

CROWN ALLOYS COMPANY

MATERIAL SAFETY DATA SHEET

Section 1 – COMPANY AND MATERIAL IDENTIFICATION

PRODUCT TYPE: Aluminum bare wire for gas tungsten arc welding (GTAW) and gas metal arc welding (GMAW).

TRADE NAME: CROWN R XXXX for TIG or CROWN ER XXXX for MIG

SPECIFICATION: AWS A5.10

CLASSIFICATION: **R A356.0, R 1100, ER 1100, R 2319, ER 2319, R 4043, ER 4043, R 4047(718), R 4145, R 5356, ER 5356**

VENDOR: Crown Alloys Company

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Section 2 - HAZARDOUS INGREDIENTS

HMIS RATING (Hazardous Materials Information System)

Health (blue) - 2	Flammability (red) - 0	Reactivity (yellow) - 0	Protective Equipment - X <small>(See Section 7)</small>
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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 38-93°C [100-200°F]); 3 (Class IB and IC flammable liquids with flash points below 38°C [100°F]); 4 (Class IA flammable liquids with flash points below 23°C [73°F] and boiling points below 38°C [100°F]).

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 MSDS'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.

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Section 2 - HAZARDOUS INGREDIENTS (continued)

IMPORTANT! This section covers the material from which these products are manufactured. The fumes and gases produced when welding with normal use of these products are covered in Sections 5 and 6.

Ingredient	CAS No.	OSHA - TWA PEL,mg/m ³	(ACGIH – TWA) ¹ TLV,mg/m ³	LD ₅₀	Wt.%
Aluminum	7429-90-5	15 (total dust) 5 (respirable)	10 (dust) 5 (fume)	Not Available	85-99.5
Beryllium & its compounds	7440-41-7	0.002, 0.005 (ceiling) 0.025 (30 min peak/8hr shift)	0.00005	Not Available	0.0003 max
Chromium ^(a)	7440-47-3	1 (Metal) 0.5 as Cr (Cr II compounds) 0.5 as Cr (Cr III compounds, inorganic) 0.005 (5 micrograms) as Cr VI (Cr VI compounds, water soluble) 0.005 as Cr VI (Cr VI compounds, water insoluble) 0.1 (as CrO ₃)	0.5 (Metal) 0.5 as Cr (Cr III compounds, inorganic) 0.05 as Cr (Cr VI compounds, water soluble) 0.01 as Cr (Cr VI compounds, water insoluble)	Not Available	0.20 max
Copper	7440-50-8	0.1 (fume) 1.0 (dust/mist)	0.2 (fume) 1.0 (dust/mist)	35 mg/kg, mouse intra-peritoneal	0.05-6.8
Iron	7439-89-6	10 as Fe (oxide dust & fume)	5 (respirable) as Fe (oxide dust & fume)	Not Available	0.95 max
Magnesium ^(b)	7439-95-4	15 total particulate (oxide fume)	10 inhalable (oxide fume)	Not Available	5.6 max
Manganese	7439-96-5	5 (ceiling) (dust fume)	0.2 (dust fume)	9,000 mg/kg, rat, oral	1.0 max
Silicon	7440-21-3	15 (total dust) 5 (respirable)	10 (total dust)	3160 mg/kg, rat, oral	0.20-13.0
Titanium ^(c)	7440-32-6	15 as oxide dust (total particulate)	10 as oxide dust	Not Available	0.05-0.20
Vanadium	7440-62-2	0.5 (ceiling) as V ₂ O ₅ (respirable dust) 0.1 (ceiling) as V ₂ O ₅ (respirable fume)	0.05 as V ₂ O ₅ (respirable dust)	Not Available	0.15 max
Zinc	7440-66-6	5 (oxide fume) 15 (total oxide dust) 5 (respirable oxide dust)	2, 10 (STEL) as respirable oxide dust	Not Available	0.25 max
Zirconium	7440-67-7	5 (compounds only)	5,10 (STEL)	Not Available	0.10-0.25

^a Not In R1100, ER1100, R2319, ER2319, R4043, ER4043, R4047(718) or RA356.0

^b Not In R1100 or ER1100

^c Not In R1100, ER1100, R4047(718) or RA356.0

¹The ACGIH has an established exposure limit for Welding Fumes, Not Otherwise Classified. That Threshold Limit Value is 5 mg/m³. NIOSH classifies welding fumes as carcinogens.

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Section 3 - PHYSICAL and CHEMICAL CHARACTERISTICS

Appearance:	Silver-Gray Solid Wire	pH:	Not Applicable
Freeze-Melt Point:	970 ⁰ -1215 ⁰ F (521 ⁰ -657 ⁰ C)	Odor:	None
Vapor Pressure (mm):	Not Applicable	Density:	Approximately .11b/in ³
Vapor Density (air=1):	Not Applicable	Boiling Point:	Not Applicable
Specific Gravity:	2.5 – 2.9	Solubility In Water:	None
Odor Threshold (ppm):	Not Applicable		
Coefficient of Water/Oil Distribution:	Not Applicable		

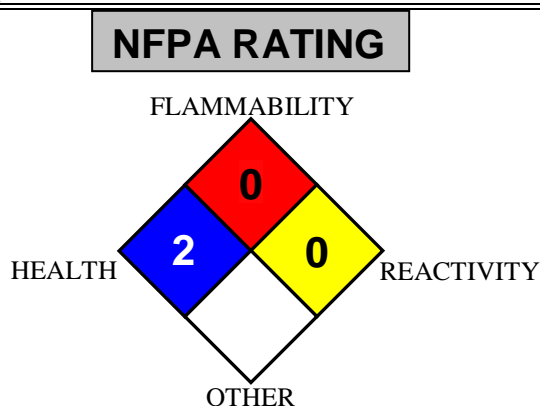
Section 4 - FIRE and EXPLOSION HAZARD DATA

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)"



-FLAMMABLE PROPERTIES: Non-flammable as *shipped*. Small chips and dust from processing may ignite readily. Welding arc and sparks can ignite combustibles and flammables. Refer to American National Standard Z49.1 for fire prevention during the use of welding and allied procedures.

-FIRE/EXPLOSION: May be a potential hazard under the following conditions:

- Dusts or fines dispersed in the air can be explosive.
- Chips, fines and dust in contact with water can generate flammable/explosive hydrogen gas. These gases could present an explosion hazard in confined or poorly ventilated spaces.
- Fines and dust in contact with certain metal oxides (e.g. rust). A thermite reaction, with considerable heat generation, can be initiated by a weak ignition source.
- Molten aluminum in contact with water/moisture can be explosive. Contact of molten aluminum with other metal oxides can initiate a thermite reaction.

-EXTINGUISHING MEDIA:

- Use fire fighting methods and materials that are appropriate for surrounding fire. Use coarse water spray on chips or turnings. For fines, dust or molten aluminum, use Class D extinguishing agents.
- **DO NOT** use halogenated extinguishing agents on small chips/fines. Do not use water in fighting fires around molten aluminum.
- Fire fighters should wear NIOSH approved, positive pressure, self-contained breathing apparatus and full protective clothing when appropriate.

Section 5 – STABILITY AND REACTIVITY DATA

Hazardous Decomposition Products

Aluminum is stable under normal conditions of use, storage, and transportation as shipped (See Section 4). Chips, fines, dust and molten aluminum are considerably more reactive with the following (See next page for more):

- **Water:** Slowly generates flammable/explosive hydrogen gas and heat. Generation rate is greatly increased with smaller particles (e.g., fines and dusts).
Molten aluminum can react violently/explosively with water or moisture, particularly when the water is entrapped.

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Section 5 – STABILITY AND REACTIVITY DATA (continued)

Chips, fines, dust and molten aluminum are considerably more reactive with the following:

- **Heat:** Oxidizes at a rate dependent upon temperature and particle size.
- **Strong Oxidizers:** Violent reaction with considerable heat generation. Can react explosively with nitrates (e.g., ammonium nitrate and fertilizers containing nitrate) when heated or molten.
- **Acids and Alkalis:** Reacts to generate flammable/explosive hydrogen gas. Generation rate is greatly increased with smaller particles (e.g., fines and dusts).
- **Halogenated Compounds:** Many halogenated hydrocarbons, including halogenated fire extinguishing agents, can react violently with finely divided aluminum.
- **Iron Oxide (rust) and other metal oxides (e.g., copper and lead oxides):** A violent thermite reaction generating considerable heat can occur. Reaction with aluminum fines and dusts requires only very weak ignition sources for initiation. Molten aluminum can react violently without an external ignition source.
- **Iron Powder:** An explosive reaction forming hydrogen gas occurs when heated above 1470°F (600°C).

Welding fumes and gases can not be classified simply. The composition and quantity of both are dependent upon the metal being welded, coatings on the metal being welded (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 consumables.

When the electrode/wire is consumed, the fume and gas decomposition products generated are different in percent and form from the ingredients listed in Section 2. Decomposition products of normal operation include those originating from the volatilization, reaction, or oxidation of the materials shown in Section 2, plus those from the base metal, coatings, etc., as noted above.

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, 550 N.W. LeJeune Road, Miami, FL 33126.

Reasonably expected decomposition products from normal use of these products include a **complex of the oxides of the materials listed in Section 2, as well as carbon monoxide, carbon dioxide, ozone (TLV 0.1 ppm ceiling and PEL 0.1 ppm), nitric oxide (TLV 25 ppm and PEL 25 ppm) and nitrogen dioxide (TLV 3, 5 ppm STEL and PEL 5 ppm ceiling). The fume limit for chromium and manganese may be reached before the general limit for welding fumes (5 mg/m³) is reached. 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/m³ (5 µg/m³).**

EU RoHS (European Union Restriction of Hazardous Substances): Some of these aluminum welding alloys contain Chromium. During welding these alloys will produce Cr(VI) (hexavalent chromium), however, the weld deposit does not contain Cr(VI) as it will all be in the zero valent state or as Cr(III) as an oxide. FINISHED PRODUCTS MANUFACTURED USING THESE ALUMINUM WELDING ALLOYS WILL NOT CONTAIN ANY Cr(VI).

Section 6 - HEALTH HAZARD DATA

- **Medical conditions aggravated by exposure to this product:** Chronic lung disease, skin rashes, and asthma.
- **EYES:** Explosion/fire hazards may be present (See Section 4). Welding fume can cause irritation. Ultraviolet radiation from welding can cause flash burns.
- **SKIN:** Explosion/fire hazards may be present (See Section 4). Aluminum can cause irritation. Ultraviolet radiation and infrared heat rays from flames and hot metal can burn skin.

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Section 6 - HEALTH HAZARD DATA (continued)

- **INHALATION:** Welding fumes can be a cancer hazard, cause respiratory tract irritation, cause metal fume fever, and other health effects listed below:
 - Welding processes generate fumes and an intense ultraviolet radiation that results in the formation of ozone and oxides of nitrogen. Exposure to *low* levels of **ozone** can cause irritation of the eyes, nose and throat. Inhalation can cause chest tightness, headache, shortness of breath, cough, wheeze and narrowing of airways. Symptoms disappear when removed from exposure.
 - Exposure to *high* levels of **ozone** may cause acute respiratory distress with shortness of breath, pulmonary changes, hemorrhage and pulmonary edema (fluid in lungs). Symptoms of pulmonary edema may be delayed for one or more hours. Exposure of test animals and human tissue to high concentrations has shown chromosomal changes, reproductive effects, blood changes, and death from lung congestion.
 - **Oxides of nitrogen** can cause irritation of the eyes, skin (when moist), and respiratory tract. Exposure to *high* levels of **nitrogen oxides** can cause delayed pulmonary edema (fluid in the lungs) which may be fatal. **Nitric oxide** can cause formation of methemoglobin, which decreases the blood's ability to carry oxygen. *Chronic overexposure* can cause pulmonary fibrosis (scarring of the lungs).
 - **Aluminum dust/fines and fumes** are a low risk by inhalation. For standard operations (milling, cutting, grinding), **aluminum dust** should be treated as a nuisance dust as defined by the ACGIH.
 - *Overexposure* to **magnesium oxide** fumes can cause respiratory tract irritation and fever, chills, shortness of breath and malaise (metal fume fever). *Temporary symptoms* can include fever, chills, nausea, vomiting, and muscular pain. *Chronic exposure* to high levels of **magnesium dust or fumes** can cause nervous system disorders, pneumonitis (inflammation of lung tissue), and may cause fibrosis (scarring of lung tissue) and reproductive disorders in males.
 - *Overexposure* to **manganese** and **manganese compounds** above safe exposure limits can cause irreversible damage to the central nervous system, including the brain, symptoms of which may include slurred speech, lethargy, tremor, muscular weakness, psychological disturbances and spastic gait.
 - *Chronic exposure* to inert **dusts of silicon** can cause increased airway resistance and contributes to chronic bronchitis. Intratracheal administration of **silicon** in rabbits produced significant pulmonary lesions.
 - *Exposure* to **zinc oxide fumes** subsequent to burning, welding, and molten metal work can result in fever, chills, shortness of breath, malaise (metal fume fever), and upper respiratory tract irritation. *Temporary symptoms* can include fever, chills, nausea, vomiting and muscular pain. *Exposure* to dust or fines presents a low health risk by inhalation.
 - **Hexavalent chromium (Chrome VI)** can cause asthma, kidney damage, primary irritant dermatitis, sensitization dermatitis, skin ulceration, and pulmonary edema (fluid in the lungs). *Chronic* inhalation or *overexposure* has been associated with lung, nasal, gastrointestinal cancer. **Hexavalent chromium** is listed as carcinogenic to humans by IARC (Group 1)*. **Chromium** and some of its compounds are listed as carcinogenic by the NTP. **Hexavalent chromium** compounds may be generated during welding operations with alloys containing **chromium**. See Section 5 for more information.
 - *Overexposure* to **copper fume** may exist when welding, flame cutting, etc. *Overexposure* to **copper dust/ mists** can cause irritation of the eyes, skin, and upper respiratory tract. *Chronic overexposure* may result in blood disorders (anemia), and skin and hair discoloration. *Overexposure* to **copper fume** can result in respiratory tract irritation, nausea, fever, chills, shortness of breath and malaise (metal fume fever).
 - **Beryllium** can cause irritant dermatitis, allergic contact dermatitis, and skin granulomas. Inhalation of excessive levels of **beryllium** can result in acute pneumonitis (inflammation of the lung tissues). **Beryllium** can cause lung sensitization in susceptible individuals. *Chronic* inhalation of dust and fumes by these sensitized individuals can result in a serious, progressive disease called Chronic Beryllium Disease (CBD) which can, over time, be fatal. Inhalation of **beryllium** has produced lung tumors in animals. **Beryllium** is listed on the NTP and is known to be carcinogenic to humans by IARC (Group 1)*.
- ***IARC CLASSIFICATIONS:**
 - Group 1: The agent is carcinogenic to humans. There is sufficient evidence that a causal relationship existed between exposure to the agent and human cancer.

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Section 7 - PRECAUTIONS FOR SAFE HANDLING & USE/APPLICABLE CONTROL MEASURES

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, 550 N.W. LeJeune Road, Miami, FL 33126 and OSHA Publication 2206 (29CFR1910), US Government Printing Office, Washington, D.C. 20402 for more details on many of the following.

Aluminum should be kept dry. Avoid generating dust (See **Section 4**). Avoid contact with sharp edges or heated metal. Hot and cold aluminum are not visually different.

VENTILATION AND ENGINEERING CONTROLS: Maintain exposures below the acceptable exposure levels (see Section 2). 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, 550 N.W. LeJeune Road, Miami, FL 33126 and OSHA Publication 2206 (29CFR1910), US Government Printing Office, Washington, D.C. 20402 for more details on many of the following.

RESPIRATORY PROTECTION: 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 2). 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).

FOR MAXIMUM SAFETY:

BE CERTIFIED FOR AND WEAR A RESPIRATOR AT ALL TIMES WHEN WELDING OR BRAZING!

EYE PROTECTION: Ensure eyewash/safety shower stations are available near areas where these products are used. Wear safety glasses, goggles or face-shield with filter lens of appropriate shade number (per ANSI Z49.1-1988, "Safety in Welding and Cutting").

PROTECTIVE CLOTHING: Wear head, hand, and body protection which help to prevent injury from radiation, sparks, and electrical shock. See ANSI Z49.1. As a minimum this includes welder's gloves, protective face shield, dark substantial clothing, and may include arm protectors, aprons, hats, and shoulder protection.

WORK PRACTICES AND HYGIENE PRACTICES: As with all chemicals, avoid getting these products ON YOU or IN YOU. Wash hands after handling these products. Do not eat or drink while handling these products.

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

Section 8 – FIRST AID MEASURES

- **EYES:** Flush eyes with plenty of water or saline for at least 15 minutes. Consult a physician.
- **SKIN:** Wash thoroughly with soap and water. Consult a physician if irritation persists.
- **INHALATION:** Remove to fresh air. Check for clear airway, breathing, and presence of pulse. Provide CPR for persons without pulse or respirations. Consult a physician immediately.

Section 9– DEFINITIONS

CAS No.	Chemical Abstracts Service Number	PEL	Permissible Exposure Level
TLV	Threshold Limit Value	STEL	Short Term Exposure Limit
LD₅₀	Lethal Dose (50 percent kill)	IARC	International Agency for Research on Cancer

Section 10 - SARA TITLE III SECTION 313 SUPPLIER NOTIFICATION

Welding and brazing rod contains chemicals subject to the reporting requirements of Section 313 of Title III of the Superfund Amendments and Reauthorization Act of 1986 and 40 CFR Part 372.

- **STATE REGULATIONS:**
Warning: This product contains or produces a chemical known to the State of California to cause cancer and birth defects (or other reproductive harm). (California Health & Safety Code 25249.5 et seq.)
PENNSYLVANIA "Special Hazardous Substance": Beryllium; Nickel; Chromium compounds, hexavalent.

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