; Repr.: Reproductive toxicity; Resp. Sens.: Respiratory sensitization; Skin Sens.: Skin sensitization; Skin Irrit.: Skin irritation; Eye Irrit.: Eye irritation; STOT SE/RE: Specific target organ toxicity – single/repeated exposure; Flam. Sol.: Flammable solid; Pyr. Sol.: Pyrophoric solid; Water-react.: Substance which in contact with water emits flammable gas; Aquatic Chronic: Hazardous to the aquatic environment, chronic; CLP: Regulation (EC) No 1272/2008; HCS: Hazard Communication Standard; IARC: International Agency for Research on Cancer; NTP: National Toxicology Program; PBT/vPvB: (very) persistent, bioaccumulative and toxic; SVHC: substance of very high concern; UFI: unique formula identifier.
Key data sources	CLP Annex VI; ECHA registration dossiers; OSHA Occupational Chemical Database; NIOSH Pocket Guide; ACGIH TLVs and BEIs; IARC Monographs; NTP Report on Carcinogens.
Training advice	Workers handling powder or performing dust- or fume-generating operations must be trained in the hazards, controls and PPE described in this SDS.
Disclaimer	The information in this SDS is believed to be accurate as of the revision date and is provided as a guide for safe handling. It does not constitute a warranty. Users are responsible for determining the suitability of this information for their particular use and for complying with applicable laws and regulations. SeAH Superalloy Technologies assumes no liability for loss, damage or injury resulting from reliance on this information.