CROWN ALLOYS COMPANY

SAFETY DATA SHEET

Section 1 – PRODUCT AND COMPANY IDENTIFICATION

PRODUCT NAME: **Tungsten Carbide Alloys for Surfacing Applications**

PRODUCT IDENTIFICATION: **ROYAL 117-T** (RWC-30/40) **and ROYAL 118-T** (RWC-8/12)

RECOMMENDED USE: OFW (Oxyfuel Gas Welding) and GTAW (Gas Tungsten Arc Welding)

SPECIFICATION: N/A

SUPPLIER: Crown Alloys Company
30105 Stephenson Hwy.
Madison Heights, MI. 48071

TELEPHONE NUMBER: (248) 588-3790

EMERGENCY NUMBER: **Call CHEMTREC Day or Night 1-800-424-9300 / +1 703-527-3887**

WEBSITE: www.crownalloys.com

Section 2 – HAZARDS IDENTIFICATION

2.1 Classification of the mixture

This product is placed on the market in solid form

2.1.1 Classification in accordance with GHS-US

Acute Tox. 4 (Oral)	H302	Carc. 1B	H350
Skin Sens. 1	H317	STOT RE 1	H372
Eye Irrit. 2A	H319	STOT RE 2	H373
Resp. Sens. 1	H334	Aquatic Chronic 3	H412
STOT SE 3	H335		

2.2 Label elements

GHS-US labelling

Hazard Pictograms (GHS-US):

GHS07

GHS08

Signal word (GHS-US): Danger

Hazard statements (GHS-US):

H302 – Harmful if swallowed
H317 – May cause an allergic skin reaction
H319 – Causes serious eye irritation
H334 – May cause allergy/asthma symptoms or breathing difficulties if inhaled
H335 – May cause respiratory irritation
H350 – May cause cancer
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
CGA-HG11 – SYMPTOMS MAY BE DELAYED

Precautionary statements (GHS-US):

P201 – Obtain special instructions before use
P202 – Do not handle until all safety precautions have been read and understood

P232 – Protect from moisture

P260 – Do not breathe dust/fume/gas/mist/vapors/spray
P261 – Avoid breathing dust/fume/gas/mist/vapors/spray
P264 – Wash thoroughly after handling
P270 – Do not eat, drink or smoke when using this product
P271 – Use only outdoors or in a well-ventilated area

P272 – Contaminated work clothing should not be allowed out of the workplace
P273 – Avoid release to the environment
P280 – Wear protective gloves/protective clothing/eye protection/face protection
P281 – Use personal protective equipment as required

P285 – In case of inadequate ventilation wear respiratory protection
P301+P312 – If swallowed: Call a poison center or physician if you feel unwell
P302+P352 – IF ON SKIN: Wash with plenty of soap and water
P304+P341 – IF INHALED: If breathing is difficult, remove victim to fresh air and keep at rest in a position comfortable for breathing
P308+P313 – IF EXPOSED OR CONCERNED: Get medical advice/attention
P314 – Get medical advice and attention if you feel unwell
P321 – Specific treatment (see Section 4 of this SDS)
P330 – If swallowed, rinse mouth
P333+P313 – If skin irritation or rash occurs: Get medical advice/attention
P342+P311 – If experiencing respiratory symptoms: Call a POISON CENTER or doctor/physician
P362+P364 – Take off contaminated clothing and wash it before reuse
P391 – Collect spillage
P405 – Store locked up
P501 – Dispose of contents/container in accordance with local / regional / national / international regulations
CGA-PG27 – Read and follow the Safety Data Sheet (SDS) before use

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2.3 Other hazards

No additional information available

2.4 Unknown acute toxicity (GHS-US)

No data available

Other hazards which do not result in GHS classification: Electrical shock can kill. Arc rays can injure eyes and burn skin. Welding arc and sparks can ignite combustibles and flammable materials. Overexposure to welding fumes and gases can be hazardous. Read and understand the manufacturer's instructions, Safety Data Sheets and the precautionary labels before using these alloys. Refer to Section 8.

Substance(s) formed under the conditions of use: The welding fumes produced from these welding alloys may contain the following constituent(s) and/or their complex metallic oxides as well as solid particles or other constituents from the consumables, base metal, or base metal coating not listed below:

Chemical Identity	CAS-No.	Chemical Identity	CAS-No.	Chemical Identity	CAS-No.
Carbon Dioxide	124-38-9	Nitrogen Dioxide	10102-44-0	Nickel	7440-02-0
Carbon Monoxide	630-08-0	Ozone	10028-15-6	Manganese	7439-96-5

Section 3 – COMPOSITION / INFORMATION ON INGREDIENTS

3.1 Substances

Not applicable

Full text of H-phrases: See section 16

3.2 Mixture

Reportable Hazardous Ingredients

Chemical Identity	CAS-No.	Weight Percent (%)	GHS-US Classification
Aluminum (Al)	7429-90-5	0.01 – 1.0	Comb. Dust
Carbon (C)	7440-44-0	0.01 – 4.00	Not classified
Iron (Fe)	7439-89-6	30.0 – 65.0	Acute Tox. 4 (Oral), H302
Manganese (Mn)	7439-96-5	0.01 – 5.00	Comb. Dust
Molybdenum (Mo)	7439-98-7	0.01 – 1.00	Comb. Dust
Nickel (Ni)	7440-02-0	0.01 – 5.00	Skin Sens. 1, H317 Carc. 1B, H350 STOT RE 1, H372 Aquatic Chronic 3, H412
Silicon (Si)	7440-21-3	0.01 – 1.00	Not classified
Tungsten (W)	7440-33-7	35.0 – 70.0	Not classified
Vanadium (V)	1314-62-1	0.01 – 1.00	Not classified
Silica, crystalline	14808-60-7	3.00 max.	Eye Irrit. 2B, H319 Carc. 1B, H350 STOT SE 3, H335 STOT RE 2, H373

Composition Comments: The term "Hazardous Ingredients" should be interpreted as a term defined in Hazard Communication standards and does not necessarily imply the existence of a welding hazard. These alloys may contain additional non-hazardous ingredients or may form additional compounds under the condition of use. Refer to Sections 2 & 8 for more information.

Section 4 – FIRST AID MEASURES

4.1 Description of first aid measures

Ingestion: Unlikely due to the form of the product. Avoid hand, clothing, food, and drink contact with metal fume or powder which can cause ingestion of particulate during hand to mouth activities such as drinking, eating, smoking, etc. If ingested, do not induce vomiting. Contact a poison control center. If symptoms develop, seek medical attention at once.

Inhalation: Remove to fresh air. If not breathing, give artificial respiration. Seek medical assistance immediately.

Skin Contact: Flush with water for at least 15 minutes. For reddened or blistered skin, or thermal burns, obtain medical assistance.

Eye Contact: Dust or fume from these alloys should be flushed from the eyes with clean, tepid water until transported to a medical facility. Do not rub eyes or keep eyes tightly closed. Obtain immediate medical assistance.
Arc rays can injure eyes. If exposed, move victim to a dark room, remove contact lenses and cover eyes with a padded dressing and rest. Obtain medical assistance if symptoms persist.

4.2 Most important symptoms/effects, acute and delayed

Symptoms/injuries after skin contact: Mechanical irritation and/or dermatitis. Ionization can occur via perspiration after skin contact which may cause sensitization.

Symptoms/injuries after eye contact: Particulate matter may scratch the cornea or cause other mechanical injury to the eye. Effects may become more serious with repeated or prolonged contact. Eye contact with vapors may cause eye irritation, watering of the eyes and reddening. Prolonged contact may result in tissue damage.

Symptoms/injuries after ingestion: Not an anticipated route of exposure during normal product handling. Ingestion of large quantities of dusts and/or particulate matter may cause gastrointestinal distress.

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4.2 Most important symptoms/effects, acute and delayed (cont.)

Symptoms/injuries after inhalation: Short-term (acute) overexposure to welding fumes may result in discomfort such as metal fume fever, dizziness, nausea, or dryness or irritation of nose, throat, or eyes. May aggravate pre-existing respiratory problems (e.g. asthma, emphysema).

Acute overexposure may include signs and symptoms such as watery eyes, nose and throat irritation, headache, dizziness, difficulty in breathing, frequent coughing, or chest pain. The presence of nickel compounds in fume can cause metallic taste, nausea, tightness of chest, fever, and allergic reaction. Excessive inhalation or ingestion of manganese can produce manganese poisoning. Overexposure to manganese compounds may affect the central nervous system, symptoms of which are languor, sleepiness, muscular weakness, emotional disturbances, and spastic gait resembling Parkinsonism. These symptoms can become progressive and permanent if not treated. Excessive inhalation of fumes may cause “Metal Fume Fever” with Flu-like symptoms such as chills, fever, body aches, vomiting, sweating, etc.

Chronic symptoms of inhalation of welding fumes can lead to siderosis (iron deposits on the lungs), central nervous system effects, bronchitis and other pulmonary effects. Refer to Section 11 for more information.

4.3 Indication of immediate medical attention and special treatment needed

No additional information available

Section 5 – FIRE-FIGHTING MEASURES

General Fire Hazards: As shipped, this product is nonflammable. However, welding arc and sparks can ignite combustibles and flammable products. Read and understand American National Standard Z49.1, "Safety In Welding, Cutting and Allied Processes” and National Fire Protection Association NFPA 51B, “Standard for Fire Prevention During Welding, Cutting and Other Hot Work” before using this product.

5.1 Extinguishing media

Suitable extinguishing media: Use extinguishing media appropriate for surrounding fire.

Unsuitable extinguishing media: None

5.2 Special hazards arising from the substance

Fire hazard: Not flammable.

Explosion hazard: None known.

Hazardous decomposition products in case of fire: Fire may produce irritating, corrosive and/or toxic gases.

5.3 Special protective equipment and precautions for firefighters

Special firefighting procedures: Use standard firefighting procedures and consider the hazards of other involved materials.

Special protective equipment for firefighters: Wear positive pressure self-contained breathing apparatus (SCBA). Structural firefighters’ protective clothing will provide limited protection only.

Section 6 – ACCIDENTAL RELEASE MEASURES

6.1 Personal precautions, protective equipment and emergency procedures

If airborne dust and/or fume is present, use adequate engineering controls and, if needed, personal protection to prevent overexposure. Refer to recommendations in Section 8.

6.2 Environmental precautions

Avoid release to the environment

6.3 Methods and material for containment and cleaning up

Clean up spills immediately, observing precautions in the personal protective equipment in Section 8. Avoid generating dust. Prevent product from entering any drains, sewers or water sources. Refer to Section 13 for proper disposal. Attempt to reclaim the product if possible.

Section 7 – HANDLING AND STORAGE

7.1 Precautions for safe handling

Avoid inhaling welding fumes. Keep formation of airborne dusts to a minimum. Provide appropriate exhaust ventilation at places where dust is formed. Any deposit of dust which cannot be avoided must be regularly removed. Read and understand the manufacturer's instruction and the precautionary label on the product. See American National Standard Z49.1, "Safety In Welding, Cutting and Allied Processes" published by the American Welding Society, http://pubs.aws.org and OSHA Publication 2206 (29CFR1910), U.S. Government Printing Office, www.gpo.gov.
Do not eat, drink or smoke when using the product. Always observe good personal hygiene measures, such as washing after handling the material and before eating, drinking, and/or smoking. Cosmetics should not be applied in areas where exposures exist! Routinely wash work clothing and protective equipment to remove contaminants.

7.2 Conditions for safe storage, including any incompatibilities

Store in closed original container in a dry place. Store away from incompatible materials. Store in accordance with local/regional/national regulations.

7.3 Specific end use(s)

For welding consumables and related products

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Section 8 – EXPOSURE CONTROLS / PERSONAL PROTECTION

8.1 Control parameters

Chemical Identity (CAS-No.)	ACGIH TLV (TWA)	OSHA PEL (TWA)	NIOSH REL	NIOSH STEL
Aluminum (7429-90-5)	1 mg/m^3 (respirable fraction)	5 mg/m^3 (respirable dust as Al) 15 mg/m^3 (total dust as Al)	5 mg/m^3 (welding fume or pyrophoric powder as Al) 5 mg/m^3 (respirable) 10 mg/m^3 (total)	N/A
Carbon (7440-44-0)	2.0 mg/m^3 (respirable)	5.0 mg/m^3 (respirable) 15.0 (dust) mppcf[1]	2.5 mg/m^3 (respirable)	N/A
Iron (7439-89-6)	5.0 mg/m^3 (as Fe_2O_3) respirable fraction	10.0 mg/m^3 (fume, as Fe_2O_3)	5.0 mg/m^3 (dust) 2500 mg/m^3 (IDLH)[2]	N/A
Manganese (7439-96-5)	0.02 mg/m^3 (elemental and inorganic compounds, as Mn – respirable fraction) 0.1 mg/m^3 (elemental and inorganic compounds, as Mn – inhalable fraction)	5.0 mg/m^3 (fume, as Mn) Ceiling	1 mg/m^3 Ceiling limit value: 500 mg/m^3 (IDLH)[2]	3 mg/m^3
Molybdenum (7439-98-7)	3.0 mg/m^3 (respirable fraction, as Mo) 10.0 mg/m^3 (inhalable fraction, as Mo)	15.0 mg/m^3 (total dust, as Mo)	Ceiling limit value: 5000 mg/m^3 (IDLH)[2]	N/A
Nickel (7440-02-0)	1.5 mg/m^3 as metal (inhalable fraction)	1.0 mg/m^3 (metal and insoluble compounds as Ni)	0.015 mg/m^3 Ceiling limit value: 10 mg/m^3 (IDLH)[2]	N/A
Silicon (7440-21-3)	Withdrawn	15.0 mg/m^3 (total dust) 5.0 mg/m^3 (respirable fraction)	5.0 mg/m^3 (respirable) 10.0 mg/m^3 (total)	N/A
Tungsten (7440-33-7)	5.0 mg/m^3 (insoluble) 10.0 mg/m^3 (soluble)	5.0 mg/m^3	5.0 mg/m^3 REL	10.0 mg/m^3
Vanadium (1314-62-1)	0.05 mg/m^3 (inhalable)	0.1 mg/m^3 (V_2O_5 fume) Ceiling 0.5 mg/m^3 (V_2O_5 respirable) Ceiling	0.05 mg/m^3 (fume & dust) Ceiling	N/A

[1]million particles per cubic foot
[2]Immediately Dangerous to Life or Health

8.2 Exposure controls

Appropriate Engineering Controls:

Use enough ventilation, local exhaust at the arc, or both to keep the fumes and gases from the worker's breathing zone & the general area. Maintain exposures below acceptable exposure levels (see Section 8.1). Use industrial hygiene air monitoring to ensure that your use of these products does not create exposures that exceed the recommended exposure limits. Always use exhaust ventilation in user operations such as high temperature cutting, grinding, welding and brazing. Train the welder to keep his head out of the fume plume. Confined spaces require adequate ventilation and/or air supplied respirators. Read and understand the manufacturer's instructions and the precautionary label on the product. See American National Standard Z49.1, Safety in Welding, Cutting, and Allied Processes, published by the American Welding Society, 8669 Doral Blvd. Suite 130, Doral, FL 33166 and OSHA Publication 2206 (29CFR1910), US Government Printing Office, Washington, D.C. 20402 for more details on many of the following.

General information: **Exposure Guidelines:** Threshold Limit Values (TLVs) and Biological Exposure Indices (BEIs) are values published by the American Conference of Government Industrial Hygienists (ACGIH). ACGIH Statement of Positions Regarding the TLVs® and BEIs® states that the TLV-TWA should be used as a guide in the control of health hazards and should not be used to indicate a fine line between safe and dangerous exposures. See Section 10 for information on potential fume constituents of health interest. Threshold Limit Values are figures published by the American Conference of Government Industrial Hygienists.

Eye/face protection: Wear helmet or use face shield with filter lens shade number 12 or darker for open arc processes. Wear helmet or use face shield with filter lens of the appropriate shade number for oxyfuel welding. Shield others by providing screens and flash goggles.

Skin/Hand Protection: Wear protective gloves. Suitable gloves can be recommended by the glove supplier.

Protective Clothing: Wear hand, head, and body protection which help to prevent injury from radiation, sparks and electrical shock. See Z49.1. At a minimum this includes welder's gloves and a protective face shield, and may include arm protectors, aprons, hats, shoulder protection, as well as dark substantial clothing. Wear dry gloves free of holes or split seams. Train the welder not to permit electrically live parts or electrodes to contact skin . . . or clothing or gloves if they are wet. Insulate yourself from the work piece and ground using dry plywood, rubber mats or other dry insulation.

Respiratory Protection: Keep your head out of fumes. Use enough ventilation and local exhaust to keep fumes and gases from your breathing zone and the general area. An approved respirator should be used unless exposure assessments are below applicable exposure limits. Use respirable fume respirator or air supplied respirator when welding in confined space or where local exhaust or ventilation does not keep exposure below TLV's (see Section 8.1). Use only NIOSH approved respirators in accordance with 29 CFR 1910.134 – Respiratory Protection. Oxygen levels below 19.5% are considered IDLH by OSHA. In such atmospheres, use of a full-facepiece pressure/demand SCBA or a full-facepiece, supplied air respirator with auxiliary self-contained air supply is required under OSHA's Respiratory Protection Standard (1910.134-1998).

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Hygiene measures: Do not eat, drink or smoke when using the product. Always observe good personal hygiene measures, such as washing after handling the material and before eating, drinking, and/or smoking. Cosmetics should not be applied in areas where exposures exist! Routinely wash work clothing and protective equipment to remove contaminants.

Determine the composition and quantity of fumes and gases to which workers are exposed by taking an air sample from inside the welder's helmet if worn or in the worker's breathing zone. Improve ventilation if exposures are not below limits. See ANSI/AWS F1.1, F1.2, F1.3 and F1.5, available from the American Welding Society, www.aws.org.

Section 9 – PHYSICAL AND CHEMICAL PROPERTIES

Appearance	Cored welding rod, with core containing solid metal and non-metal particles
Physical state	Solid
Form	Solid
Color	Dark grey/black
Odor	Odorless
Odor threshold	No data available
Melting point/freezing point	>1000^{O}F (>500^{O}C)
Flammability (solid, gas)	No data available
Flash Point	Not applicable
Evaporation rate	Not applicable
Initial boiling point and boiling range	No data available
%VOC's	0%

Flammability limit - upper (%)	No data available
Flammability limit - lower (%)	No data available
Explosive limit - upper (%)	No data available
Explosive limit - lower (%)	No data available
Vapor pressure	Not applicable
Vapor density	Not applicable
Solubility in water	Insoluble
Solubility (other)	No data available
Partition coefficient (n-octanol/water)	No data available
Auto-ignition temperature	No data available
Decomposition temperature	No data available
Viscosity	Not applicable
Specific Gravity (Bulk Density)	5 - 9 g/cc

Section 10 – STABILITY AND REACTIVITY

10.1 Reactivity

This product is non-reactive under normal conditions of use, storage and transport.

10.2 Chemical stability

This product is stable under normal temperatures and pressures.

10.3 Possibility of hazardous reactions

Reacts with strong acids and alkali.

10.4 Conditions to avoid

Uncontrolled exposure to extreme temperatures and incompatible materials.

10.5 Incompatible materials

Strong acids, strong oxidizers, mineral acids.

10.6 Hazardous decomposition products

Welding/brazing fumes and gases can't be classified simply. The composition and quantity of both are dependent upon the metal being welded/brazed and the rods used. Coatings on the metal being welded/brazed (such as paint, plating, or galvanizing), the number of welders, the volume of the work area, the quality and the amount of ventilation, the position of the welder's head with respect to the gas plume, the presence of contaminants in the atmosphere (such as chlorinated hydrocarbon vapors from cleaning and degreasing activities), the process and procedures, as well as the welding/brazing consumables.

When the Royal 117-T and/or 118-T are consumed, the fume and gas decomposition products generated are different in percent and form from the ingredients listed in Section 3. Decomposition products of normal operation include those originating from the volatilization, reaction, or oxidation of the materials shown in Section 3, plus those from the base metal, coatings, etc., as noted above. Gaseous reaction products may include carbon monoxide and carbon dioxide. Ozone and nitrogen oxides may be formed by the radiation from an arc, in addition to the shielding gases like argon and helium, whenever they are employed. Reasonably expected fume constituents of the Royal 117-T and/or 118-T would include: Complex oxides of iron, manganese, silicon, nickel, molybdenum, tungsten, vanadium, carbon dioxide, carbon monoxide, ozone and nitrogen oxides. The fume limit for nickel, vanadium and/or manganese may be reached before the general welding fume limit of 5 mg/m^3 is reached. One recommended way to determine the composition and quantity of fumes and gases to which workers are exposed is to take an air sample inside the welder's helmet if worn or in the worker's breathing zone. See ANSI/AWS F1.1 *"Method for Sampling Airborne Particles Generated by Welding and Allied Processes"* and *"Characterization of Arc Welding Fume"* available from the American Welding Society, 8669 Doral Blvd. Suite 130, Doral, FL 33166.

WHEN WELDING ON BASE METALS WHICH CONTAIN CHROMIUM, A SIGNIFICANT AMOUNT OF THE CHROMIUM IN THE FUMES CAN BE HEXAVALENT CHROMIUM , ALSO KNOWN AS Cr(VI), WHICH HAS A VERY LOW EXPOSURE LIMIT OF 0.005 mg/m^3 (5 µg/m^3).
Monitor fume levels and Cr(VI) level. Train workers about the hazards of Cr(VI). **Read and comply with OSHA's permissible exposure limits for hexavalent chromium Cr(VI), Fed. Reg. 71 – 10099 (specifically 29 CFR 1910.1026, 29 CFR 1915.1026, and 29 CFR 1926.1126).** For Cr(VI), OSHA requires: "The employer shall perform initial monitoring to determine the 8-hour TWA exposure for each employee on the basis of a sufficient number of personal breathing zone air samples to accurately characterize full shift exposure on each shift, for each job classification, in each work area". Specialized equipment is required for monitoring Cr(VI) concentration in the workplace. OSHA Analytical Method Number ID-215 for area and breathing zone sampling and OSHA Analytical Method Number W4001 for wipe samples are listed on the OSHA website – www.osha.gov – as methods for measuring Cr(VI). This standard is complex and the employer should contact an occupational health professional for doing the Cr(VI) monitoring and all other fume monitoring.

EU RoHS (European Union Restriction of Hazardous Substances): FINISHED PRODUCTS MANUFACTURED USING THE ROYAL 117-T and/or ROYAL 118-T WILL NOT CONTAIN ANY Cr(VI).

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Section 11 – TOXICOLOGICAL INFORMATION

Royal 117-T and Royal 118-T as sold and distributed is not expected to cause hazardous exposures. During welding activity, the likely routes of exposure could include ingestion, skin, eyes, but most importantly by inhalation of welding fumes and dust. Inhalation of welding fumes and gases can be dangerous to your health. Classification of welding fume is difficult because of site specific factors such as varying base materials, coatings, air contamination and processes. The International Agency for Research on Cancer has classified welding fumes as possibly carcinogenic to humans (Group 2B).

Information on likely routes of exposure

Ingestion: Health injuries from ingestion are not expected under normal use. Should ingestion occur, it may cause gastrointestinal irritation, nausea, vomiting and diarrhea. Ingestion may cause irritation to mucous membranes.

Inhalation: Potential chronic health hazards related to the use of welding consumables are most applicable to the inhalation route of exposure. It may cause allergy or asthma symptoms or breathing difficulties if inhaled. Refer to Inhalation statements in this section.

Skin Contact: Repeated or prolonged skin contact may cause allergic reactions with susceptible persons. Prolonged contact may cause redness and irritation. Arc rays can burn skin. Skin cancer has been reported.

Eye contact: May cause eye irritation with susceptible persons. Arc rays can injure eyes.

Symptoms related to the physical, chemical and toxicological characteristics

Inhalation: Short-term (acute) overexposure to welding fumes may result in discomfort such as metal fume fever, dizziness, nausea, or dryness or irritation of nose, throat, or eyes. May aggravate pre-existing respiratory problems (e.g. asthma, emphysema). Long-term (chronic) overexposure to welding fumes can lead to siderosis (iron deposits in lung), central nervous system effects, bronchitis and other pulmonary effects.

Respiratory exposure to the crystalline silica present in the Royal 117-T and Royal 118-T is not anticipated during normal use. Respiratory overexposure to airborne crystalline silica is known to cause silicosis, a form of disabling pulmonary fibrosis which can be progressive and may lead to death. Crystalline silica is on the IARC (International Agency for Research on Cancer) and NTP (National Toxicology Program) lists as posing a cancer risk to humans.

Information on toxicological effects

Acute toxicity (list all possible routes of exposure): Harmful if swallowed

Specified substance: IRON LD50 (oral, rat) = 98.6 g/kg ATE (oral) = 984.00 mg/kg LDLO (intraperitoneal, rabbit) = 20 mg/kg – no toxic effect noted	**Specified substance: MANGANESE** LD50 (oral, rat) = 9000 mg/kg ATE (oral) = 9000000.0 mg/kg LC50 (inhalation) > 5.14 mg/l air (analytical)	**Specified substance: TUNGSTEN** LD50 (oral) > 2000 mg/kg bw LD50 (dermal) > 2000 mg/kg bw LC50 (inhalation) > 5.4 mg/l air
Specified substance: NICKEL LD50 (oral, rat) > 9000 mg/kg bw LDLO (oral, rat) = 5000 mg/kg NOAEC > 10.2 mg/l air	**Specified substance: SILICON** ATE (oral) = 3160.0 mg/kg LD50 (oral, rat) = 3160 mg/kg	**Specified substance: CARBON** LD50 (oral, rat) > 10000 mg/kg
Specified substance: VANADIUM PENTOXIDE LD50 (oral, rat) = 221.1 – 715.7 mg/kg LD50 (dermal, rabbit) = 50 mg/kg LC50 (inhalation, rat) = 2.21 mg/l / 4h	**Specified substance: SILICA, CRYSTALLINE** LD50 (oral, rat) = 500 mg/kg ATE (oral) = 500.00 mg/kg	

Repeated dose toxicity (product): Not classified

Skin corrosion/irritation (product): Not classified

Serious eye damage/irritation (product): Not classified

Respiratory or skin sensitization (product): May cause an allergic skin reaction

Germ cell mutagenicity (product): Not classified

Carcinogenicity (product): May cause cancer (if inhaled)

Nickel (7440-02-0)	
International Agency for Research on Cancer (IARC) Monographs	2B (Possibly carcinogenic to humans)
National Toxicology Program (NTP) Status	Reasonably anticipated to be a Human Carcinogen

Vanadium Pentoxide (1314-62-1)	
International Agency for Research on Cancer (IARC) Monographs	2B (Possibly carcinogenic to humans)
National Toxicology Program (NTP) Status	1
International Agency for Research on Cancer (IARC) Monographs	2B (Possibly carcinogenic to humans)

Silica, Crystalline [Quartz] (14808-60-7)	
International Agency for Research on Cancer (IARC) Monographs	1 (Carcinogenic to humans)
National Toxicology Program (NTP) Status	2 (Known To Be Human Carcinogen)

Reproductive toxicity (product): Not classified

Specific target organ toxicity - single exposure (product): Not classified

Specific target organ toxicity - repeated exposure (product): Causes damage to organs through prolonged or repeated exposure

Aspiration hazard (product): Not classified

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Other Effects: Organic polymers may be used in the manufacture of various welding consumables. Overexposure to their decomposition byproducts may result in a condition known as polymer fume fever. Polymer fume fever usually occurs within 4 to 8 hours of exposure with the presentation of flu like symptoms, including mild pulmonary irritation with or without an increase in body temperature. Signs of exposure can include an increase in white blood cell count. Resolution of symptoms typically occurs quickly, usually not lasting longer than 48 hours.

Symptoms related to the physical, chemical and toxicological characteristics under the condition of use:

Specified substance: NICKEL **Inhalation:** Nickel and its compounds are on the IARC and NTP lists as posing respiratory cancer risk, and are skin sensitizers with symptoms ranging from slight itch to severe dermatitis.	**Specified substance: MANGANESE** **Inhalation:** Overexposure to manganese fumes may affect the brain and central nervous system, resulting in poor coordination, difficulty speaking, and arm or leg tremors. This condition can be irreversible.

Additional toxicological information under the conditions of use:

Acute toxicity

Specified substance: CARBON MONOXIDE LC50 (inhalation, rat) = 1300 mg/l /4h	**Specified substance: CARBON DIOXIDE** LCLo (inhalation, human) = 90000 ppm/5 min.	**Specified substance: NITROGEN DIOXIDE** LC50 (inhalation, rat) = 88 ppm/4h **Specified substance: OZONE** LCLo (inhalation, human) = 50 ppm/30 min.

Carcinogenicity:

Specified substance: Nickel	
International Agency for Research on Cancer (IARC) Monographs	2B (Possibly carcinogenic to humans)
National Toxicology Program (NTP) Status	Reasonably anticipated to be a Human Carcinogen

Section 12 – ECOLOGICAL INFORMATION

Ecotoxicity

Acute hazards to the aquatic environment:

Fish

Specified substance: NICKEL LC50 (Fathead minnow (Pimephales promelas), 96 h): 2.916 mg/l LC50 (Brachydanio rerio), 96 h): >100 mg/l EC50 (Daphnia magna), 48 h): >100 mg/l LC50 (Cyprinus carpio) [semi-static], 96 h): 1.3 mg/l EC50 (Daphnia magna) [static], 48 h): 1 mg/l	**Specified substance: MOLYBDENUM** LC50 (Rainbow trout, donaldson trout (Oncorhynchus mykiss), 96 h): 800 mg/l **Specified substance: IRON and/or iron alloys (as Fe)** LC50 (Cyprinus carpio) [semi-static], 96 h): 0.56 mg/l

Aquatic Invertebrates

Specified substance: NICKEL EC50 (Water flea (Daphnia magna), 48 h): 1 mg/l EC50 (Pseudokirchneriella subcapitata), 72 h): 0.18 mg/l EC50 (Pseudokirchneriella subcapitata) [static], 96 h): 0.174 – 0.311 mg/l	**Specified substance: MANGANESE** EC50 (Water flea (Daphnia magna), 48 h): 40 mg/l

Chronic hazards to the aquatic environment:

Fish (product): Not classified
Aquatic Invertebrates (product): Not classified
Toxicity to Aquatic Plants (product): Not classified

Persistence and Degradability
Biodegradation (product): No data available

Bioaccumulative Potential
Bioconcentration Factor (BCF) (product): No data available

Specified substance: NICKEL
Zebra mussel (Dreissena polymorpha), Bioconcentration Factor (BCF): 5,000 - 10,000 (Lotic) Bioconcentration factor calculated using dry weight tissue conc

Mobility in Soil: No data available

Other Adverse Effects: Very toxic to aquatic organisms

Section 13 – DISPOSAL CONSIDERATIONS

Waste disposal recommendations: Prevent waste from contaminating surrounding environment. Discard any product, residue, disposable container or liner in an environmentally acceptable manner, in full compliance with international/federal/state/local regulations. However, alloy wastes are normally collected to recover metal values.

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Section 14 – TRANSPORT INFORMATION

In accordance with DOT / ADR / RID / ADNR / IMDG / ICAO / IATA

14.1 UN number

Welding wires and rods are not classified as dangerous goods and therefore have no UN number.

14.2 UN proper shipping name

Not applicable

14.3 Additional information

Other information: No supplementary information available

Overland transport:

No additional information available

Transport by sea:

No additional information available

Air transport:

No additional information available

Section 15 – REGULATORY INFORMATION

15.1 US Federal regulations

Manganese (7439-96-5)	**Nickel (7440-02-0)**
Listed on the United States TSCA (Toxic Substances Control Act) inventory Listed on SARA Section 313 (Specific toxic chemical listings)	Listed on the United States TSCA (Toxic Substances Control Act) inventory Listed on SARA Section 313 (Specific toxic chemical listings)
SARA Section 313 - Emission Reporting: **1.0 %**	SARA Section 313 - Emission Reporting: **0.1%**

Vanadium pentoxide (1314-62-1)	**Aluminum (7429-90-5)**
Listed on the United States TSCA (Toxic Substances Control Act) inventory Listed on SARA Section 302 (Specific toxic chemical listings)	Listed on the United States TSCA (Toxic Substances Control Act) inventory Listed on SARA Section 313 (Specific toxic chemical listings)
SARA Section 302 Threshold Planning Quantity (TPQ): **≤ 10000**	SARA Section 313 - Emission Reporting: **1.0 % (dust or fume only)**

Iron (7439-89-6)	**Molybdenum (7439-98-7)**
Listed on the United States TSCA (Toxic Substances Control Act) inventory	Listed on the United States TSCA (Toxic Substances Control Act) inventory

Carbon (7440-44-0)	**Silicon (7440-21-3)**
Listed on the United States TSCA (Toxic Substances Control Act) inventory	Listed on the United States TSCA (Toxic Substances Control Act) inventory

Silica, crystalline (14808-60-7)
Listed on the United States TSCA (Toxic Substances Control Act) inventory

15.2 US State regulations

Nickel (7440-02-0)				
U.S. - California - Proposition 65 - Carcinogens List	U.S. - California - Proposition 65 - Developmental Toxicity	U.S. - California - Proposition 65 - Reproductive Toxicity - Female	U.S. - California - Proposition 65 - Reproductive Toxicity - Male	No significance risk level (NSRL)
Yes				
U.S. - Massachusetts - Right To Know List U.S. - Minnesota - Hazardous Substance List		U.S. - New Jersey - Right to Know Hazardous Substance List U.S. - Pennsylvania - RTK (Right to Know) List		

Vanadium pentoxide (1314-62-1)				
U.S. - California - Proposition 65 - Carcinogens List	U.S. - California - Proposition 65 - Developmental Toxicity	U.S. - California - Proposition 65 - Reproductive Toxicity - Female	U.S. - California - Proposition 65 - Reproductive Toxicity - Male	No significance risk level (NSRL)
Yes				
U.S. - Massachusetts - Right To Know List U.S. - Minnesota - Hazardous Substance List		U.S. - New Jersey - Right to Know Hazardous Substance List U.S. - Pennsylvania - RTK (Right to Know) List		

Silica, crystalline (14808-60-7)				
U.S. - California - Proposition 65 - Carcinogens List	U.S. - California - Proposition 65 - Developmental Toxicity	U.S. - California - Proposition 65 - Reproductive Toxicity - Female	U.S. - California - Proposition 65 - Reproductive Toxicity - Male	No significance risk level (NSRL)
Yes				
U.S. - Massachusetts - Right To Know List U.S. - Minnesota - Hazardous Substance List		U.S. - New Jersey - Right to Know Hazardous Substance List U.S. - Pennsylvania - RTK (Right to Know) List		

Aluminum (7429-90-5)	**Manganese (7439-96-5)**
U.S. - Massachusetts - Right To Know List U.S. - Minnesota - Hazardous Substance List U.S. - New Jersey - Right to Know Hazardous Substance List U.S. - Pennsylvania - RTK (Right to Know) List	U.S. - Massachusetts - Right To Know List U.S. - Minnesota - Hazardous Substance List U.S. - New Jersey - Right to Know Hazardous Substance List U.S. - Pennsylvania - RTK (Right to Know) List

Silicon (7440-21-3)	**Tungsten (7440-33-7)**
U.S. - Massachusetts - Right To Know List U.S. - Minnesota - Hazardous Substance List U.S. - New Jersey - Right to Know Hazardous Substance List U.S. - Pennsylvania - RTK (Right to Know) List	U.S. - Massachusetts - Right To Know List U.S. - Minnesota - Hazardous Substance List U.S. - New Jersey - Right to Know Hazardous Substance List U.S. - Pennsylvania - RTK (Right to Know) List

Molybdenum (7439-98-7)	
U.S. - Massachusetts - Right To Know List U.S. - Minnesota - Hazardous Substance List	U.S. - New Jersey - Right to Know Hazardous Substance List U.S. - Pennsylvania - RTK (Right to Know) List

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Section 16 – OTHER INFORMATION

SUPERSEDES LAST REVISION: 03/15/2018 (SDS)

HMIS RATING (Hazardous Materials Information System)			
Health (blue) - 2	**Flammability (red) - 0**	**Reactivity (yellow) - 0**	**Protective Equipment - X** (See Sections 4, 8 & 10)

Health Hazard: **0** (minimal acute or chronic exposure hazard); **1** (slight acute or chronic exposure hazard); **2** (moderate acute or significant chronic exposure hazard); **3** (severe acute exposure hazard; one time overexposure can result in permanent injury and may be fatal); **4** (extreme acute exposure hazard; onetime overexposure can be fatal).

Flammability Hazard: **0** (minimal hazard); **1** (materials that require substantial pre-heating before burning); **2** (combustible liquid or solids; liquids with a flash point of 38-93ºC [100-200ºF]); **3** (Class IB and IC flammable liquids with flash points below 38ºC [100ºF]); **4** (Class IA flammable liquids with flash points below 23ºC [73ºF] and boiling points below 38ºC [100ºF].

Reactivity Hazard: **0** (normally stable); **1** (material that can become unstable at elevated temperatures or which can react slightly with water); **2** (materials that are unstable but do not detonate or which can react violently with water); **3** (materials that can detonate when initiated or which can react explosively with water); **4** (materials that can detonate at normal temperatures or pressures).

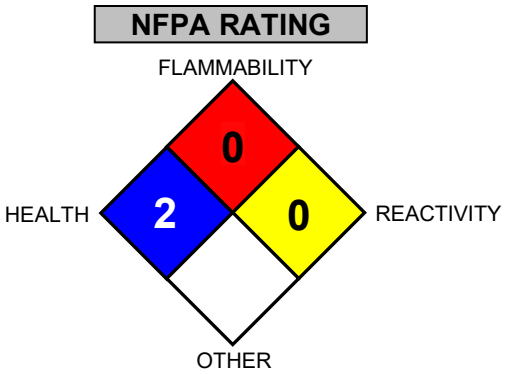
Caution: HMIS® ratings are based on a 0-4 rating scale, with 0 representing minimal hazards or risks, and 4 representing significant hazards or risks. Although HMIS® ratings are not required on SDS's under 29 CFR 1910.1200, the preparer may choose to provide them. HMIS® ratings are to be used only in conjunction with a fully implemented HMIS® program by workers who have received appropriate HMIS® training. HMIS® is a registered trade and service mark of the NPCA.

NATIONAL FIRE PROTECTION ASSOCIATION:

Health Hazard: **0** (material that on exposure under fire conditions would offer no hazard beyond that of ordinary combustible materials); **1** (materials that on exposure under fire conditions could cause irritation or minor residual injury); **2** (materials that on intense or continued exposure under fire conditions could cause temporary incapacitation or possible residual injury); **3** (materials that can on short exposure cause serious temporary or residual injury); **4** (materials that under very short exposure causes death or major residual injury).

Flammability Hazard: Refer to definitions for "HMIS RATING (Hazardous Materials Information System)"

Reactivity Hazard: Refer to definitions for "HMIS RATING (Hazardous Materials Information System)"



DEFINITIONS OF TERMS

CAS No. - Chemical Abstracts Service Number
OSHA - U.S. Occupational Safety and Health Administration
PEL - Permissible Exposure Level
TLV - Threshold Limit Value
TWA - Time Weighted Average
STEL - Short Term Exposure Limit
NIOSH - National Institute of Occupational Safety and Health
ACGIH - American Conference of Governmental Industrial Hygienists
TDLo - the lowest dose to cause a symptom
TCLo - the lowest concentration to cause a symptom
LD50 & LC50 - These values are the amount of a substance given to the stated species that causes 50% of that species to die.
SARA - Superfund Amendments and Reauthorization Act
IARC - International Agency for Research on Cancer
GHS – Globally Harmonized System

Full text of H-phrases (from Section 2)

Acute Tox. 4 (Oral)	Acute toxicity (oral), Category 4	**H302**	Harmful if swallowed
Skin Sens. 1	Sensitisation — Skin, Category 1	**H317**	May cause an allergic skin reaction
Eye Irrit. 2A	Eye Irritation, Category 2A	**H319**	Causes serious eye irritation
Resp. Sens. 1	Respiratory Sensitiser, Category 1	**H334**	May cause allergy/asthma symptoms or breathing difficulties if inhaled
STOT SE 3	Specific target organ toxicity — Single exposure, Category 3	**H335**	May cause respiratory irritation
Carc. 1B	Carcinogenicity, Category 1B	**H350**	May cause cancer
STOT RE 1	Specific target organ toxicity — Repeated exposure, Category 1	**H372**	Causes damage to organs through prolonged or repeated exposure
STOT RE 2	Specific target organ toxicity — Repeated exposure, Category 2	**H373**	May cause damage to organs through prolonged or repeated exposure
Aquatic Chronic 3	Hazardous to the aquatic environment — Chronic Hazard, Category 3	**H412**	Harmful to aquatic life with long lasting effects

DISCLAIMER OF EXPRESSED AND IMPLIED WARRANTIES: Crown Alloys Company urges each end user and recipient of this SDS to study it carefully. If necessary, consult an industrial hygienist or other expert to understand this information and safeguard the environment and protect workers from the potential hazards associated with the handling or use of this product. The information in this document is believed to be correct as of the date issued. However, this information is provided without any representation or warranty, expressed or implied, regarding accuracy or correctness. The conditions or methods of handling, storage, use and disposal of the product are beyond our control and may be beyond our knowledge. For this and other reasons we do not assume responsibility and expressly disclaim liability of loss, damage, or expense arising from it or any way connected with the handling, storage, use, or disposal of this product. Data may be changed from time to time. Be sure to consult the latest edition of the SDS. Compliance with all applicable Federal, State, Provincial and local laws and regulations remain the responsibility of the user.