

USA 80S-D2 Welding Wire and Rod

U.S. ALLOY CO.
dba Washington Alloy
7010-G Reames Rd.
Charlotte, NC 28216
www.weldingwire.com



American Welding Society
Sustaining Company Member



ALLOY DESCRIPTION AND APPLICATION;

80S-D2 is a low alloy designed to produce high strengths on a wide range of base metals such as problem steels containing high sulfur to the basic carbon and low alloy Cr-Mo base metals. Its silicon level with molybdenum and manganese gives you excellent arc stability, low spatter, yielding a flat bead with excellent impact values and high ductile tensile strengths in the 100,000 psi range. 80S-D2 produces X-ray quality and porosity free welds even over poor cleaned base metals – widely use out of position .

TYPICAL GMAW WELDING PROCEDURES; DCEP Short Circuit ⁽¹⁾ 98Ar/2% O₂

Wire Diameter	Wire Speed (ipm)	Amps	Volts	Travel speed (ipm)	CO ₂ (cfh)
0.023	80-350	30-85	14-19	10-15	20-25
0.030	110-340	40-130	15-20	12-24	20-25
0.035	100-520	60-235	16-25	11-40	20-30
0.045	70-270	90-290	18-23	12-22	25-35
<i>Spray 0.035</i>	<i>320-600</i>	<i>160-300</i>	<i>23-26</i>	<i>11-22</i>	⁽¹⁾ 25-35
<i>0.045</i>	<i>170-550</i>	<i>170-375</i>	<i>23-29</i>	<i>12-21</i>	⁽¹⁾ 25-35
<i>1/16"</i>	<i>175-350</i>	<i>275-475</i>	<i>25-31</i>	<i>9-19</i>	⁽¹⁾ 25-35

TYPICAL GTAW WELDING PROCEDURES; DCEN with EWTh-2 truncated conical tip

Filler Wire Size	Tungsten	Amps	Volts	Gas Cup Size	Argon (cfh)	Base thickness
1/16"	1/16"	100-160	12	3/8"	20	1/16-3/32"
1/16-3/32"	3/32"	120-250	12	3/8"	20	1/8- 3/16"
1/8"	1/8"	150-300	12	1/2"	25	1/4-1/2"

Procedures may vary with change in position, base metals, filler metals, equipment and other changes.

TYPICAL WIRE CHEMISTRY (%) AND WELD METAL PROPERTIES; 100%CO₂

	AWS Spec.	80S-D2		AWS Spec.	Typical
Carbon	0.07-0.12	0.080	Tensile Strength (psi)	80,000 min.	99,000
Manganese	1.60-2.10	1.95	Yield Strength (psi)	68,000 min.	84,000
Silicon	0.50-0.80	0.60	Elongation in 2"	17% min.	22%
Phosphorus	0.025 max	0.012	Charpy V-notch at -20°F	20 ft-lbs min.	30 ft-lbs
Sulfur	0.025 max	0.012	Reduction of area	n/a	55%
Nickel	0.15 max	0.020			
Molybdenum	0.40-0.60	0.50			
Copper	0.50 max	0.10			

AVAILABLE SIZES: TC = Spools and rods of .030, .035, .045, 1/16,

TT = Cut lengths of .025, .030, .035, .045, 1/16, 3/32, 1/8, 5/32, 3/16

SPECIFICATIONS; ANSI/AWS A5.28 ER 80S-D2

ASME SFA 5.28 ER 80S-D2 ; A-2, F-6

EAST COAST

GULF COAST

WEST COAST

7010-G Reames Rd
Charlotte, NC 28216

4755 Alpine Drive #100A
Stafford, TX 77477

8535 Utica Ave
Rancho Cucamonga, CA 91730

Tel (888) 522-8296

Tel (877) 711-9274

Tel(800)830-9033

Fax (704)598-6673

Fax (281)313-6332

Fax (909)291-4586



Warehouse Distribution Center – Dayton, Ohio

Head Office – Puyallup, Washington

Washington Alloy Company believes that all information and data given is correct. Use this information to assist in making your own evaluations or decisions and this information should not be mistaken as an expressed or implied warranty. U.S. ALLOY CO. assumes no liability for results or damages incurred from the use of any information contained herein, in whole or in part.

LINCOLN® ER90S-B3

Low Alloy Steel ■ AWS ER90S-B3

KEY FEATURES

- High strength filler metal used for precision welding of 2.25% Cr – 1% Mo high pressure piping, pressure vessels, and dissimilar combinations of Cr-Mo and carbon steels
- Designed to sustain elevated temperatures within demanding work environments
- Produced to the most stringent quality standards including AWS A.5.28 and ASME SFA-5.28
- Trace elements are controlled to ensure low Briscato factor (X-Factor < 10 ppm)
- Q2 Lot® - Certificates showing actual wire chemistry available online

CONFORMANCES

AWS A5.28/A5.28M: ER90S-B3

ASME SFA-5.28 ER90S-B3

TYPICAL APPLICATIONS

- Power Generation, Nuclear Industries

WELDING POSITIONS

All

DIAMETERS / PACKAGING

Diameter in (mm)	10 lb (4.5 kg) Plastic Tube 30 lb (13.6 kg) Master Carton
1/16 (1.6)	ED034357
3/32 (2.4)	ED034358
1/8 (3.2)	ED034359

MECHANICAL PROPERTIES⁽¹⁾ – As Required per AWS A5.28/A5.28M

	Yield Strength ⁽²⁾ MPa (ksi)	Tensile MPa (ksi)	Elongation on 4d (%)	Charpy V-Notch @-28°C (-20°F) J (ft-lbf)	Hardness (Rockwell B)
Requirements - AWS A5.28	540 (78) min	620 (90) min	17 min	-	-
TIG (100% Argon)	575-620 (83-90)	690-725 (100-105)	22-24	250-264 (185-195)	95-97

WIRE COMPOSITION⁽¹⁾ – As Required per AWS A5.28/A5.28M

	%C	%Mn	%Si	%S	%P	%Cr	%Ni	%Mo	%Cu
Requirements AWS ER90S-B3	0.07-0.12	0.40-0.70	0.40-0.70	0.025 max	0.025 max	2.30-2.70	0.20 max	0.90-1.20	0.35 max
Test Results⁽³⁾	0.10	0.56-0.58	0.53-0.54	0.003-0.004	0.005	2.4	0.03-0.04	1.02-1.04	0.06-0.08

⁽¹⁾Typical all weld metal. ⁽²⁾Measured with 0.2% offset. ⁽³⁾See test results disclaimer

Material Safety Data Sheets (MSDS) and Certificates of Conformance are available on our website at www.lincolnelectric.com

TEST RESULTS

Test results for mechanical properties, deposit or electrode composition and diffusible hydrogen levels were obtained from a weld produced and tested according to prescribed standards, and should not be assumed to be the expected results in a particular application or weldment. Actual results will vary depending on many factors, including, but not limited to, weld procedure, plate chemistry and temperature, weldment design and fabrication methods. Users are cautioned to confirm by qualification testing, or other appropriate means, the suitability of any welding consumable and procedure before use in the intended application.

CUSTOMER ASSISTANCE POLICY

The Lincoln Electric Company is manufacturing and selling high quality welding equipment, consumables, and cutting equipment. Our challenge is to meet the needs of our customers and to exceed their expectations. On occasion, purchasers may ask Lincoln Electric for information or advice about their use of our products. Our employees respond to inquiries to the best of their ability based on information provided to them by the customers and the knowledge they may have concerning the application. Our employees, however, are not in a position to verify the information provided or to evaluate the engineering requirements for the particular weldment. Accordingly, Lincoln Electric does not warrant or guarantee or assume any liability with respect to such information or advice. Moreover, the provision of such information or advice does not create, expand, or alter any warranty on our products. Any express or implied warranty that might arise from the information or advice, including any implied warranty of merchantability or any warranty of fitness for any customers' particular purpose is specifically disclaimed.

Lincoln Electric is a responsive manufacturer, but the selection and use of specific products sold by Lincoln Electric is solely within the control of, and remains the sole responsibility of the customer. Many variables beyond the control of Lincoln Electric affect the results obtained in applying these types of fabrication methods and service requirements.

Subject to Change – This information is accurate to the best of our knowledge at the time of printing. Please refer to www.lincolnelectric.com for any updated information.

Techalloy® 309/309L

AWS ER309L

CONFORMANCES

AWS ER309L

UNS 30983

UNS 30980

ISO 14343:2009 (23 12 L)

CWB



Techalloy® 309/309L electrodes have reduced carbon levels (0.04% max) that offers increased resistance to inter-granular corrosion. Type 309/309L is ideal for joining stainless steels to themselves or to carbon or low alloy steels, and can be used at temperatures of up to 700°F (371°C). Reduced carbon levels help prevent intergranular corrosion.

Applications: Do not exceed service temperatures of 700°F (371°C).

DIAMETERS / PACKAGING

Diameter in (mm)		MIG WIRE 33 lb (14.9 kg) Wire Basket	TIG WIRE 10 lb (4.5 kg) Tube 30 lb (13.6 kg) Master Carton	SAW WIRE 55 lb (25 kg) Coil
0.035	(0.9)	MG309L035667		
0.045	(1.2)	MG309L045667		
1/16	(1.6)	MG309L062667	TG309L062638	
3/32	(2.4)		TG309L093638	SA309L093726
1/8	(3.2)		TG309L125638	SA309L125726
5/32	(4.0)		TG309L156638	SA309L156726

DEPOSIT COMPOSITION

	%C	%Cr	%Ni	%Mo	%Mn
Requirements AWS ER309L	0.03 max.	23.0 - 25.0	12.0 - 14.0	0.75 max.	1.0 - 2.5
Typical Performance Techalloy® 309/309L	0.01	23.4	13.6	0.06	1.6
	%Si	%P	%S	%Cu	FN
Requirements AWS ER309L	0.30 - 0.65	0.03 max.	0.03 max.	0.75 max.	Not Required
Typical Performance Techalloy® 309/309L	0.38	0.02	0.007	0.07	9 - 14

TYPICAL OPERATING PROCEDURES

Process	Diameter in (mm)	Voltage (volts)	Amperage	Gas Flow	Gas
MIG	0.035 (0.9) 0.045 (1.2) 1/16 (1.6)	26-29 28-32 29-33	160-210 180-250 200-280	30-50 CFH	98/99% Argon + 2/1% Oxygen 97% Argon + 3% CO ₂
TIG	1/16 (1.6) 3/32 (2.4) 1/8 (3.2) 5/32 (4.0)		90-130 120-175 150-220 160-230	20 - 40 CFH	100% Argon
SAW	3/32 (2.4) 1/8 (3.2) 5/32 (4.0)	28-33 29-32 30-33	275-350 350-450 400-550		Lincolnweld® P2007

Material Safety Data Sheets (MSDS) are available on our website at www.techalloy.com

TEST RESULTS

Test results for mechanical properties, deposit or electrode composition and diffusible hydrogen levels were obtained from a weld produced and tested according to prescribed standards, and should not be assumed to be the expected results in a particular application or weldment. Actual results will vary depending on many factors, including, but not limited to, weld procedure, plate chemistry and temperature, weldment design and fabrication methods. Users are cautioned to confirm by qualification testing, or other appropriate means, the suitability of any welding consumable and procedure before use in the intended application.

CUSTOMER ASSISTANCE POLICY

The Lincoln Electric Company is manufacturing and selling high quality welding equipment, consumables, and cutting equipment. Our challenge is to meet the needs of our customers and to exceed their expectations. On occasion, purchasers may ask Lincoln Electric for information or advice about their use of our products. Our employees respond to inquiries to the best of their ability based on information provided to them by the customers and the knowledge they may have concerning the application. Our employees, however, are not in a position to verify the information provided or to evaluate the engineering requirements for the particular weldment. Accordingly, Lincoln Electric does not warrant or guarantee or assume any liability with respect to such information or advice. Moreover, the provision of such information or advice does not create, expand, or alter any warranty on our products. Any express or implied warranty that might arise from the information or advice, including any implied warranty of merchantability or any warranty of fitness for any customers' particular purpose is specifically disclaimed.

Lincoln Electric is a responsive manufacturer, but the selection and use of specific products sold by Lincoln Electric is solely within the control of, and remains the sole responsibility of the customer. Many variables beyond the control of Lincoln Electric affect the results obtained in applying these types of fabrication methods and service requirements.

Subject to Change – This information is accurate to the best of our knowledge at the time of printing. Please refer to www.lincolnelectric.com for any updated information.

LANCASTER ALLOYS COMPANY

**PREMIUM QUALITY WELDING WIRE
FOR THE AEROSPACE
AND AIRCRAFT INDUSTRIES**



**LANCASTER ALLOYS COMPANY
PROMISE OF TECHNICAL & ENGINEERING SUPPORT
WE HELP BUILD PERFORMANCE**

It is the policy of LANCASTER ALLOYS COMPANY to support our customers in their welding applications. We realize that this industry is tremendously varied and is often very complicated. We want the users of our products to be as successful as possible, therefore, we encourage you to call us whenever we can help.

Such interaction helps us to supply alloys that are the very best they can be for you, rather than simply suggesting that you use a standard alloy from existing stock. Even if we must suggest alloys from other suppliers, our commitment to excellence and quality in the aerospace industry is of the utmost importance to us.

Alloys geared specifically to our performance criteria may sometimes cost more, but almost always saves time and money by minimizing rework, production delays, confusion and product profit degradation to you.

So, call us anytime you need us -----

We're not in the commodity business - we are dedicated to building performance that will last into the 21st Century.

LANCASTER ALLOYS COMPANY



STOCK LIST

LAC STOCK # ¹	ALLOY DESIGNATION	CHEMICAL COMPOSITION
-----------------------------	----------------------	----------------------

Aluminum alloys

4181	4008	7Si 0.3Mg 0.1Ti
4184	4145	10Si 4Cu
4185	4047	12Si
4189	4643	4.1Si 0.2Mg
4190	4043	5.2Si
4191	2319	6.3Cu 0.3Mn 0.18Zr 0.15Ti 0.10V
4245	C355.0	5.0Si 1.2Cu 0.50Mg
4246	A357.0	7.0Si 0.52Mg 0.12Ti 0.06Be
A106	5356	5.0Mg

Cobalt based alloys

5385	ALLOY 21	62Co 27Cr 2.8Ni 5.5Mo 0.25C
5789	ALLOY 31	54Co 25.5Cr 10.5Ni 7.5W
5796	L-605	52Co 20Cr 10Ni 15W
5801	HS 188	39Co 22Cr 22Ni 14.5W 0.07La

Magnesium alloys

4350	AZ61A	6.5Al 0.95Zn
4395	AZ92A	9Al 2Zn
4396	EZ33A	3.3Ce 2.5Zn 0.7Zr
M107	AZ101	10Al 1.0Zn

• Call toll free (800) LA-WIRES

LAC STOCK # ¹	ALLOY DESIGNATION	CHEMICAL COMPOSITION
--------------------------	-------------------	----------------------

Nickel based alloys

5675	FM 92	70Ni 15.5Cr 7Fe 3.0Ti 2.4Mn
5679	FM 62	73Ni 15.5Cr 2.2Cb 8.0Fe
5778	FM 69	72Ni 15.5Cr 2.4Ti 1(Cb+Ta) 0.7Al 7Fe
5786	ALLOY W	62.5Ni 5.0Cr 24.5Mo 5.5Fe
5798	ALLOY X	47.5Ni 22Cr 1.5Co 9.0Mo 0.60W 18.5Fe
5800	ALLOY 41	54Ni 19Cr 11Mo 3.2Ti 1.5Al 0.006B
5828	WASPALLOY	57Ni 19.5Cr 13.5Cb 4.2Mo 3.1Ti 1.4Al 0.006B
5829	ALLOY 90	56Ni 19.5Cr 18Co 2.5Ti 1.5Al
5832	ALLOY 718	52.5Ni 19Cr 5.1(Cb+Ta) 0.90Ti 0.5Al 18Fe
5835	ALLOY 82	72Ni 3.2Mn 20Cr 2.5(Cb+Ta) 0.48Ti
5837	ALLOY 625	62Ni 21.5Cr 9.0Mo 3.7(Cb+Ta)
5838	ALLOY S	65Ni 16Cr 15Mo 0.30Al 0.06La
5872	ALLOY 263	48Ni 20Cr 20Co 5.9Mo 2.2Ti 0.45Al
N100	B2	26Mo
N112	80/20	80Ni 20Cr

Iron based alloys²

5621	420	13Cr (0.30-0.40C)
5656	21-6-9	9.0Mn 20Cr 6.5Ni 0.27N
5659	15-5PH	15Cr 4.5Ni 0.30(Cb+Ta) 3.5Cu
5680	347A	18.5Cr 11Ni 0.40(Cb+Ta) HiSi
5689	321	18Cr 10.5Ni 0.40Ti
5692	316	19Cr 12.5Ni 2.50Mo
5694	310	27Cr 21.5Ni
5776	410	12.5Cr 0.15C

• Call toll free (800) LA-WIRES

LAC STOCK # ¹	ALLOY DESIGNATION	CHEMICAL COMPOSITION
--------------------------	-------------------	----------------------

Iron based alloys (continued)

5782	349	20.5Cr 9.0Ni 0.50Mo 1.5W 1.2(Cb+Ta) 0.20Ti
5784	312	29Cr 9.5Ni
5794	N-155	31Fe 21Cr 20Ni 20Co 3Mo 2.5W 1(Cb+Ta) 0.15N
5802	INCO 909	41Fe 37.5Ni 14Co 4.8(Cb+Ta) 1.5Ti
5813	15-7	15Cr 7.1Ni 2.4Mo 1Al
5817	GREEK ASCOLOY	13Cr 2.0Ni 3.0W
5823	ALLOY 190	11.8Cr 2.8Ni 1.6Co 1.8Mo 0.32V
5824	17-7PH	17Cr 7.1Ni 1.0Al
5825	17-4PH	16.4Cr 4.8Ni 0.22Cb 3.6Cu
5826	15-5PH VM	15Cr 5.1Ni 0.30(Cb+Ta) 3.2Cu

Low alloy steel

6456	4340	0.80Cr 1.8Ni 0.25Mo (0.35-0.40C)
6457	4130	0.95Cr 0.20Mo (0.28-0.33C)
6458	17-22VM	1.25Cr 0.65Si 0.50Mo 0.30V (0.28-0.33C)
6461	6130	1Cr 0.2V (0.28-0.33C)

Titanium alloys

4914	15-3-3-3	15V 3Al 3Cr 3Sn
4951	C.P	99Ti (Commercially pure)
4954	6-4	6Al 4V Std
4955	8-1-1	8Al 1Mo 1V
4956	6-4 ELI	6Al 4V ELI
4975	6-2-4-2	6.0Al 2.0Sn 4.0Zr 2.0Mo 0.08Si

Notes:

1. AMS designation used as LAC stock # where applicable.
2. Low alloy carbon grade are available where applicable.
3. 308; 308L; 309 & 309L Stainless is certified to AWS A5. 9-93 only.

Call toll free (800) LA-WIRES

Table Of Contents

Guide To Filler Metal Selection	II
Filler Metal Of Aluminum Based Alloys	1
Filler Metal Of Cobalt Based Alloys	2
Filler Metal Of Magnesium Based Alloys	3
Filler Metal Of Nickel Based Alloys	4
Filler Metal Of Iron Based Heat And Corrosion Resistant Alloys And Stainless Steels	5
Filler Metal Of Low Alloy Steel	6
Filler Metal Of Titanium Based Alloys	7

Guide To Filler Metal Selection

The properties of welded joints mainly depend on properties of an alloy formed from the filler metal and base metal. Strength, Ductility, resistance to weld cracking, gas porosity, corrosion resistance, heat treatability and other properties may be largely influenced by the degree of dilution of the filler metal.

The extent of the fusion of the base metal and dilution with the filler metal depends upon joint design, welding process used, and welding procedure. Weld cracking tendencies are generally reduced by keeping bare alloy dilution to a minimum.

The proper choice of a filler metal in welding is an extremely important factor, and in combination with the welding technique, it may play a crucial role in achieving the desired results.

This catalog is designed to introduce selectively and very generally the correlation and proper usage between base alloys and the suggested filler metal Lancaster Alloys Company has to offer.

Though the welding industry is tremendously complicated and widely varied in it's nature, we hope that you will find the information we have put together here as helpful and beneficial as possible.

Understanding our customer's needs and supplying them with the best weld wire possible is our most important goal.

THE FOLLOWING DOCUMENT IS PROTECTED UNDER
UNITED STATES AND INTERNATIONAL COPYRIGHT LAWS.
REPRODUCTION, IN FULL OR PARTIALLY, IS STRICTLY
PROHIBITED WITHOUT THE WRITTEN PERMISSION OF
LANCASTER ALLOYS COMPANY.

SAFETY DATA SHEET

SECTION 1 IDENTIFICATION

Product Stock No: 5832
Product Name: TURBALOY• 718 (ALLOY 718) AMS 5832
Product use: Welding Wire and Rod

Manufacturer's name: UNITED STATES WELDING CORPORATION
Address: 3579 HWY 50 E. #104, Carson City, NV 89701
Emergency phone: (775) 883-7878
Business phone: (775) 883-7878
Website: www.usweldingcorp.com
Date of issue: 11/30/15

SECTION 2—HAZARDS IDENTIFICATION

The article is NOT classified as dangerous according to Directive 1999/45/EC

Byproducts generated during the welding process are considered hazardous.

Warning!- Avoid breathing fumes and gases, they may be dangerous to your health. Always use adequate ventilation. Always use appropriate personal protective equipment.

Primary Routes of Entry: Respiratory System, Eyes and/or Skin.

Electric Shock: Arc welding and associated process can kill. See Section 8

See Section 11 for more detailed information on health effects and symptoms.

Arc Rays: The welding arc can injure eyes and burn skin.

Fumes and Gases: Can be dangerous to your health.



WARNING

SECTION 3—COMPOSITION/INFORMATION ON INGREDIENTS

Components	CAS No.	EC No.	Wt. %	Classification
Aluminum	7429-90-5	231-072-3	0.80	F: R15, R10
Chromium	7440-47-3	231-157-5	21.00	Not Classified
Cobalt	7440-48-4	231-158-0	1.00	R42/43 R53
Copper	7440-50-8	231-159-6	0.30	Not Classified
Iron	7439-89-6	231-096-4	Bal	Not Classified
Manganese	7439-96-5	231-105-1	0.35	Xn, R20/22
Molybdenum	7439-98-7	231-107-2	3.30	Not Classified
Nickel	7440-02-0	231-111-4	55.00	Carc. Cat. 3: R40, R43
Silicon	7440-21-3	231-130-8	0.35	Not Classified
Titanium	7440-32-6	231-142-3	1.15	Xn: R15

The above percent concentrations are considered nominal and are provided for industrial hygiene purposes. They do not represent a certification of content.

SECTION 4 FIRST AID MEASURES

These measures apply primarily to the byproducts produced during welding.

Inhalation - For over-exposure to airborne fumes and particulate, remove exposed person to fresh air. If breathing is difficult or has stopped, administer artificial respiration or oxygen as indicated. Seek medical attention promptly.

Skin - Remove contaminated clothing. Wash affected areas with soap or mild detergent and water. If thermal burn has occurred, flush area with cold water and seek medical attention. If mechanical abrasion has occurred, seek medical attention.

Eye - To remove dusts or fumes flush with water for at least fifteen minutes. If irritation persists, obtain medical assistance. For radiation burns due to arc flash, see physician.

Ingestion - While Ingestion is not a likely route of exposure for these products. If swallowed call physician immediately! Do not induce vomiting unless directed by medical personnel. Never give fluids or induce vomiting if person is unconscious, having convulsions, or not breathing.

SECTION 5 FIRE-FIGHTING MEASURES

Welding consumables applicable to this sheet as shipped are nonreactive, nonflammable, non explosive and essentially nonhazardous until welded. Welding arcs and sparks can ignite combustibles and flammable products. Unused welding consumables may remain hot for a period of time after completion of a welding process. See American National Standard (ANSI) Z49.1 for further general safety information on the use and handling of welding consumables and associated procedures.

Fire-Fighting Equipment: Wear a self-contained breathing apparatus (SCBA) with a full face-piece operated in pressure-demand or positive-pressure mode and full protective clothing.

SECTION 6 ACCIDENTAL RELEASE MEASURES

As shipped this product does not pose a hazard to the environment.

SECTION 7 HANDLING AND STORAGE

HANDLING: No specific requirements in the form supplied. Handle with care to avoid cuts. Wear gloves when handling welding consumables. Avoid exposure to dust. Do not ingest. Some individuals can develop an allergic reaction to certain materials. Retain all warning and product labels.

STORAGE: Keep separate from acids and strong bases to prevent possible chemical reactions.

SECTION 8 EXPOSURE CONTROLS/PERSONAL PROTECTION

Components	OSHA PEL (mg/m ³)	ACGIH (mg/m ³)
Aluminum	15mg/m ³ (Total metal dust) 5 mg/m ³ (Metal dust – respirable fraction)	10 mg/m ³ (Metal dust) 5 mg/m ³ (Welding fumes)
Beryllium	0.002 mg/m ³ , 0.005 mg/m ³ (ceiling), 0.025 mg/m ³ (water soluble)	0.002 mg/m ³
Chromium *	1.0 mg/m ³ (Metal as Cr)	0.5 mg/m ³
Cobalt	0.05 mg/m ³ (As Co metal)	0.05 mg/m ³ (Dust & fume as Co)
Copper	1 mg/m ³ (Dust & mists, as Cu), 0.1 mg/m ³ (Fumes as Cu)	1 mg/m ³ (Dust & mists, as Cu), 0.2 mg/m ³ (Fumes)
Iron	No limit set (For Fe ₂ O ₃ dust & fumes the PEL is 10 mg/m ³ as Fe)	No limit set (For Fe ₂ O ₃ fume the TLV is 5 mg/m ³ as Fe)
Manganese	5 mg/m ³ (Ceiling, as Mn compounds); 1 mg/m ³ (Fume, as Mn); STEL 3 mg/m ³ (Fume as Mn)	5 mg/m ³ (Dust & compounds, as Mn); 1 mg/m ³ (Fume, as Mn); STEL 3 mg/m ³ (Fume as Mn)
Molybdenum	10 mg/m ³ (Insoluble compounds, total dust as Mo)	mg/m ³ (Insoluble compounds, as Mo)
Nickel	1 mg/m ³ for metal and insoluble compounds as Ni	1 mg/m ³ as metal
Silicon	10 mg/m ³ Total dust; 5 mg/m ³ Respirable fraction	10 mg/m ³
Titanium	No limit set	No limit set
Tungsten	5 mg/m ³ insoluble compounds, as W; STEL 10 mg/m ³ for insoluble compounds, as W	5 mg/m ³ insoluble compounds, as W; STEL 10 mg/m ³ for insoluble compounds, as W

SECTION 8 CONTINUED

Addition Information:	* A portion of metallic chromium may be converted during the welding process to hexavalent chromium. Hexavalent chromium is classified as an IARC Group 1 Carcinogenic. NTP classifies hexavalent chromium as Known to be Carcinogenic.
Monitoring Procedures:	If this product contains ingredients with exposure limits, personal, workplace atmosphere or biological monitoring may be determine the effectiveness of ventilation or other control measures and/or the necessity to use respiratory protective equipment. Reference should be made to European Standard EN689 for methods for the assessment of exposure by inhalation to chemical agents and national guidance documents for methods for the determination of hazardous substances.
Ventilation:	Use process enclosures, local ventilation or other engineering controls to keep airborne levels below recommended exposure limits. If user operations generate dust, fumes or mist, use ventilation to keep exposure to airborne contaminants below the exposure limits.
Respiratory Protection:	Use a properly fitted, air-purifying or air-fed respirator complying with an approved standard if a risk assessment indicates this is necessary. Respirator selection must be based on known or anticipated exposure levels the hazards of the product and the safe working limits of the selected respirator.
Hand Protection:	Gloves should be worn to minimize contact. During the welding process, heat insulated gloves are recommended.
Eye Protection:	Safety glasses or goggles are recommended when handling this material. During the welding process, safety goggles and dark lenses must be worn.
Skin Protection:	Personal protective equipment for the body should be selected based on the task being performed and the risk involved and should be approved by a specialist before handling this product.
Hearing Protection:	During the welding process, the operator and other personal close to the welding operation must be protected from excessive noise. Hearing protection that meets local standards should be used.
Hygiene Measures:	Wash hands, forearms and face thoroughly after handling chemical products, before eating, smoking and using the lavatory and at the end of the working period, appropriate techniques should be used to remove potentially contaminated clothing. Wash contaminated clothing before reusing. Ensure that eyewash stations and safety showers are close to the workstation location.

SECTION 9 PHYSICAL AND CHEMICAL PROPERTIES

This section applies primarily to the wire as supplied. Physical State: Wire or rod. Color: Metallic. Odor: Oderless		
Vapor Pressure: Not applicable	Water Solubility: Insoluble	Boiling Point: Not applicable
Vapor Density (Air=1): Not applicable	Viscosity: Not applicable	Evaporation Rate: Not applicable
Density: ~8 gm/cc	Melting Point: ~2350 °F	pH: Not applicable

SECTION 10 STABILITY AND REACTIVITY

General: Welding consumables applicable to this sheet are solid and nonvolatile as shipped. This product is only intended for use per the welding parameters it was designed for. When this product is used for welding, hazardous fumes may be created. Other factors to consider include the base metal, base metal preparation and base metal coating. All of these factors can contribute to the fume and gases generated during welding. The amount of fume varies with the welding parameters.	
Stability: This product is stable under normal conditions.	Reactivity: Contact with acids or strong bases may cause generation of gas.

SECTION 11 TOXICOLOGICAL INFORMATION

SHORT-TERM (ACUTE) OVEREXPOSURE EFFECTS: Welding Fumes – May result in discomfort such as dizziness, nausea or dryness or irritation of nose, throat or eyes. Aluminum Oxide – Irritation of the respiratory system. Chromium – Inhalation of fumes with chromium (VI) compounds can cause irritation of the respiratory tract, lung damage and asthma-like symptoms. Swallowing chromium (VI) salts can cause severe injury or death. Dust on skin can form ulcers. Eyes may be burned by chromium (VI) compounds. Allergic reactions may occur in some people. Iron, Iron Oxide – None are known. Treat as nuisance dust or fume. Magnesium, Magnesium Oxide – Overexposure to the oxide may cause metal fume fever characterized by metallic taste, tightness of chest and fever. Symptoms may last 24 to 48 hours following overexposure. Manganese – Metal fume fever characterized by chills. Fever, upset stomach, vomiting, irritation of the throat and aching of body. Recovery is generally complete within 48 hours of the overexposure. Molybdenum – Irritation of the eyes, nose, throat. Nickel, Nickel Compounds – Metallic taste, nausea, tightness in chest, metal fume fever, allergic reaction. Titanium Dioxide – Irritation of respiratory system.	
LONG TERM (CHRONIC) OVEREXPOSURE EFFECTS: Welding Fumes – Excess levels may cause bronchial asthma, lung fibrosis, pneumoconiosis or “siderosis”. Aluminum Oxide – Pulmonary fibrosis and emphysema. Chromium – Ulceration and perforation of nasal septum. Respiratory irritation may occur with symptoms resembling asthma. Studies have shown that chromate production workers exposed to hexavalent chromium compounds have an excess of lung cancers, Chromium (VI) compounds are more readily absorbed through the skin than chromium (III) compounds. Good practice requires the reduction of employee exposure to chromium (III) and (VI) compounds. Iron, Iron Oxide Fumes – Can cause siderosis (deposits of iron in lungs) which some researchers believe may affect pulmonary functions. Lungs will clear in time when exposure to iron and its compounds ceases. Iron and magnetite (Fe3O4) are not regarded as fibrogenic materials. Magnesium, Magnesium Oxide – No adverse long term health effects have been reported in the literature. Manganese – Long-term overexposure to manganese compounds may affect the central nervous system. Symptoms may be similar to Parkinson’s disease and can include slowness, changes in handwriting, gait impairment, muscle spasms and cramps and less commonly, tremor and behavioral changes. Employees who are overexposed to manganese compounds should be seen by a physician for early detection of neurologic problems. Overexposure to manganese and manganese compounds above safe exposure limits can cause irreversible damage to the nervous system, including the brain, symptoms of which may include slurred speech, lethargy, tremor, muscular weakness, psychological disturbances and spastic gait. Molybdenum – Prolonged overexposure may result in loss of appetite, weight loss, loss of muscle coordination, difficulty in breathing and anemia. Nickel, Nickel Compounds – Lung fibrosis or pneumoconiosis. Studies of nickel refinery workers indicated a higher incidence of lung and nasal cancers. Titanium Dioxide – Pulmonary irritation and slight fibrosis.	
MEDICAL CONDITIONS AGGRAVATED BY EXPOSURE: Persons with pre-existing impaired lung functions (asthma-like conditions). Persons with a pacemaker should not go near welding and cutting operations until they have consulted their doctor and obtained information from the manufacturer of the device. Respirators are to be worn only after being medically cleared by your company-designated physician.	
CARCINOGENICITY: Chromium VI compounds, nickel compounds are classified as IARC Group 1 and NTP Group K carcinogens. Titanium dioxide compounds are classified as IARC Group 2B carcinogens, Chromium VI compounds, nickel compounds, and welding fumes must be considered as carcinogens under OSHA (29 CFR 1910-1200).	

CALIFORNIA PROPOSITION 65: WARNING: THIS PRODUCT CONTAINS A CHEMICAL KNOWN TO THE STATE OF CALIFORNIA TO CAUSE CANCER AND BIRTH DEFECTS (OR OTHER REPRODUCTIVE HARM).
--

SECTION 12 ECOLOGICAL INFORMATION

Welding processes can releases fumes directly to the environment. Welding wire can degrade if left outside and unprotected. Residues from welding consumables and processes could degrade and accumulate in the soil and groundwater.

SECTION 13 DISPOSAL CONSIDERATION

Use recycling procedures if available. Discard any product, residue, packaging, disposable container or liner in an environmentally acceptable manner, in full compliance with Federal, State and local regulations.
--

SECTION 14 TRANSPORT INFORMATION

Not international regulations or restrictions are applicable. No special precautions are necessary.

SECTION 15 REGULATORY INFORMATION

This information applies to the wire as supplied. SARA Section 313 Supplier Notification The product covered by this MSDS may contain the following toxic chemicals subject to the reporting requirements of Section 313 of the Emergency Planning and Community Right-To-Know act of 1986 and of 40 DFR 372: Beryllium, Chromium, Copper, Manganese and Nickel. Refer to Section 3 of the MSDS for percentage of each element by weight and CAS number.	
Risk Phrases:	R40- Limited evidence of a carcinogenic effect. R42/43- May cause sensitization BY INHALATION AND SKIN CONTACT. R15- Contact with water liberates extremely flammable gases. R10- Flammable
Safety Phrases:	S22- Do not breathe dust. S24- Avoid contact with skin S37- Wear suitable protective gloves
Product Use:	Classification and labeling have been performed according to EU Directives 67/548/EEC and 1999/45/EC (including amendments) and the intended use.
Industrial Application:	Used by welding

SECTION 16 OTHER INFORMATION

For additional information please refer to the following sources:	
USA:	American National Standard (ANSI) Z49.1 “Safety in Welding and Cutting”, ANSI/American Welding Society (AWS) F1.5 “Methods for Sampling and Analyzing Gases from Welding and Allied Processes”, ANSI/AWS F1.1 “Method for Sampling Airborne Particles Generated by Welding and Allied Processes”, AWSF3.2M/F3.2 Ventilation Guide for Weld Fume”, American Welding Society, 550 North Le Jeune Road, Miami, Florida, 33135. Safety and Health Fact Sheets available from AWS at www.aws.org OSHA Publication 2206 (29 C.F.R. 1910) , U.S. Government Printing Office, Superintendent of Documents, P. O. Box 371954, Pittsburgh, PA. 15250-7954. Threshold Limit Values and Biological Exposure Indices , American Conference of Governmental Hygienists (ACGIH), 6500 Glenway Ave., Cincinnati, Ohio 45211, USA. NFPA 51B “Standard for Fire Prevention During Welding, Cutting and Other Hot Work” published by the National Fire Protection Association, 1 Batterymarch Park, Quincy, MA 02169.
UK:	WMA Publication 236 and 237 , “Hazards from Welding Fume”, The arc welder at work, some general aspects of health and safety:.
Canada:	CSA Standard CAN-CSA-W117.2-01 “Safety in Welding, Cutting and Allied Processes”.

NOTICE

To the best of our knowledge the information herein is accurate. However, United States Welding Corp. does not assume liability whatsoever for the accuracy or completeness of the information contained herein.
Final Determination of Suitability of any material is the sole responsibility of the user. All materials may present unknown hazards and should be used with caution. Although certain hazards are described herein, we cannot guarantee that these are the only hazards that exist.



SAFETY DATA SHEET (SDS)

Document Number: SDS-ARC-NF-0001

1. IDENTIFICATION

Product Type:	Arcos nonferrous solid wire for arc welding	
Product Names:	Arcos 1100, 4043, 5356, Silicon Bronze, A2 Bronze, Ti-1, Ti-2, Ti-5, Ti-12	
Specifications:	AWS A5.7 or A5.10	
Product Intended/Recommended Use:	Arc welding	
Manufacturer:	Arcos Industries, LLC 394 Arcos Drive Mt. Carmel, PA 17851 Tel: 1-800-233-8460 Fax: 1-570-339-5206	
Emergency Telephone Number:	3E Company Emergency Response Hotline	Company Code: 334276
	U.S. / Canada / Mexico:	1-866-519-4752
	Europe:	1-760-476-3962
	Asia Pacific:	1-760-476-3960
	Middle East/Africa:	1-760-476-3959

2. HAZARD IDENTIFICATION

Hazard Classification: Not classified as hazardous according to the applicable Globally Harmonized System of Classification and Labelling of Chemicals (GHS) and OSHA Hazard Communication Standard (29 CFR 1910.1200) criteria.

Label Elements:

Hazard Symbol – None

Signal Word – None

Hazard Statement – Not Applicable

Precautionary Statement – Not Applicable

Other Hazards: This product presents no hazards in its intrinsic form. However, several hazards are generated during welding operations that can be harmful.

ELECTRICITY- Electric shock can kill.

HEAT- Molten metal and weld spatter can burn skin and start fires.

RADIATION- Arc rays can injure eyes and burn skin.

FUMES AND GASES - Fumes and gases generated during welding can be dangerous to your health. See Section 11.

3. COMPOSITION/INFORMATION ON INGREDIENTS

Composition: Chemical composition information is shown below for the solid wire electrodes.

Solid Electrodes for Arc Welding

Product	Al	Cu	Fe	Mn	Si	Mg	C	Ti	O	N	H	Other
1100	Bal	0.20	0.95 ¹	0.05								
4043	Bal	0.30	0.8	0.05	6.0	0.5						
5356	Bal	0.10	0.40	0.20	0.25	5.5						Cr = 0.20
Silicon Bronze		Bal		1.5	4.0							
A2 Bronze	11.0	Bal		1.5								
Ti-1, Ti-2			0.12				0.03	Bal	0.16	0.015	0.005	
Ti-5 (Ti6AlV4)	6.75		0.22				0.05	Bal	0.20	0.030	0.008	V = 4.50
Ti-12			0.15				0.03	Bal	0.16	0.015	0.008	Ni = 0.9 Mo = 0.4

1. Includes Fe + Si content

4. FIRST AID MEASURES

Inhalation - If breathing has stopped, immediately seek medical assistance. Begin performing cardio pulmonary resuscitation (CPR) if you are trained to do so. If breathing is difficult, move to area with fresh air and seek medical attention immediately.

Skin contact - For skin burns due to arc radiation flush with cold water. If burn and irritation persists seek medical attention. In case of skin contact with fume or dust, wash affected areas with soap and water. Thoroughly clean shoes and wash clothing. Seek medical attention if irritation develops and persists.

Eye contact - In case of radiation burns due to arc flash move to a dark room and seek medical attention. To remove fume or dust flush with plenty of lukewarm water. Seek medical attention if irritation develops. In case of foreign metallic or slag material lodged in the eye, seek medical attention to remove it. Do not rub or agitate the eyes.

Ingestion – Although unlikely due to product form, immediately seek medical attention if wire pieces or metal powders from inside the wire are ingested. Do not induce vomiting unless directed to do so by medical personnel.

Electric Shock - Disconnect power. Use non-conductive material to pull victim from contact with live wires. If no detectable pulse, seek medical attention immediately and begin cardio pulmonary resuscitation (CPR) if you are trained to do so.

Most Serious Symptoms:

Short Term Exposure – Acute overexposure to welding fumes may result in discomfort such as irritation of the respiratory system, metal fume fever, nausea, and may aggravate pre-existing respiratory conditions.

Long Term Exposure – Chronic overexposure to welding fume may lead to iron deposits in the lungs (siderosis) and reduced pulmonary function. Manganese overexposure can lead to irreversible damage to the central nervous system resulting in impaired speech and movement. Chronic overexposure to nickel fumes and hexavalent chromium can cause cancer. Some of the products contain silica quartz, but not in an inhalable fraction. Silica quartz is a listed carcinogen.

Refer to Section 11 for more information.

5. FIRE FIGHTING MEASURES

General - Products are non-flammable as shipped. Welding arcs and spatter can ignite nearby combustible materials.

Suitable Extinguishing Media- Use methods and materials appropriate for the combustible material.

Specific Hazards Arising from the Chemical - Welding arcs and spatter can ignite nearby combustible materials.

General Firefighting Procedures- Keep people away. Isolate fire and deny entry to the area by any non-essential personnel. Fight fire from protected location or safe distance.

Special Actions for Firefighters- Firefighters should be equipped with self-contained breathing apparatus to protect against potentially toxic and hazardous fumes. Toxic and irritating fumes and gases may be given off during burning or thermal decomposition.

6. ACCIDENTAL RELEASE MEASURES

Personal Precautions, Protective Equipment and Emergency Procedures:

For Non-Emergency Personnel – Isolate the area and keep non-essential people away. Do not touch or walk through spilled material. Allow the molten metallic material to solidify and cool before disposal. If molten metal spills out of the weldment, turn off the power. Contain the flow using sand or submerged arc flux. If airborne dust and or fumes are present, wear appropriate personal protective equipment (PPE) to avoid overexposure.

For Emergency Personnel – Wear appropriate personal protective equipment (PPE), including clothes, gloves and breathing protection. Evacuate non-essential personnel.

Environmental Precautions: Keep material out of waterways and drains.

Methods and Materials for Containment and Cleaning Up: Isolate and clean up spills immediately. Avoid generating dust or airborne particles during clean up. Dispose of solidified mass per Federal, State and Local regulations.

7. HANDLING AND STORAGE

Precautions for Safe Handling: Wear safety glasses and gloves to avoid cuts and abrasion when handling welding consumables and their packaging. Do not eat drink or smoke in areas where these products are being used.

Conditions for Safe Storage, Including Any Incompatibilities: Store in a cool, dry area in the original packaging. Keep products away from heat, flame and moisture.

8. EXPOSURE CONTROLS/PERSONAL PROTECTION

Appropriate Engineering Controls: Provide adequate ventilation and/or local exhaust at the weld station to keep fumes and gases away from the welder. Train welders and welding operators to keep their head out of the fumes. See ANSI Z49.1 “Safety in Welding, Cutting, and Allied Processes” for recommendations of safe work practices.

Personal Protective Equipment:

Eye/Face Protection – Wear safety glasses or goggles with appropriate side shields. Wear a helmet or face shield with an appropriate filter lens. Use protective screens to shield others in the work area.

Skin/Body Protection – Wear hand, head and body protection including welder’s gloves, protective face shield and long sleeved protective clothing.

Respiratory Protection – Use NIOSH approved fume respirator or air supplied respirator when where ventilation is inadequate, welding in confined spaces or where required to by OSHA regulations. Fume sampling per AWS F1.1 “*Method for Sampling Airborne Particulates Generated by Welding and Allied Processes*” may be required. Other appropriate standards that may be considered include, but are not limited to, AWS F1.2 “*Laboratory Method for Measuring Fume Generation Rate and Total Fume Emission of Welding and Allied Processes*” and AWS F3.2 “*Ventilation Guide for Weld Fume*”. For actual weld fume and particulate analysis, refer to the appropriate analytical methods recommended by NIOSH or OSHA, and consult an industrial hygiene professional.

Control Parameters:
Exposure Limits - USA

Common Name	CAS Number	Form	Exposure Limit	Source
Aluminum Metal	7429-90-5	Total Dust	15 mg/m ³	USA. OSHA PELs
		Total Dust	10 mg/m ³	USA. California OSHA PELs
		Respirable	5 mg/m ³	USA. OSHA PELs
		Respirable	1 mg/m ³	USA. ACGIH TLVs
Aluminum Oxide	1344-28-1	Total Dust	15 mg/m ³	USA. OSHA PELs
		Respirable	5 mg/m ³	USA. OSHA PELs
		Respirable	1 mg/m ³	USA. ACGIH TLVs
Barium Compounds	7440-39-3	Soluble Compounds	0.5 mg/m ³	USA. OSHA PELs
		Soluble Compounds	0.5 mg/m ³	USA. ACGIH TLVs
Calcium Carbonate	1317-65-3	Total Dust	15 mg/m ³	USA. OSHA PELs
		Total Dust	10 mg/m ³	USA. California OSHA PELs
		Respirable	5 mg/m ³	USA. OSHA PELs
Chromium	7440-47-3	Metal	1 mg/m ³	USA. OSHA PELs
		Metal	0.5 mg/m ³	USA. ACGIH TLVs
		Cr II compounds	0.5 mg/m ³	USA. OSHA PELs
		Cr III Compounds, Inorganic	0.5 mg/m ³	USA. OSHA PELs
		Cr III Compounds, Inorganic	0.5 mg/m ³	USA. ACGIH TLVs
	18540-29-9	Cr VI Compounds	0.1 mg/m ³	USA. OSHA PELs Ceiling
		Cr VI Compounds, Soluble	0.005 mg/m ³ (as Cr VI)	USA. OSHA PELs
		Cr VI Compounds, Soluble	0.05 mg/m ³ (as Cr)	USA. ACGIH TLVs
		Cr VI Compounds, Insoluble	0.005 mg/m ³ (as Cr VI)	USA. OSHA PELs
		Cr VI Compounds, Insoluble	0.01 mg/m ³ (as Cr)	USA. ACGIH TLVs
Cobalt	7440-48-4	As Metal, Dust & Fume	0.1 mg/m ³	USA. OSHA PELs
		As Metal, Dust & Fume	0.02 mg/m ³	USA. California OSHA PELs
		As Metal, Dust & Fume	0.02 mg/m ³	USA. ACGIH TLVs
Copper	7440-50-8	Dust	1 mg/m ³	USA. OSHA PELs & ACGIH TLVs
		Fume	0.1 mg/m ³	USA. OSHA PELs
		Fume	0.2 mg/m ³	USA. ACGIH TLVs
Fluorides	7789-75-5	As Fluorides	2.5 mg/m ³	USA. OSHA PELs & ACGIH TLVs
Iron & Iron Oxide	1309-37-1	Iron Oxide (As Fume)	10 mg/m ³	USA. OSHA PELs
		Iron Oxide (As Fume)	5 mg/m ³	USA. California OSHA PELs
		Respirable	5 mg/m ³	USA. ACGIH TLVs
Graphite	7782-42-5	Total Dust	15 mg/m ³	USA. OSHA PELs
		Total Dust	10 mg/m ³	USA. California OSHA PELs
		Respirable	5 mg/m ³	USA. OSHA PELs
		Respirable	2 mg/m ³	USA. ACGIH TLVs
Magnesite	546-93-0	Total Dust	15 mg/m ³	USA. OSHA PELs

		Total Dust	10 mg/m ³	USA. California OSHA PELs
		Total Dust	10 mg/m ³	USA. ACGIH TLVs
		Respirable	5 mg/m ³	USA. OSHA PELs
		Respirable	2 mg/m ³	USA. ACGIH TLVs
Magnesium Oxide	1309-48-4	Fume	15 mg/m ³	USA. OSHA PELs
		Fume	10 mg/m ³	USA. California OSHA PELs
		Fume (Inhalable)	10 mg/m ³	USA. ACGIH TLVs
Manganese & Mn Compounds	7439-96-5	Fume	5 mg/m ³	USA. OSHA PELs Ceiling
		Fume	0.2 mg/m ³	USA. California OSHA PELs
		Fume (Respirable)	0.02 mg/m ³	USA. ACGIH TLVs
		Fume (Inhalable)	0.1 mg/m ³	USA. ACGIH TLVs
		Inorganic	5 mg/m ³	USA. OSHA PELs Ceiling
		Inorganic	0.2 mg/m ³	USA. California OSHA PELs
		Inorganic (Respirable)	0.02 mg/m ³	USA. ACGIH TLVs
		Inorganic (Inhalable)	0.1 mg/m ³	USA. ACGIH TLVs
Molybdenum	7439-98-7	Soluble Compounds	5 mg/m ³	USA. OSHA PELs
		Soluble Compounds (Respirable)	0.5 mg/m ³	USA. ACGIH TLVs
		Insoluble compounds (Total Dust)	15 mg/m ³	USA. OSHA PELs
		Insoluble compounds (Total Dust)	10 mg/m ³	USA. California OSHA PELs
		Insoluble compounds (Respirable)	3 mg/m ³	USA. ACGIH TLVs & California OSHA PELs
		Insoluble compounds (Inhalable)	10 mg/m ³	USA. ACGIH TLVs
Nickel	7440-02-0	Metal	1 mg/m ³	USA. OSHA PELs
		Metal (Inhalable)	1.5 mg/m ³	USA. ACGIH TLVs
		Metal	0.015 mg/m ³	USA. NIOSH RELs
		Soluble Compounds	1 mg/m ³	USA. OSHA PELs
		Soluble Compounds (Inorganic)	0.1 mg/m ³	USA. ACGIH TLVs
		Insoluble Compounds	1 mg/m ³	USA. OSHA PELs
		Insoluble Compounds (Inorganic)	0.2 mg/m ³	USA. ACGIH TLVs
Potassium Silicate	1312-76-1	Total	10 mg/m ³	USA. ACGIH TLVs
Sodium Silicate	1344-09-8	Total	10 mg/m ³	USA. ACGIH TLVs
Silicon	7440-21-3	Total Dust	15 mg/m ³	USA. OSHA PELs
		Total Dust	10 mg/m ³	USA. California OSHA PELs
		Respirable	5 mg/m ³	USA. OSHA PELs
Silica (Quartz)	14808-60-7	Respirable	0.1 mg/m ³	USA. OSHA PELs
		Respirable	0.025 mg/m ³	USA. ACGIH TLVs
		Total Dust	0.3 mg/m ³	USA. OSHA PELs
Titanium Dioxide	13463-67-7	Total Dust	15 mg/m ³	USA. OSHA PELs
		Total Dust	10 mg/m ³	USA. ACGIH TLVs

Tungsten	7440-33-7	Insoluble	5.0 mg/m ³	USA. ACGIH TLVs
		Insoluble	10.0 mg/m ³	USA. ACGIH TLVs Ceiling
		Soluble	1.0 mg/m ³	USA. ACGIH TLVs
		Soluble	3.0 mg/m ³	USA. ACGIH TLVs Ceiling
Vanadium	7440-62-2	Oxide Dust	0.5 mg/m ³	USA. OSHA PELs Ceiling
		Oxide Dust (Inhalable)	0.05 mg/m ³	USA. ACGIH TLVs & California OSHA PELs
		Oxide Fume	0.1 mg/m ³	USA. OSHA PELs Ceiling
		Oxide Fume (Inhalable)	0.05 mg/m ³	USA. ACGIH TLVs & California OSHA PELs
Zirconium & Zr Compounds	7440-67-7	Metal	5 mg/m ³	USA. ACGIH TLVs
		Metal	10 mg/m ³	USA. ACGIH TLVs Ceiling
		Compound	5 mg/m ³	USA. OSHA PELs
		Compound	5 mg/m ³	USA. ACGIH TLVs
		Compound	10 mg/m ³	USA. ACGIH TLVs Ceiling

Exposure Limits – Canada

Common Name	CAS Number	Form	Exposure Limit	Source
Calcium Carbonate	1317-65-3	Total Dust	10 mg/m ³	Canada. Alberta OEL TWA
		Total Dust	20 mg/m ³	Canada. British Columbia OEL TWA STEL
		Total Dust	10 mg/m ³	Canada. British Columbia OEL TWA
		Respirable	3 mg/m ³	Canada. British Columbia OEL TWA
		Total Dust	10 mg/m ³	Canada. Saskatchewan OEL for 8hr ACL
		Total Dust	20 mg/m ³	Canada. Saskatchewan OEL for 15min ACL
		Total Dust	10 mg/m ³	Canada. Quebec OEL TWA
Manganese & Mn Compounds	7439-96-5	As Mn	0.2 mg/m ³	Canada. Alberta OEL TWA
		As Mn	0.2 mg/m ³	Canada. British Columbia OEL TWA
		As Mn (Inhalable)	0.1 mg/m ³	Canada. Manitoba OEL TWA
		As Mn (Respirable)	0.02 mg/m ³	Canada. Manitoba OEL TWA
		As Mn	0.2 mg/m ³	Canada. New Brunswick OEL TWA
		As Mn	0.1 mg/m ³	Canada. Newfoundland & Labrador OEL TWA
		As Mn	0.1 mg/m ³	Canada. Nova Scotia OEL TWA
		As Mn	1 mg/m ³	Canada. Nunavut OEL TWA
		As Mn	3 mg/m ³	Canada. Nunavut OEL STEL
		As Mn	5 mg/m ³	Canada. Nunavut OEL Ceiling
		As Mn	1 mg/m ³	Canada. Northwest Territories OEL TWA
		As Mn	3 mg/m ³	Canada. Northwest Territories OEL STEL
		As Mn	5 mg/m ³	Canada. Northwest Territories OEL Ceiling

		As Mn	0.2 mg/m ³	Canada. Ontario OEL TWA
		As Mn	0.2 mg/m ³	Canada. Prince Edward Island OEL TWA
		As Mn	0.2 mg/m ³	Canada. Quebec OEL TWA
		As Mn	0.2 mg/m ³	Canada. Saskatchewan OEL TWA
		As Mn	0.6 mg/m ³	Canada. Saskatchewan OEL STEL
		As Mn	5 mg/m ³	Canada. Yukon OEL Ceiling
Silicon	7440-21-3	Total Dust	10 mg/m ³	Canada. British Columbia OEL TWA
		Total Dust	3 mg/m ³	Canada. New Brunswick OEL TWA
		Total Dust	10 mg/m ³	Canada. Nunavut OEL TWA
		Total Dust	10 mg/m ³	Canada. Northwest Territories OEL TWA
		Total Dust	10 mg/m ³	Canada. Ontario OEL TWA
		Total Dust	10 mg/m ³	Canada. Quebec OEL TWA
		Total Dust	10 mg/m ³	Canada. Saskatchewan OEL TWA
		Total Dust	20 mg/m ³	Canada. Saskatchewan OEL STEL
		Total Dust	10 mg/m ³	Canada. Yukon OEL TWA
		Total Dust	20 mg/m ³	Canada. Yukon OEL STEL
Silica (Quartz)	14808-60-7	Respirable Fraction	0.025 mg/m ³	Canada. Alberta OEL TWA
		Respirable Fraction	0.025 mg/m ³	Canada. British Columbia OEL TWA
		Respirable Fraction	0.025 mg/m ³	Canada. Manitoba OEL TWA
		Respirable Fraction	0.1 mg/m ³	Canada. Ontario OEL TWA
		Respirable Fraction	0.05 mg/m ³	Canada. Quebec OEL TWA
		Respirable Fraction	0.1 mg/m ³	Canada. Saskatchewan OEL TWA
Titanium Dioxide	13463-67-7	Total Dust	10 mg/m ³	Canada. Alberta OEL TWA
		Dust (Respirable)	3 mg/m ³	Canada. British Columbia OEL TWA
		Total Dust	10 mg/m ³	Canada. British Columbia OEL TWA
		Total Dust	10 mg/m ³	Canada. Manitoba OEL TWA
		Total Dust	10 mg/m ³	Canada. Ontario OEL TWA
		Total Dust	10 mg/m ³	Canada. Quebec OEL TWA
		Total Dust	10 mg/m ³	Canada. Saskatchewan OEL TWA
		Total Dust	20 mg/m ³	Canada. Saskatchewan OEL STEL

Exposure Limits – Mexico

Common Name	CAS Number	Form	Exposure Limit	Source
Calcium Carbonate	1317-65-3	Total Dust	20 mg/m ³	Mexico. OEL CTT
		Total Dust	10 mg/m ³	Mexico. OEL CPT
Manganese & Mn Compounds	7439-96-5	As Mn	0.2 mg/m ³	Mexico. OEL CPT
		As Mn Fume	1.0 mg/m ³	Mexico. OEL CPT
		As Mn Fume	3.0 mg/m ³	Mexico. OEL CTT
Silicon	7440-21-3	Total Dust	10 mg/m ³	Mexico. OEL CPT
		Total Dust	20 mg/m ³	Mexico. OEL CTT
Silica	69012-46-2	Fume	10 mg/m ³	Mexico. OEL CPT
		Fume (Respirable)	3 mg/m ³	Mexico. OEL CPT

Silica (Quartz)	14808-60-7	Respirable Fraction	0.1 mg/m ³	Mexico. OEL CPT
Titanium Dioxide	13463-67-7	Total Dust	20 mg/m ³	Mexico. OEL CTT
		Total Dust	10 mg/m ³	Mexico. OEL CPT

9. PHYSICAL AND CHEMICAL PROPERTIES

Appearance	Solid wire
Color:	Various
Odor:	None
Odor threshold:	Not Applicable
pH:	Not Applicable
Melting point	>2000F (1100C)
Initial Boiling Point & Range:	Data Not Available
Flash point	Data Not Available
Evaporation rate	Data Not Available
Flammability	Data Not Available
Upper flammability/explosive limit:	Data Not Available
Lower flammability/explosive limit:	Data Not Available
Vapor pressure	Not Applicable
Vapor density:	Not Applicable
Relative density	0.2-0.3 lbs/in ³
Solubility in water	Data Not Available
Solubility (other)	Data Not Available
Partition coefficient	Data Not Available
Auto-ignition temperature	Data Not Available
Decomposition temperature:	Data Not Available
Viscosity :	Data Not Available

10. STABILITY AND REACTIVITY

Reactivity – This product is not reactive under normal conditions as shipped.

Chemical stability – This product is chemically stable under normal conditions as shipped.

Possibility of hazardous reactions – Polymerization reactions will not occur.

Conditions to avoid – Protect product from moisture and contamination.

Incompatible materials – Data not available

Hazardous decomposition products – Welding electrodes and wires emit fumes and gases when used under normal conditions. These fumes and gases produced during welding operations cannot be easily classified, and will differ in quantity and form from those ingredients listed in Section 3 of this SDS. The composition and quantity of these fumes and gases are directly dependent upon the metal being welded, any material coatings (such as primer or galvanizing), the welding process, the welding consumables and the welding procedures. Other conditions which also influence the composition and quantity of the fumes and gases produced include the number of welders in the work area, the volume of the work area, the quality and amount of ventilation or exhaust, and the proximity of the welder's head to the fume plume.

Decomposition products of welding consumables under normal operation include oxides of elements present in the welding consumable and base material. Manganese compounds may be present in the fume from manganese bearing electrodes. Hexavalent chromium may be present in the fume from electrodes containing chromium. Nickel compounds may be present in the fume from nickel bearing electrodes. Fluoride containing consumables may generate gaseous and particulate fluoride. Gases such as carbon monoxide, carbon dioxide, ozone and nitrogen oxides may also be produced in the arc area.

11. TOXICOLOGICAL INFORMATION

Information on likely routes of exposure:

Oral – Unknown health effects, but this exposure is unlikely to occur.

Inhalation – Inhalation of welding fumes may lead to acute and/or chronic health hazards (see table below).

Skin – Arc rays can burn the skin. Weld fume deposited on the skin may cause irritation (see table below).

Eye – Arc rays can injure the eyes. Weld fume contact with the eyes may cause irritation (see table below).

Information on toxicological effects:

The acute and chronic effects of compounds which may be exposed to the welder are listed in the table below. Also listed are the available measured values of toxicity for that substance and whether it is classified as carcinogenic.

Substance	Short-Term Exposure Effects	Long Term Exposure Effects	Toxicity Measure	Carcinogenicity
Aluminium Oxide	May cause eye & respiratory irritation.	May cause effects on central nervous system.	LC50 (Rat, Oral Exposure) >5,000 mg/kg	Not classifiable
Barium Compounds	May cause irritation to the nose, throat, and respiratory tract.	May cause baratosis (deposits of barium in lungs). Baratosis is benign & does not progress to fibrosis.	LD50 (Rat, Oral Exposure) = 418 mg/kg	Not classifiable
Chromium as Cr+3	May cause eye, skin & respiratory irritation.	May cause chronic bronchitis, sinusitis, rhinitis and asthma.	LC50 (Rat, 14 day Oral Exposure) >5,000 mg/kg	Not classifiable
Chromium as Cr+6	May cause eye, skin & respiratory irritation.	May cause lung, nasal and sinus cancer, ulceration and perforation of the nasal septum and skin rash.	LC50 (Rat, Oral Exposure) = 29 mg/kg	IARC-1 NTP-known OSHA
Cobalt Compounds	May cause respiratory irritation and cardiovascular inflammation.	May cause chronic irritation, diminished pulmonary function, asthma and fibrosis.	LC50 (Rat, 30 min Inhalation Exposure) = 165mg/m ³	Not classifiable
Copper Oxide	May cause metal fume fever with upper respiratory irritation, chills, and aching muscles.	Prolonged contact may cause skin sensitization.	LD50 (Rat, Oral Exposure) = 470mg/kg	Not classifiable
Fluorides	May cause eye, skin & respiratory irritation.	May cause serious bone erosion and mottling of teeth (fluorosis).	LD50 (Rat, Oral Exposure) = 31 mg/kg	Not classifiable
Iron Oxide	May cause respiratory irritation.	May cause siderosis (deposits of iron in lungs). Siderosis is benign and does not progress to fibrosis.	LD50 (Rat, Oral Exposure) > 10,000 mg/kg	Not classifiable
Lithium Compounds	May cause eye & skin irritation.	May adversely affect the central nervous system & kidneys, and may be a reproductive toxin.	LC50 (Rat, 4 hour Inhalation Exposure) > 2.17 mg/L	Not classifiable
Magnesium Oxide	May cause eye & respiratory irritation.	May cause decreased lung function.	LD50 (Rat, Oral Exposure) = 3870 mg/kg	Not classifiable
Manganese Oxide	May cause respiratory irritation, metal fume fever with chills, fever, upset stomach, body ache, vomiting.	May cause brain and central nervous system effects resulting in arm and leg tremors, slurred speech and poor coordination.	LD50 (Rat, 4 hour Inhalation Exposure) = 19 mg mg/kg	Not classifiable

Substance	Short-Term Exposure Effects	Long Term Exposure Effects	Toxicity Measure	Carcinogenicity
Molybdenum	May cause eye & respiratory irritation.	Not found.	Not found	Not classifiable
Nickel Oxide	May cause respiratory irritant, inhalation of fumes may cause pneumonitis.	Prolonged exposure may lead to asthma. Nickel refinery workers showed a higher incidence of lung and nasal cancers.	LD50 (Rat, Inhalation Exposure) > 5,000 mg/kg	IARC-1 NTP-known
Niobium	May cause respiratory irritation.	Not found.	Not found	Not classifiable
Silica	May cause eye & respiratory irritation.	Crystalline silica is a known carcinogen. Overexposure may also result in silicosis.	Not found	IARC-1 NTP-known
Titanium Dioxide	May cause respiratory irritation.	May be carcinogenic.	LD50 (Rat, Oral Exposure) > 10 g/kg	IARC-2B
Tungsten compounds	May cause respiratory irritation.	Not found.	Not found	Not found
Vanadium Oxide	May cause eye, skin & respiratory irritation.	Exposure to high concentrations of fume may lead to chronic nasal hyperplasia.	LD50 (Rat, Oral Exposure) =10 mg/kg	Not classifiable
Zirconium Oxide	May cause eye & respiratory irritation.	May cause decreased lung function.	Not found	Not classifiable
Carbon Dioxide	At low levels, may cause headache, dizziness, loss of coordination, nausea. At high levels can cause coma and possibly death.	Long term exposure may affect the body's metabolism.	LC50 (Human, Inhalation Exposure) =100,000 ppm/min	Not classifiable
Carbon Monoxide	May cause effects on the blood, resulting in carboxyhaemoglobinemia and cardiac disorders. High levels may result in death.	May have effects on the cardiovascular system and central nervous system. May cause toxicity to human reproduction or development.	LC50 (Rat, 4 hour Inhalation Exposure) =1807 ppm	Not classifiable
Ozone	May cause eye and respiratory tract Irritation. Inhalation may cause lung oedema. May cause effects on the central nervous system, resulting in headache and impaired performance.	May cause decreased lung function.	LC50 (Rat, 3 hour Inhalation Exposure) =4.5 mg/m ³	Not classifiable
Nitric Oxide	May cause respiratory irritation. Inhalation may cause lung oedema. Exposure far above the OEL may result in death.	May cause decreased lung function.	LC50 (Rat, Inhalation Exposure) =160 mg/m ³	Not classifiable
Nitrogen Dioxide	Corrosive to the skin and respiratory tract. Inhalation may cause lung oedema. Exposure far above the OEL may result in death.	May cause effects on the immune system and lungs, resulting in decrease in resistance to infection.	LC50 (Rat, 4 hour Inhalation Exposure) =88 ppm	Not classifiable

Other information on toxicological effects:

Germ cell mutagenicity – Not classified

Reproductive toxicity – Not classified

Specific target organ toxicity (Single exposure) – Not classified

Specific target organ toxicity (Repeated exposure) – Not classified

Aspiration hazard – Not classified

12. ECOLOGICAL INFORMATION

Toxicity:	Not classified
Persistence and degradability:	No information available
Bioaccumulative potential:	No information available
Mobility in soil:	No information available
Other adverse effects:	Unknown

13. DISPOSAL CONSIDERATIONS

Discard any product, residue, waste or packaging in an environmentally acceptable manner in compliance with federal, State, or local laws. Do not dispose of any waste, remaining product or by-product in the sewer.

14. TRANSPORT INFORMATION

UN Number:	Not regulated
UN Proper Shipping Name:	Not regulated
Transport Hazard Class:	Not regulated
Packing Group:	Not regulated
IMDG:	Not regulated
ICAO/IATA:	Not regulated

15. REGULATORY INFORMATION

U.S. Federal Regulations:

Emergency Planning & Community Right-To-Know Act (EPCRA) of 1986

Section 313 Hazardous Chemicals:

Aluminum, Aluminum Oxide, Barium and Barium Compounds, Chromium, Copper, Lithium Carbonate, Manganese, Nickel, Silicon & Silica, Iron & Iron Oxide, Magnesium, Zirconium and Vanadium.

Superfund Amendments and Reauthorization Act of 1986 (SARA):

Hazard categories – Acute (Immediate) and Chronic (Delayed)

Toxic Substances Control Act (TSCA) Inventory:

Iron – Listed

Silicon – Listed

U.S. State Laws:

California Proposition 65:

Titanium Dioxide – Carcinogenic

Silica (Quartz) - Carcinogenic

Warning: These products contain chemicals known to the State of California to cause cancer, birth defects, or other reproductive harm.

New Jersey Community Worker and Right-to-Know Act

Titanium Dioxide – Listed

Manganese – Listed

Massachusetts Right-to-Know Act Substance List

Titanium Dioxide – Listed

Manganese – Listed

Silica (Quartz) – Listed

Pennsylvania Right-to-Know Act Hazardous Substances List

Titanium Dioxide – Listed

Manganese – Listed

Rhode Island Right-to-Know Act Substance List

Manganese – Listed

Minnesota Right-to-Know Act Hazardous Substances List

Titanium Dioxide – Listed

Manganese – Listed

Silica (Quartz) – Listed

Canadian Regulations:

This product is classified according to the requirements of the Canadian Controlled Products Regulations Section 33, and this SDS contains all required information.

16. OTHER INFORMATION

DISCLAIMER: Users should take all standard and reasonable precautions when using this product for its intended use. The manufacturer does not recommend this product for any uses other than that described. The manufacturer makes no claims and provides no warranty for non-standard use.

NFPA 704:	HEALTH:	2	FLAMMABILITY:	0	REACTIVITY:	0
HMIS:	HEALTH:	2	FLAMMABILITY:	0	PHYSICAL HAZARD:	0

SDS Revisions

Preparation date:	5/12/2015	Revision date:	--	Revision number:	0
-------------------	-----------	----------------	----	------------------	---

Note: Although the information and recommendations set forth herein (hereinafter "information") are presented in good faith and believed to be correct as of the date hereof, Arcos Industries, LLC makes no representations as to the completeness or accuracy thereof. Information is supplied upon the condition that persons receiving same will make their own determination as to its suitability for their purposes prior to use. In no event will Arcos Industries, LLC be responsible for damages of any nature whatsoever resulting from the use of, misuse or reliance upon information. No representations or warranties, either express or implied, or merchantability, fitness for a particular purpose or any other nature are made hereunder with respect to information or the product to which information refers. Regulatory requirements are subject to change and may differ from one location to another. It is the buyer's responsibility to ensure its activities comply with federal, State, Provincial, and local laws and regulations.



3579 HIGHWAY 50 EAST #104 □ CARSON CITY, NEVADA 89701-2826
775/883-7878 □ 800/423-5964 □ FAX: 775/883-7776



Quality Management System
in accordance with
ISO 9001:2000
Cert # 05-R0925

4643 ALUMINUM Welding wire

U.S. ALLOY CO.
dba Washington Alloy
7010-G Reames Rd.
Charlotte, NC 28216
www.weldingwire.com



American Welding Society
Sustaining Company Member



ALLOY DESCRIPTION AND APPLICATION;

4643 is a 4% silicon aluminum filler which contains a small amount of magnesium and primary recommended for welding

of thick or heavy 6xxx series base metals when postweld heat treating may follow. This alloy provides better response to solution heat treating and is less dependant on the dilution to achieve the needed properties as found in the common 4043 alloy.

TYPICAL GMAW WELDING PROCEDURES; DCEP

Wire Diameter	Amps	Volts	Travel speed (ipm)	Argon (cfh)
0.030	60-175	15-24	25-45	25-30
0.035	70-185	15-27	25-40	30-35
3/64	125-260	20-29	24-35	35-45
1/16	170-300	24-30	28-38	45-55
3/32	275-400	26-31	14-20	60-75

TYPICAL GTAW WELDING PROCEDURES; ACHF with Pure or Ziconiated Hemisphere shape tungsten tip

Filler Wire Size	Tungsten	Amps	Volts	Gas Cup Size	Argon (cfh)	Base thickness
1/16"	1/16"	60-80	15	3/8"	20	1/16"
3/32"	3/32"	125-160	15	3/8"	20	1/8"
1/8"	1/8"	190-220	15	7/16"	20	3/16"
5/32"	5/32"	200-300	15	1/2"	25	1/4"
3/16"	3/16"	330-380	15-20	5/8"	25	3/8"
1/4"	1/4"	400-450	25	5/8"	25	1/2"

Procedures are base on flat position and may vary with change in position, base metals, filler metals, equipment and other changes.

TYPICAL CHEMISTRY AND PROPERTIES;

Silicon	Iron	Copper	Manganese	Magnesium	Zinc	Titanium	Beryllium
3.6-4.6	0.80	0.10	0.05	0.10-0.30	0.10	0.15	0.0008
Aluminum Remainder and others each 0.50 & total 0.15				All values are maximum percentage unless noted			
Solidus:1065°F		Liquidus:1175°F		Density: 0.097 lbs./cu. In.		Anodize color: Gray	
Average Tensile Strength All weld metal (as welded) 30,000 psi (207 mpa)							

AVAILABLE SIZES: TB 4643 = Cut lengths of 3/64, 1/16, 5/64, 3/32, 1/8

SPECIFICATIONS; ANSI/AWS A5.10 ER/ R 4643
ASME SFA5.10 ER/ R 4643
AMS 4189

Other sizes available – please inquire

EAST COAST
7010-G Reames Rd
Charlotte, NC 28216
Tel (888) 522-8296
Fax (704) 598-6673

GULF COAST
4855 Alpine Drive #190
Stafford, TX 77477
Tel (877) 711-9274
Fax (281) 313-6332

WEST COAST
8535 Utica Ave
Rancho Cucamonga, CA 91730
Tel (800) 830-9033
Fax (909) 291-4586

Warehouse Distribution Center – Dayton, Ohio

Head Office – Puyallup, Washington



5-2008 DC

Washington Alloy Company believes that all information and data given is correct. Use this information to assist in making your own evaluations or decisions and this information should not be mistaken as an expressed or implied warranty. U.S. ALLOY CO. assumes no liability for results or damages incurred from the use of any information contained herein, in whole or in part.



SAFETY DATA SHEET

This Safety Data Sheet complies with Annex II of 830/2015 amending EC No. 1907/2006, CLP directive 1272/2008, also in accordance with ISO 11014-1 and ANSI Z400.1

Issued: 2019-11-01

5554 Aluminum Welding and Metallizing Wire

SECTION 1: Identification of the substance/mixture and of the company/undertaking

1.1. Product identifier

Trade name	5554 Aluminum Welding and Metallizing Wire
------------	--

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

Product type	This product is a continuous solid metal wire.
--------------	--

Use	Arc Welding
-----	-------------

1.3. Details of the supplier of the safety data sheet

SDS created by	TDS Team
----------------	----------

Supplier	AlcoTec Wire Corporation
----------	--------------------------

Street address	2750 Aero Park Drive Traverse City, MI 49686 USA
----------------	--

Telephone	1-800-228-0750
-----------	----------------

Email	orders@alcotec.com
-------	--------------------

Web site	www.alcotec.com
----------	-----------------

1.4. Emergency telephone number

Emergency phone number	AlcoTec 1-800-228-0750/ Chemtrec 1-800-424-9300
------------------------	---

Available outside office hours	No
--------------------------------	----

Other

Not applicable

SECTION 2: Hazards identification

2.1. Classification of the substance or mixture

The product is not classified

2.2. Label elements

The product does not require labelling in accordance with CLP Regulation (EC) No 1272/2008.



SAFETY DATA SHEET

This Safety Data Sheet complies with Annex II of
830/2015 amending EC No. 1907/2006, CLP
directive 1272/2008, also in accordance with ISO
11014-1 and ANSI Z400.1

Issued: 2019-11-01

5554 Aluminum Welding and Metallizing Wire

2.3. Other hazards

Other hazards

When this product is used in a welding process, the most important hazards are welding fumes, heat, radiation and electric shock. Avoid exposure to brazing and welding fumes, radiation, spatter, electric shock, heated materials and dust. Overexposure to cutting, scarfing and welding fumes may result in symptoms like metal fume fever, dizziness, nausea, dryness or irritation of the nose, throat or eyes. Overexposure to cutting, scarfing and welding fumes may affect pulmonary function. Persons with a pacemaker should not go near welding or cutting operations until they have consulted their doctor and obtained information from the manufacturer of the device.

Other

Not applicable

SAFETY DATA SHEET

This Safety Data Sheet complies with Annex II of
830/2015 amending EC No. 1907/2006, CLP
directive 1272/2008, also in accordance with ISO
11014-1 and ANSI Z400.1

Issued: 2019-11-01

5554 Aluminum Welding and Metallizing Wire

SECTION 3: Composition/information on ingredients

3.2. Mixtures

Chemical name	CAS No. EC No. REACH No. Index No.	Concentration	Classification	H-phrase M factor acute M factor chronic	Note
Aluminum	7429-90-5 231-072-3 - -	99 - 100%	-	- - -	-
magnesium powder (pyrophoric)	7439-95-4 231-104-6 - -	2.4 - 3%	Pyr. Sol. 1, Water react. 1	H250, H260 - -	-
MANGANESE	7439-96-5 231-105-1 - -	0.05 - 1%	-	- - -	-
IRON	7439-89-6 231-096-4 - -	0 - 0.4%	-	- - -	-
Silicon	7440-21-3 231-130-8 - -	0 - 0.25%	-	- - -	-
Zinc	7440-66-6 231-175-3 - -	0 - 0.25%	-	- - -	-
Titanium	7440-32-6 231-142-3 - -	0.05 - 0.2%	-	- - -	-
CHROMIUM	7440-47-3 231-157-5 - -	0.05 - 0.2%	-	- - -	-
COPPER	7440-50-8 231-159-6 - -	0 - 0.1%	-	- - -	-



5554 Aluminum Welding and Metallizing Wire

SECTION 4: First aid measures

4.1. Description of first aid measures

Description of first aid measures	No first aid measures should be required for this product as shipped. WARNING: Welding fumes and gases are hazardous to your health and may damage lungs and other organs. Use adequate ventilation. Disconnect and turn off the power. Use a nonconductive material to pull victim away from contact with live parts or wires. If not breathing, begin artificial respiration, preferably mouth-to-mouth. If no detectable pulse, begin Cardio Pulmonary Resuscitation (CPR). call emergency physician to the scene of the accident.
Inhalation	If breathing has stopped, perform artificial respiration and obtain medical assistance immediately! If breathing is difficult, provide fresh air and call physician.
Skin contact	For skin burns from arc radiation, promptly flush with cold water. Get medical attention for burns or irritations that persist. To remove dust or particles wash with mild soap and water
Eye contact	For radiation burns due to arc flash, see physician. To remove dusts or fumes flush with water for at least fifteen minutes. If irritation persists, obtain medical assistance.
Ingestion	According to experience not expected.

4.2. Most important symptoms and effects, both acute and delayed

Most important symptoms and effects, both acute and delayed	No first aid measures should be required for this product as shipped.
Inhalation	Overexposure to welding fumes may result in symptoms like metal fume fever, dizziness, nausea, dryness or irritation of the nose, throat or eyes. Chronic overexposure to welding fumes may affect pulmonary function.
Skin contact	ELECTRIC SHOCK can kill.
Eye contact	ELECTRIC SHOCK can kill.
Ingestion	According to experience not expected.

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

Not applicable

Other

Not applicable

SECTION 5: Firefighting measures

5.1. Extinguishing media

Not applicable

5.2. Special hazards arising from the substance or mixture

Special hazards arising from the substance or mixture	No specific recommendations for welding consumables. Welding arcs and sparks can ignite combustible and flammable materials. Use the extinguishing media recommended for the burning materials and fire situation.
---	--



SAFETY DATA SHEET

This Safety Data Sheet complies with Annex II of
830/2015 amending EC No. 1907/2006, CLP
directive 1272/2008, also in accordance with ISO
11014-1 and ANSI Z400.1

Issued: 2019-11-01

5554 Aluminum Welding and Metallizing Wire

5.3. Advice for firefighters

Special protective equipment for fire-fighters

Wear self-contained breathing apparatus as fumes or vapors may be harmful.

Other

Not applicable

SECTION 6: Accidental release measures

6.1. Personal precautions, protective equipment and emergency procedures

Personal precautions, protective equipment and emergency pro- cedures

Wear hand, head, eyes, ear and body protection like welders gloves, helmet or face shield with filter lens, safety boots, apron, arm and shoulder protection. Keep protective clothing clean and dry.

6.2. Environmental precautions

Environmental precautions

Refer to Section 13.

6.3. Methods and material for containment and cleaning up

Methods and material for con- tainment and cleaning up

Solid objects may be picked up and placed into a container. Liquids or pastes should be scooped up and placed into a container. Wear proper protective equipment while handling these materials. Do not discard as refuse.

6.4. Reference to other sections

Reference to other sections

Refer to Section 8 and Section 13.

Other

Not applicable

SECTION 7: Handling and storage

7.1. Precautions for safe handling

Preventive handling precautions

Handle with care to avoid stings and cuts. Wear gloves when handling welding consumables. Avoid exposure to dust. Do not ingest. Some individuals can develop an allergic reaction to certain materials. Retain all warning and identity labels.

7.2. Conditions for safe storage, including any incompatibilities

Conditions for safe storage, including any incompatibilities

Keep separate from chemical substances like acids and strong bases, which could cause chemical reactions.

7.3. Specific end use(s)

Specific end use(s)

Arc Welding

Other

Not applicable

SAFETY DATA SHEET

This Safety Data Sheet complies with Annex II of
830/2015 amending EC No. 1907/2006, CLP
directive 1272/2008, also in accordance with ISO
11014-1 and ANSI Z400.1

Issued: 2019-11-01

5554 Aluminum Welding and Metallizing Wire

SECTION 8: Exposure controls/personal protection

8.1. Control parameters

Exposure limits

Use industrial hygiene monitoring equipment to ensure that exposure does not exceed applicable national exposure limits. The following limits can be used as guidance. Unless noted, all values are for 8 hour time weighted averages (TWA).

National occupational exposure limits

<i>Ingredient</i>	<i>CAS No. EC No.</i>	<i>Exposure limit ppm / mg/m³</i>	<i>Short-term expos- ure limit ppm / mg/m³</i>	<i>Ceiling exposure limit ppm / mg/m³</i>	<i>Source</i>	<i>Remark</i>	<i>Year</i>
Silicon	7440-21-3 231-130-8	- 15	- -	- -	OSHA	Total Dust	2017
Silicon	7440-21-3 231-130-8	- 5	- -	- -	OSHA	Respirable Fraction	2017
MANGANESE	7439-96-5 231-105-1	- -	- -	- 5	OSHA	as Mn	2017
Zinc	7440-66-6 231-175-3	- -	- -	- -	OSHA	NO PEL	2017
Titanium	7440-32-6 231-142-3	- -	- -	- -	OSHA	NO PEL	2017
IRON	7439-89-6 231-096-4	- -	- -	- -	OSHA	NO PEL	2017
COPPER	7440-50-8 231-159-6	- 0.1	- -	- -	OSHA	as Cu(fume)	2017
COPPER	7440-50-8 231-159-6	- 1	- -	- -	OSHA	as Cu(dust,mist)	2017
magnesium powder (pyrophoric)	7439-95-4 231-104-6	- -	- -	- -	OSHA	NO PEL	2017
Aluminum	7429-90-5 231-072-3	- 15	- -	- -	OSHA	Total Dust	2017
Aluminum	7429-90-5 231-072-3	- 5	- -	- -	OSHA	Respirable Fraction	2017
Chromium	7440-47-3 231-157-5	- 1	- -	- -	OSHA	as metal	2017
Chromium	7440-47-3 231-157-5	- 0.5	- -	- -	OSHA	as Cr(Cr(II) and Cr(III) inorganic comps)	2017
Chromium	7440-47-3 231-157-5	- 0.005	- -	- -	OSHA	as Cr(VI)(water sol. and insol. inorganic com- pds)	2017

8.2. Exposure controls

Not applicable



SAFETY DATA SHEET

This Safety Data Sheet complies with Annex II of
830/2015 amending EC No. 1907/2006, CLP
directive 1272/2008, also in accordance with ISO
11014-1 and ANSI Z400.1

Issued: 2019-11-01

5554 Aluminum Welding and Metallizing Wire

Other

Other

Avoid exposure to brazing and welding fumes, radiation, spatter, electric shock, heated materials and dust. Train welders to avoid contact with live electrical parts and insulate conductive parts.

Ventilation

Use respirator or air supplied respirator when welding or brazing in a confined space, or where local exhaust or ventilation is not sufficient to keep exposure values within safe limits. Use special care when welding painted or coated steels since hazardous substances from the coating may be emitted. Ensure sufficient ventilation, local exhaust, or both, to keep welding fumes and gases from breathing zone and general area.

SECTION 9: Physical and chemical properties

9.1. Information on basic physical and chemical properties

Appearance, physical state

Silver grey

Appearance, colour

Not applicable

Odour

None

Odour threshold

Not applicable

pH value

Not applicable

Melting point / freezing point

970 - 1515 °F

Initial boiling point and boiling range

Not applicable

Flash point

Not applicable

Evaporation rate

Not applicable

Flammability (solid, gas)

Not applicable

Upper / lower flammability or explosive limits

Not applicable

Vapour pressure

Not applicable

Vapour density

Not applicable

Relative density

0.1 lb/in3

Solubility

Not applicable

Water solubility

None

Partition coefficient: n-octanol / water

Not applicable

Auto-ignition temperature

Not applicable

Decomposition temperature

Not applicable

Viscosity, kinematic

Not applicable



SAFETY DATA SHEET

This Safety Data Sheet complies with Annex II of 830/2015 amending EC No. 1907/2006, CLP directive 1272/2008, also in accordance with ISO 11014-1 and ANSI Z400.1

Issued: 2019-11-01

5554 Aluminum Welding and Metallizing Wire

Viscosity, dynamic

Not applicable

Explosive properties

Not applicable

Oxidising properties

Not applicable

9.2. Other information

Not applicable

Other

Not applicable

SECTION 10: Stability and reactivity

10.1. Reactivity

Reactivity

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

10.2. Chemical stability

Chemical stability

Stable at normal conditions

10.3. Possibility of hazardous reactions

Not applicable

10.4. Conditions to avoid

Conditions to avoid

Incompatible with strong acids and oxidizing agents. This product is only intended for normal welding purposes.

10.5. Incompatible materials

Incompatible materials

Incompatible with strong acids and oxidizing agents.

10.6. Hazardous decomposition products

Hazardous decomposition products

When this product is used in a welding process, hazardous decomposition products would include those from the volatilization, reaction or oxidation of the materials listed in Section 3 and those from the base metal and coating.

Other

Other

Refer to applicable national exposure limits for fume compounds, including those exposure limits for fume compounds found in Section 8.

SECTION 11: Toxicological information

11.1. Information on toxicological effects

Information on toxicological effects

Inhalation of welding fumes and gases can be dangerous to your health. Classification of welding fumes is difficult because of 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).



SAFETY DATA SHEET

This Safety Data Sheet complies with Annex II of 830/2015 amending EC No. 1907/2006, CLP directive 1272/2008, also in accordance with ISO 11014-1 and ANSI Z400.1

Issued: 2019-11-01

5554 Aluminum Welding and Metallizing Wire

Acute toxicity	Overexposure to welding fumes may result in symptoms like metal fume fever, dizziness, nausea, dryness or irritation of the nose, throat or eyes.
Skin corrosion/irritation	No data available
Serious eye damage/irritation	No data available
Respiratory/skin sensitization	No data available
Germ cell mutagenicity	No data available
Genotoxicity	No data available
Carcinogenicity	*This product contains substance(s) that may cause cancer, which is/are classified as Carcinogenic to humans as per IARC.
Repeated dose toxicity	No data available
Reproductive toxicity	No data available
STOT-single exposure	No data available
STOT-repeated exposure	No data available
Aspiration hazard	No data available
LD50 Oral	No data available
LD50 Dermal	No data available
LC50 Inhalation	No data available
<i>Other</i>	
Long term effect	Chronic toxicity: Overexposure to welding fumes may affect pulmonary function.

SECTION 12: Ecological information

12.1. Toxicity

Acute toxicity	No data available
Toxicity	Welding consumables and materials could degrade/weather into components originating from the consumables or from the materials used in the welding process. Avoid exposure to conditions that could lead to accumulation in soils or groundwater.
Aquatic	No data available
Soil	No data available
Acute fish toxicity	No data available
Acute algae toxicity	No data available
Acute crustacean toxicity	No data available
Chronical toxicity	No data available



5554 Aluminum Welding and Metallizing Wire

12.2. Persistence and degradability

Persistence and degradability	No data available
--------------------------------------	-------------------

Decay/transformation	No data available
-----------------------------	-------------------

12.3. Bioaccumulative potential

Bioaccumulative potential	No data available
----------------------------------	-------------------

12.4. Mobility in soil

Mobility	No data available
-----------------	-------------------

12.5. Results of PBT and vPvB assessment

Results of PBT and vPvB assessment	No data available
---	-------------------

12.6. Other adverse effects

Other adverse effects	No data available
------------------------------	-------------------

Other

Not applicable

SECTION 13: Disposal considerations

13.1. Waste treatment methods

Disposal considerations	Discard any product, residue, disposable container or liner in an environmentally acceptable manner, in full compliance with federal and local regulations. Use recycling procedures if available. USA RCRA: Unused products or product residue containing chromium is considered hazardous waste if discarded, RCRA ID Characteristic Toxic Hazardous Waste D007. (https://rcrainfo.epa.gov/rcrainfoweb/action/modules/main/glossary/waste.jsessionid=A98F2456754BC0CE970C52F4E3AA429F) Residues from welding consumables and processes could degrade and accumulate in soils and ground-water.
--------------------------------	---

Other

Not applicable

SECTION 14: Transport information

14.1. UN number

Not applicable

14.2. UN proper shipping name

Not applicable



SAFETY DATA SHEET

This Safety Data Sheet complies with Annex II of 830/2015 amending EC No. 1907/2006, CLP directive 1272/2008, also in accordance with ISO 11014-1 and ANSI Z400.1

Issued: 2019-11-01

5554 Aluminum Welding and Metallizing Wire

14.3. Transport hazard class(es)

Not applicable

14.4. Packing group

Not applicable

14.5. Environmental hazards

Not applicable

14.6. Special precautions for user

Not applicable

14.7. Transport in bulk according to Annex II of Marpol and the IBC Code

Not applicable

Other

Not applicable

SECTION 15: Regulatory information

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

EU regulations

Regulation (EC) No 1907/2006 of the European Parliament and of the Council of 18 December 2006 concerning the Registration, Evaluation, Authorisation and Restriction of Chemicals (REACH), establishing a European Chemicals Agency, amending Directive 1999/45/EC and repealing Council Regulation (EEC) No 793/93 and Commission Regulation (EC) No 1488/94 as well as Council Directive 76/769/EEC and Commission Directives 91/155/EEC, 93/67/EEC, 93/105/EC and 2000/21/EC.

Regulation (EC) No 1272/2008 of the European Parliament and of the Council of 16 December 2008 on classification, labelling and packaging of substances and mixtures, amending and repealing Directives 67/548/EEC and 1999/45/EC, and amending Regulation (EC) No 1907/2006

Commission Regulation (EU) 2015/830 of 28 May 2015 amending Regulation (EC) No 1907/2006 of the European Parliament and the Council concerning the Registration, Evaluation, Authorisation and Restriction of Chemicals (REACH)

DIRECTIVE 2008/98/EC OF THE EUROPEAN PARLIAMENT AND OF THE COUNCIL. of 19 November 2008. on waste and repealing certain Directives.

European Parliament and Council Directive 94/62/EC of 20 December 1994 on packaging and packaging waste.



SAFETY DATA SHEET

This Safety Data Sheet complies with Annex II of
830/2015 amending EC No. 1907/2006, CLP
directive 1272/2008, also in accordance with ISO
11014-1 and ANSI Z400.1

Issued: 2019-11-01

5554 Aluminum Welding and Metallizing Wire

Other regulations, limitations and legal regulations

Poland Regulations:

ACT of 25 February 2011 on the chemical substances and their mixtures(OJ # 63, poz. 322).

Regulation of the Minister of Labour and Social Policy of 6 June 2014 on Maximum Permissible Concentration and Intensity of Agents Harmful to Health in the Working Environment (Dz. u. z. 2014, poz 817).
The Act on Waste of 14 December 2012, Journal of Laws of 2013, item 21 with amendments

Act of 13th June 2013 on packaging management and packaging waste (Journal of Laws of 2013, item 888).

Regulation of the Minister of the Environment of 9 December 2014 on waste catalogue (Journal of Laws of 2014, item 1923).

Regulation of the Minister of Economy of 21 December 2005. Concerning essential requirements for personal protective equipment (Journal. Laws No. 259, item. 2173).

Regulation of the Minister of Health of 2 February 2011 on tests and measurements of factors harmful to health in the working environment (the Journal of Laws 2011, no. 33, item 166).

USA Regulations :

USA: 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.)

CERCLA/SARA Title III Reportable Quantities (RQs) and/or Threshold Planning Quantities (TPQs):

Product is a solid solution in the form of a solid article. Spills or releases resulting in the loss of any ingredient at or above its RQ require immediate notification to the National Response Center and to your Local Emergency Planning Committee.

EPCRA/SARA Title III 313 Toxic Chemicals: The following metallic components are listed as SARA 313 "Toxic Chemicals" and potential subject to annual SARA 313 reporting. See Section 3 for weight percent.

Chromium: 1.0% de minimis concentration

Copper: 1.0% de minimis concentration

Aluminium: 1.0% de minimis concentration

Zinc: 1.0% de minimis concentration

Manganese: 1.0% de minimis concentration

International Inventories:

Australia: The substance(s) in this product is/are in compliance with the inventory requirements of Australian Inventory of Chemical Substances (AICS)

United States EPA Toxic Substance Control Act: All constituents of this product are on the TSCA inventory list or are excluded from listing.

Canadian Environmental Protection Act (CEPA): All constituent(s) of this product is/are on the Domestic Substance List (DSL).

15.2. Chemical safety assessment

Chemical safety assessment

No data available



SAFETY DATA SHEET

This Safety Data Sheet complies with Annex II of
830/2015 amending EC No. 1907/2006, CLP
directive 1272/2008, also in accordance with ISO
11014-1 and ANSI Z400.1

Issued: 2019-11-01

5554 Aluminum Welding and Metallizing Wire

Other

Other

Read and understand the manufacturer's instructions, your employer's safety practices and the health and safety instructions on the label. Observe any federal and local regulations. Take precautions when welding and protect yourself and others.

WARNING: Welding fumes and gases are hazardous to your health and may damage lungs and other organs. Use adequate ventilation. ELECTRIC SHOCK can kill.
ARC RAYS and SPARKS can injure eyes and burn skin.

SECTION 16: Other information

Changes to previous revision

This Safety Data Sheet has been revised due to modifications to Sections 1-16.

References to key literature and data sources

Refer to ESAB "Welding & Cutting - Risks and Measures", F52-529 "Precautions and Safe Practices for ARC WELDING, CUTTING & GOUGING" and F2035 "Precautions and Safe Practices for Gas Welding, Cutting and Heating" available from ESAB Website. www.esab.com

USA: Contact AlcoTec at orders@alcotec.com or 1-800-228-0750 if you have any questions about this SDS.

Phrase meaning

Pyr. Sol. 1 - Pyrophoric solids, hazard category 1

Water react. 1 - Substances and mixtures, which in contact with water, emit flammable gases, hazard category 1

H250 Catches fire spontaneously if exposed to air.

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



SAFETY DATA SHEET

This Safety Data Sheet complies with Annex II of
830/2015 amending EC No. 1907/2006, CLP
directive 1272/2008, also in accordance with ISO
11014-1 and ANSI Z400.1

Issued: 2019-11-01

5554 Aluminum Welding and Metallizing Wire

Other

Additional information

American National Standard Z49.1 Safety in Welding and Cutting, ANSI/AWS F1.5 Methods for Sampling and Analyzing Gases from Welding and Allied Processes, ANSI/AWS F1.1 "Method for Sampling Air-borne Particles Generated by Welding and Allied Processes", AWSF3.2M/F3.2 "Ventilation Guide for Weld Fume", 550 North Le Jeune Road, Miami Florida 33135. Safety and Health Fact Sheets available from AWS at www.aws.org.

OSHA Publication 2206 (29 C.F.R. 1910), U.S. Government Printing Office, Superintendent of Documents, P.O. Box 371954, Pittsburgh, PA 15250-7954

American Conference of Governmental Hygienists (ACGIH), Threshold Limit Values and Biological Exposure Indices, 6500 Glenway Ave., Cincinnati, Ohio 45211, USA.

NFPA 51B "Standard for Fire Prevention During Welding, Cutting and Other Hot Work" published by the National Fire Protection Association, 1 Batterymarch Park, Quincy, MA 02169

UK: WMA Publication 236 and 237, "Hazards from Welding fume", "The arc welder at work, some general aspects of health and safety".

Germany: Germany: Accident prevention regulation BGV D1, "Welding, cutting and related processes".

Canada: CSA Standard CAN/CSA-W117.2-01 "Safety in Welding, Cutting, and Allied Processes".

This product has been classified according to the hazard criteria of the CPR and the SDS contains all of the information required by the CPR.

ESAB requests the users of this product to study this Safety Data Sheet (SDS) and become aware of product hazards and safety information. To promote safe use of this product a user should: notify its employees, agents and contractors of the information on this SDS and any product hazards/safety information.furnish this same information to each of its customers for the products

Request such customers to notify employees and customers for the same product hazards and safety information.

The information herein is given in good faith and based on technical data that ESAB believes to be reliable. Since the conditions of use is outside our control, we assume no liability in connection with any use of this information and no warranty expressed or implied is given. Contact ESAB for more information.



T H E H A R R I S P R O D U C T S G R O U P
A L I N C O L N E L E C T R I C C O M P A N Y
4501 Quality Place • Mason, OH 45040 U.S.A Tel: 513-754-2000 Fax: 513-754-6015

TECHNICAL SPECIFICATION SHEET

5556 ALUMINUM WELD WIRE

STATEMENT OF LIABILITY- DISCLAIMER

Any suggestion of product applications or results is given without representation or warranty, either expressed or implied. Without exception or limitation, there are no warranties of merchantability or of fitness for particular purpose or application. The user must fully evaluate every process and application in all aspects, including suitability, compliance with applicable law and non-infringement of the rights of others. The Harris Products Group and its affiliates shall have no liability in respect thereof.

NOMINAL COMPOSITION:

Aluminum	BALANCE	Titanium	.05-.20 %
Magnesium	4.7-5.5 %	Copper	.10 % max.
Manganese	.50-.10 %	Chromium	.05-.20 %
Silicon	.25 % max.	Zinc	.25 % max.
Beryllium	.0008 % max.	Iron	.40% max.
Others	Each .05% max. Total .15% max		

PHYSICAL PROPERTIES:

Solidus	1065 °F (574 °C)	Density lbs/cu in	.096
Liquidus	1175 °F (635 °C)	Post Anodize Color	White
As Welded Base Plate of 5456			
Tensile Strength	46,000 psi	Elongation in 2"	14%
Yield Strength	23,000 psi		

RECOMMENDED WELDING PARAMETERS:

* GMAW (MIG) Parameters (DC Reverse Polarity) Electrode Positive Spray transfer

Metal Thickness	Wire Diameter	Amps	Volts	Argon
1/16"	.030	70-110	15-20	25
1/8"	.030-3/64	120-150	20-24	30
3/16"	.030-3/64	130-210	22-26	30-35
1/4"	3/64-1/16	170-225	24-28	40
3/8"	1/16	225-300	26-29	50

*GTAW (TIG) Parameters (AC) Hemisphere tip shape tungsten electrode

Metal (1)	Pure or zirconiated	Filler Wire Size	Amps	Volts ACHF	Gas Cup	Argon (cfh)
1/16"	1/16"- 3/32"	1/16"-3/32"	70-100	15	3/8	20
1/8"	1/8"-5/32"	1/8"-5/32"	125-175	15	7/16	20
3/16"	5/32"-3/16"	5/32-3/16"	170-225	15	7/16-1/2	25
1/4"	3/16"-1/4"	3/16"	220-275	15	1/2	30
3/8"	1/4"	3/16"-1/4"	330-380	15	5/8	35
1/2"	1/4"	1/4"	400-450	25	5/8	35

All statements, information and data given are believed to be accurate and reliable but are presented without guarantee, warranty or responsibility of any kind, expressed or implied.

Additional information available at our web site: www.harrisproductsgroup.com



* All parameters are suggested as basic guidelines and will vary depending on joint design, number of passes and other factors.

**SPECIFICATION COMPLIANCE: ANSI/AWS A5.10, ASME SFA 5.10, QQ-R-566B
Class R/ER 5356**

(2) QQ-R-566B = SILICON PLUS IRON SHALL NOT EXCEED .50 %

WARNING: PROTECT yourself and others. Read and understand this information.

FUMES AND GASES can be hazardous to your health.

ARC RAYS can injure eyes and burn skin.

ELECTRIC SHOCK can KILL.

- Before use, read and understand the manufacturer's instructions, Material Safety Data Sheets (MSDSs), and your employer's safety practices.
- Keep your head out of fumes.
- Use enough ventilation, exhaust at the arc, or both, to keep fumes and gases from your breathing zone and the general area.
- Wear correct eye, ear, and body protection.
- Do not touch live electrical parts.
- 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, Florida 33126; OSHA Safety and Health Standards, available from the U.S. Government Office, Washington, DC 20402

All statements, information and data given are believed to be accurate and reliable but are presented without guarantee, warranty or responsibility of any kind, expressed or implied.

Additional information available at our web site: www.harrisproductsgroup.com

HASTELLOY® W alloy

CHEMISTRY: Weight %

Ni	Co	Fe	Cr	Mo	Mn	Si	V	C
63 ^a	2.5*	6	5	24	1*	1*	0.6*	0.12*

^a As Balance

*Maximum

ALLOY DESCRIPTION:

HASTELLOY W alloy is a solid-solution-strengthened superalloy that was developed primarily as a filler metal for welding of dissimilar alloys. It displays excellent dissimilar welding characteristics, and is widely used for that purpose in the gas turbine, aerospace, and chemical process industries. The properties of dissimilar weld joints made with alloy W are dependent upon the alloys joined, but are generally acceptable for a wide variety of combinations. Alloy W is also used as a wrought alloy for a limited number of ring-type applications in older gas turbine engines. HAYNES 242™ alloy is a more modern alloy, and should be considered as a substitute for alloy W in these ring applications (ask for publication H-3079).

PHYSICAL PROPERTIES:

	Temp., °F	British Units	Temp., °C	Metric Units
Density	Room	0.325 lb/in ³	Room	9.00 g/cm ³
Melting Range	2350-2510		1290-1375	
Mean Coefficient of Thermal Expansion	70-800	7.3 µin/in-°F	20-500	13.2 µm/m-°C
	70-1000	7.4 µin/in-°F	20-600	13.2 µm/m-°C
	70-1200	7.4 µin/in-°F	20-700	13.5 µm/m-°C
	70-1400	7.8 µin/in-°F	20-800	14.2 µm/m-°C
	70-1600	8.2 µin/in-°F	20-900	14.8 µm/m-°C
	70-1800	8.4 µin/in-°F	20-1000	15.3 µm/m-°C

HEAT TREATMENT, Weld Deposits (A) and Wrought Bar (B)

(A) None (B) 2165°F(1185°C)/15 minutes/WQ

APPLICABLE ALLOY SPECIFICATIONS:

Bare Wire: AMS 5786

AWS A5.14 & ASME SFA 5.14; (ERNiMo-3)

Coated Electrodes: AMS 5787

AWS A5.11 & ASME SFA 5.11; (ENiMo-3)

Bar, Rings and Forgings: AMS 5755

HASTELLOY® W alloy

TYPICAL ALL-WELD-METAL TENSILE PROPERTIES:

GAS TUNGSTEN ARC WELDS:

Condition	Test Temperature		Ultimate Tensile Strength		Yield Strength		Elongation	Reduction of Area
	°F	°C	Ksi	MPa	Ksi	MPa	%	%
As-Welded	70	20	120	830	80	555	35	27
	1600	870	43	295	40	275	45	53
Aged 1000 Hrs. 1200°F (650°C)	70	20	160	1100	115	795	14	16
Aged 1000 Hrs. 1400°F (760°C)	1400	760	84	580	64	445	27	38

GAS METAL ARC WELDS:

Condition	Test Temperature		Ultimate Tensile Strength		Yield Strength		Elongation	Reduction of Area
	°F	°C	Ksi	MPa	Ksi	MPa	%	%
As-Welded	70	20	127	870	80	555	38	32
	1600	870	45	310	42	285	41	42
Aged 1000 Hrs. 1200°F (650°C)	70	20	153	1055	110	755	15	16
Aged 1000 Hrs. 1400°F (760°C)	1400	760	82	565	58	400	30	47

SHIELDED METAL ARC WELDS:

Condition	Test Temperature		Ultimate Tensile Strength		Yield Strength		Elongation	Reduction of Area
	°F	°C	Ksi	MPa	Ksi	MPa	%	%
As-Welded	70	20	110	760	76	525	25	22
	1600	870	38	265	36	250	14	15
Aged 1000 Hrs. 1200°F (650°C)	70	20	128	885	108	745	8	8
Aged 1000 Hrs. 1400°F (760°C)	1400	760	77	535	57	390	11	14

HASTELLOY® W alloy

TYPICAL TRANSVERSE TENSILE PROPERTIES FOR 1/2-INCH (12.7mm) PLATE WELDMENTS (GTAW) USING ALLOY W FILLER*

Base Materials	Test Temperature		Ultimate Tensile Strength		Yield Strength		Elongation	Reduction of Area
	°F	°C	Ksi	MPa	Ksi	MPa	%	%
HASTELLOY alloy X	70	20	113	780	58	395	52	55
	1600	870	42	290	33	230	39	65
HAYNES® alloy 188	70	20	128	885	73	505	20 ¹	30 ¹
	1600	870	58	400	51	350	36 ¹	60 ¹
MULTIMET® alloy	70	20	116	800	62	425	49	65
	1600	870	42	290	32	215	28	42
HAYNES alloy 625	70	20	119	820	69	475	63	63
	1600	870	44	300	35	240	58	91
HAYNES alloy 718	70	20	125	860	68	470	23 ¹	31 ¹
Type 304 stainless	70	20	90	620	48	330	62	69
Carbon Steel	70	20	72	500	60	415	14	50
Alloy 188/MULTIMET alloy	70	20	117	805	66	455	35	64
	1600	870	47	320	34	235	19	19
Alloy 625/Alloy 718	70	20	131	905	62	430	43 ²	42 ²
	1600	870	48	330	39	270	51	95
Type 304/Carbon Steel	70	20	71	490	51	355	17	51

*Failures in base metal unless otherwise indicated

¹Failures in weld ²Failures in weld and base metal

All values are averages of 2-4 tests

TYPICAL GUIDED BEND TEST RESULTS FOR 1/2-INCH (12.7mm) PLATE WELDMENTS (GTAW) USING ALLOY W FILLER

Base Materials	Bend Radius	Results
HAYNES 188 alloy/MULTIMET alloy	2t	No Cracks
HAYNES 625 alloy/HAYNES 718 alloy	2t	No Cracks
Type 304 Stainless/Carbon Steel	2t	No Cracks

HASTELLOY® W alloy

TYPICAL TENSILE PROPERTIES, BAR (AMS 5755):

Test Temperature		Ultimate Tensile Strength		0.2% Yield Strength		Elongation in 2 in (51mm)
°F	°C	Ksi	MPa	Ksi	MPa	%
ROOM	ROOM	139.8	965	75.5	520	51.0
1000	540	120.8	835	54.0	370	52.5
1200	650	103.5	715	52.9	365	27.0
1400	760	88.5	610	55.5	385	20.3
1600	870	60.5	415	48.8	335	31.8
1800	980	32.4	225	23.6	160	47.5
2000	1095	17.4	120	10.6	73	79.0

TYPICAL STRESS-RUPTURE STRENGTH, BAR (AMS 5755):

Test Temperature		Approximate Initial Stress, Ksi (MPa) to Produce Rupture in:			
°F	°C	10 Hours		100 Hours	
1300	705	-		34.5 (240)	27.5 (190)
1400	760	33.0 (230)		26.0 (180)	19.0 (130)
1500	815	24.8 (170)		18.0 (125)	12.4 (85)
1600	870	17.4 (120)		12.0 (83)	8.0 (55)
1700	925	11.7 (81)		7.9 (54)	5.2 (36)
1800	980	7.9 (54)		5.2 (36)	3.2 (22)

PROPERTIES DATA:

The data and information in this publication are based upon work conducted principally by Haynes International, Inc. and occasionally supplemented by information from the open literature, and are believed to be reliable. However, we do not make any warranty or assume any legal liability or responsibility for its accuracy, completeness or usefulness. We also make no warranty of results to be obtained for any particular use of the information herein contained. Material safety data sheets are available from Haynes International, Inc.

® HAYNES, HASTELLOY, MULTIMET and 242 are trademarks of Haynes International, Inc.

AVAILABLE FORMS: (Routine Production)

Wire - 0.035 to 0.187" (0.89 to 4.75 mm)
Billet - 4.0 to 8.0" (101.6 to 203.2 mm)
All others - By inquiry only.

For More Information Call:
800-354-0806

or Write
Haynes International, Inc.
P.O. Box 9013
Kokomo, IN 46904-9013

www.haynesintl.com

SAFETY DATA SHEET

This Safety Data Sheet complies with Annex II of
830/2015 amending EC No.
1907/2006, Commission Regulation (EU) 2019/521
amending CLP directive 1272/2008, also in
accordance with ISO 11014-1 and ANSI Z400.1

Issued: 2021-04-21

ATOM ARC 9015-B9

SECTION 1: Identification of the substance/mixture and of the company/undertaking

1.1. Product identifier

Trade name	ATOM ARC 9015-B9
------------	------------------

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

Use	Arc Welding
-----	-------------

1.3. Details of the supplier of the safety data sheet

SDS created by	TDS Team
----------------	----------

Supplier	ESAB AB
----------	---------

Street address	Box 8004 402 77 Göteborg Sweden
----------------	---------------------------------------

Telephone	+46 31 509000
-----------	---------------

Email	sdsrequest@esab.com
-------	---------------------

Web site	www.esab.com
----------	--------------

1.4. Emergency telephone number

Emergency phone number	+46 31 509000
------------------------	---------------

Available outside office hours	No
--------------------------------	----

Other

Other	Classification: AWS A5.5; 9015-B9
-------	-----------------------------------

SECTION 2: Hazards identification

2.1. Classification of the substance or mixture

Description	This product is not classified as hazardous according to applicable GHS hazard classification criteria as required and defined in OSHA Hazard Communication Standard (29CFR Part 1910.1200).
-------------	--

2.2. Label elements

More information	This product does not require labeling.
------------------	---

SAFETY DATA SHEET

This Safety Data Sheet complies with Annex II of
830/2015 amending EC No.
1907/2006, Commission Regulation (EU) 2019/521
amending CLP directive 1272/2008, also in
accordance with ISO 11014-1 and ANSI Z400.1

Issued: 2021-04-21

ATOM ARC 9015-B9

2.3. Other hazards

Other hazards

This product contains nickel, which is classified as toxic by prolonged inhalation, a skin sensitizer and a suspect carcinogen. Nickel powder is harmful for the environment. This product contains titanium dioxide which is possibly carcinogenic. This product contains quartz, but normally not in an inhalable fraction. Quartz can cause silicosis and may cause cancer. Avoid eye contact or inhalation of dust from the product.

Skin contact is normally no hazard but should be avoided to prevent possible allergic reactions. Persons with a pacemaker should not go near welding or cutting operations until they have consulted their doctor and obtained information from the manufacturer of the device.

When this product is used in a welding process, the most important hazards are welding fumes, heat, radiation and electric shock.

Fumes: Overexposure to welding fumes may result in symptoms like metal fume fever, dizziness, nausea, dryness or irritation of the nose, throat or eyes. Chronic overexposure to welding fumes may affect pulmonary function. Prolonged inhalation of nickel and chromium compounds above safe exposure limits can cause cancer. 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. psychological disturbances and spastic gait

Heat: Spatter and melting metal can cause burn injuries and start fires.

Radiation: Arc rays can severely damage eyes or skin.

Electricity: ELECTRIC SHOCK can kill.

Other

Other

Emergency Overview: Metal wire or rods in varying colours. This product is normally not considered hazardous as shipped. Gloves should be worn when handling to prevent cuts and abrasions.

SECTION 3: Composition/information on ingredients

3.2. Mixtures

Chemical name	CAS No. EC No. REACH No. Index No.	Concentration	Classification	H-pharse M factor acute M factor chronic	Note
IRON(REACH Registered)	7439-89-6 231-096-4 - -	60 - 100%	-	- - -	-
Limestone	1317-65-3 215-279-6 - -	5 - 10%	-	- - -	-
Calcium fluoride	7789-75-5 232-188-7 - -	5 - 10%	-	- - -	-
CHROMIUM	7440-47-3 231-157-5 - -	5 - 10%	-	- - -	-

SAFETY DATA SHEET

This Safety Data Sheet complies with Annex II of
830/2015 amending EC No.
1907/2006, Commission Regulation (EU) 2019/521
amending CLP directive 1272/2008, also in
accordance with ISO 11014-1 and ANSI Z400.1

Issued: 2021-04-21

ATOM ARC 9015-B9



Chemical name	CAS No. EC No. REACH No. Index No.	Concentration	Classification	H-phrases M factor acute M factor chronic	Note
SILICATE BINDER (SODIUM SILICATE)	1344-09-8 215-687-4 - -	1 - 5%	-	- - -	-
TITANIUM OXIDE**	13463-67-7 236-675-5 - -	1 - 5%	-	- - -	-
MANGANESE	7439-96-5 231-105-1 - -	1 - 5%	-	- - -	-
Feldspar	68476-25-5 270-666-7 - -	0.1 - 2%	-	- - -	-
Zirconium silicate	10101-52-7 233-252-7 - -	0 - 2%	-	- - -	-
SILICATE BINDER (POTASSIUM SILICATE)	1312-76-1 215-199-1 - -	0.1 - 1%	-	- - -	-
Silicon	7440-21-3 231-130-8 - -	0.1 - 1%	-	- - -	-
QUARTZ*	14808-60-7 238-878-4 - -	0.1 - 1%	STOT RE 1	H372 - -	-
Molybdenum	7439-98-7 231-107-2 - -	0.1 - 1%	-	- - -	-
Lithium fluoride	7789-24-4 232-152-0 - -	0.1 - 1%	-	- - -	-
Cellulose	9004-34-6 232-674-9 - -	0.1 - 1%	-	- - -	-
Nickel powder**	7440-02-0 231-111-4 - -	0.1 - 1%	Skin Sens. 1, STOT RE 1, Aquatic Chronic 3, Carc. 2	H317, H351, H372, H412 - -	-

SAFETY DATA SHEET

This Safety Data Sheet complies with Annex II of
830/2015 amending EC No.
1907/2006, Commission Regulation (EU) 2019/521
amending CLP directive 1272/2008, also in
accordance with ISO 11014-1 and ANSI Z400.1

Issued: 2021-04-21



ATOM ARC 9015-B9

Product based on

This product is a preparation of core wire with extruded coating.

SECTION 4: First aid measures

4.1. Description of first aid measures

Description of first aid measures

Electric shock: Disconnect and turn off the power. Use a nonconductive material to pull victim away from contact with live parts or wires. If not breathing, begin artificial respiration, preferably mouth-to-mouth. If no detectable pulse, begin Cardio Pulmonary Resuscitation (CPR). call emergency physician to the scene of the accident.

Inhalation

If breathing has stopped, perform artificial respiration and obtain medical assistance immediately! If breathing is difficult, provide fresh air and call physician.

Skin contact

For skin burns from arc radiation, promptly flush with cold water. Get medical attention for burns or irritations that persist. To remove dust or particles wash with mild soap and water

Eye contact

For radiation burns due to arc flash, see physician. To remove dusts or fumes flush with water for at least fifteen minutes. If irritation persists, obtain medical assistance.

4.2. Most important symptoms and effects, both acute and delayed

Not applicable

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

Not applicable

SECTION 5: Firefighting measures

5.1. Extinguishing media

Suitable extinguishing media

No specific recommendations for welding consumables. Welding arcs and sparks can ignite combustible and flammable materials. Use the extinguishing media recommended for the burning materials and fire situation.

5.2. Special hazards arising from the substance or mixture

Not applicable

5.3. Advice for firefighters

Special protective equipment for fire-fighters

Wear self-contained breathing apparatus as fumes or vapors may be harmful.

SECTION 6: Accidental release measures

6.1. Personal precautions, protective equipment and emergency procedures

Personal precautions, protective equipment and emergency procedures

Wear hand, head, eyes, ear and body protection like welders gloves, helmet or face shield with filter lens, safety boots, apron, arm and shoulder protection. Keep protective clothing clean and dry.

SAFETY DATA SHEET

This Safety Data Sheet complies with Annex II of
830/2015 amending EC No.
1907/2006, Commission Regulation (EU) 2019/521
amending CLP directive 1272/2008, also in
accordance with ISO 11014-1 and ANSI Z400.1

Issued: 2021-04-21



ATOM ARC 9015-B9

6.2. Environmental precautions

Environmental precautions

Refer to section 13.

6.3. Methods and material for containment and cleaning up

Methods and material for containment and cleaning up

Solid objects may be picked up and placed into a container. Liquids or pastes should be scooped up and placed into a container. Wear proper protective equipment while handling these materials. Do not discard as refuse.

6.4. Reference to other sections

Reference to other sections

Refer to section 8/13

SECTION 7: Handling and storage

7.1. Precautions for safe handling

Preventive handling precautions

Handle with care to avoid stings and cuts. Wear gloves when handling welding consumables. Avoid exposure to dust. Do not ingest. Some individuals can develop an allergic reaction to certain materials. Retain all warning and identity labels.

7.2. Conditions for safe storage, including any incompatibilities

Conditions for safe storage, including any incompatibilities

Keep separate from chemical substances like acids and strong bases, which could cause chemical reactions.

7.3. Specific end use(s)

Specific end use(s)

Arc Welding

SECTION 8: Exposure controls/personal protection

8.1. Control parameters

Exposure limits

Use industrial hygiene monitoring equipment to ensure that exposure does not exceed applicable national exposure limits. The following limits can be used as guidance. Unless noted, all values are for 8 hour time weighted averages (TWA).

National occupational exposure limits

Ingredient	CAS No. EC No.	Exposure limit ppm / mg/m ³	Short-term exposure limit ppm / mg/m ³	Source	Remark	Year
IRON(REACh Registered) (English- Canada) / Fer(REACh Registered) (French- Canada)	7439-89-6 231-096-4	- -	- -	ALBERTA REGULATIO N 87/2009	-	2020
Silicates (English- Canada) / Silicates (French- Canada)	1344-09-8 215-687-4	- -	- -	ALBERTA REGULATIO N 87/2009	-	2020
Silicon (English- Canada) / Silicium (French- Canada)	7440-21-3 231-130-8	- -	- -	ALBERTA REGULATIO N 87/2009	-	2020
QUARTZ* (English- Canada) /	14808-60-7	-	-	ALBERTA	-	2020

SAFETY DATA SHEET

This Safety Data Sheet complies with Annex II of
830/2015 amending EC No.
1907/2006, Commission Regulation (EU) 2019/521
amending CLP directive 1272/2008, also in
accordance with ISO 11014-1 and ANSI Z400.1

Issued: 2021-04-21

ATOM ARC 9015-B9



Ingredient	CAS No. EC No.	Exposure limit ppm / mg/m ³	Short-term exposure limit ppm / mg/m ³	Source	Remark	Year
QUARTZ* (French- Canada)	238-878-4	0.025	-	REGULATIO N 87/2009		
FLUORIDES (English- Canada) / Fluorures (French- Canada)	7789-75-5 232-188-7	- -	- -	ALBERTA REGULATIO N 87/2009	-	2020
Titanium oxide** (English- Canada) / Oxyde de titane** (French- Canada)	13463-67-7 236-675-5	- 10	- -	ALBERTA REGULATIO N 87/2009	-	2020
MOLYBDENUM (English- Canada) / Molybdène (French- Canada)	7439-98-7 231-107-2	- 0.5	- -	ALBERTA REGULATIO N 87/2009	Soluble compounds, respirable / Composés solubles, respirable	2020
Limestone (English- Canada) / Calcaire (French- Canada)	1317-65-3 215-279-6	- 10	- -	ALBERTA REGULATIO N 87/2009	-	2020
Nickel powder** (English- Canada) / Poudre de Nickel** (French- Canada)	7440-02-0 231-111-4	- 0.2	- -	ALBERTA REGULATIO N 87/2009	Insoluble compounds / Composés insolubles	2020
Silicates (English- Canada) / Silicates (French- Canada)	1312-76-1 215-199-1	- -	- -	ALBERTA REGULATIO N 87/2009	-	2020
MANGANESE (English- Canada) / Manganèse (French- Canada)	7439-96-5 231-105-1	- 0.2	- -	ALBERTA REGULATIO N 87/2009	as Mn / comme Mn	2020
MOLYBDENUM (English- Canada) / Molybdène (French- Canada)	7439-98-7 231-107-2	- 10	- -	ALBERTA REGULATIO N 87/2009	Metal and insoluble compounds, total/ Composés métalliques et insolubles, totale	2020
Zirconium silicate (English- Canada) / Silicate de Zirconium (French- Canada)	10101-52-7 233-252-7	- -	- -	ALBERTA REGULATIO N 87/2009	-	2020
Feldspar (English- Canada) / Feldspath (French- Canada)	68476-25-5 270-666-7	- -	- -	ALBERTA REGULATIO N 87/2009	-	2020
Cellulose (English- Canada) / Cellulose (French- Canada)	9004-34-6 232-674-9	- 10	- -	ALBERTA REGULATIO N 87/2009	-	2020
CHROMIUM (English- Canada) / CHROME (French- Canada)	7440-47-3 231-157-5	- 0.05	- -	ALBERTA REGULATIO N 87/2009	Water-soluble Cr VI Compounds/ Composés de Cr VI hydrosolubles	2020
MOLYBDENUM (English- Canada) / Molybdène (French- Canada)	7439-98-7 231-107-2	- 3	- -	ALBERTA REGULATIO N 87/2009	Metal and insoluble compounds, respirable/ Composés métalliques et insolubles, respirables	2020
Nickel powder** (English- Canada) / Poudre de Nickel** (French- Canada)	7440-02-0 231-111-4	- 0.1	- -	ALBERTA REGULATIO N 87/2009	Soluble compounds / Composés solubles	2020

SAFETY DATA SHEET

This Safety Data Sheet complies with Annex II of
830/2015 amending EC No.
1907/2006, Commission Regulation (EU) 2019/521
amending CLP directive 1272/2008, also in
accordance with ISO 11014-1 and ANSI Z400.1

Issued: 2021-04-21

ATOM ARC 9015-B9



Ingredient	CAS No. EC No.	Exposure limit ppm / mg/m ³	Short-term exposure limit ppm / mg/m ³	Source	Remark	Year
Lithium fluoride (English- Canada) / Fluorure de lithium (French- Canada)	7789-24-4 232-152-0	- -	- -	ALBERTA REGULATIO N 87/2009	-	2020
CHROMIUM (English- Canada) / CHROME (French- Canada)	7440-47-3 231-157-5	- 0.5	- -	ALBERTA REGULATIO N 87/2009	Metal and Cr III Compounds/ Composés métalliques et Cr III	2020
CHROMIUM (English- Canada) / CHROME (French- Canada)	7440-47-3 231-157-5	- 0.01	- -	ALBERTA REGULATIO N 87/2009	Insoluble Cr VI Compounds/ Composés de Cr VI insolubles	2020

8.2. Exposure controls

Hand protection

Abrasion (Cycles):(Type A-2 (500));(Type B-1 (100)); Cut (Factor):(Type A-1 (1.2));(Type B-1 (1.2)); Tear (Newton):(Type A-2 (25));(Type B-1 (10)); Puncture (Newton):(Type A-2 (60));(Type B-1 (20)); Burning Behaviour:(Type A-3);(Type B-2); Contact Heat:(Type A-1);(Type B-1); Convective Heat:(Type A-2);(Type B--); Small Splashes:(Type A-3);(Type B-2); Dexterity:(Type A-1 (11));(Type B-4 (6.5)) Type B gloves are recommended when high dexterity is required as for TIG welding, while type A gloves are recommended for other welding processes. The contact temp (oC) is 100 and the threshold time (seconds) >15.

Other

Other

Avoid exposure to welding fumes, radiation, spatter, electric shock, heated materials and dust. Train welders to avoid contact with live electrical parts and insulate conductive parts.

Ventilation

Use respirator or air supplied respirator when welding or brazing in a confined space, or where local exhaust or ventilation is not sufficient to keep exposure values within safe limits. Use special care when welding painted or coated steels since hazardous substances from the coating may be emitted. Ensure sufficient ventilation, local exhaust, or both, to keep welding fumes and gases from breathing zone and general area.

SECTION 9: Physical and chemical properties

9.1. Information on basic physical and chemical properties

Physical state

Solid

Colour

Steel rod with extruded flux coating with Varying color

Odour

Not applicable

Odour threshold

Not applicable

Melting point / freezing point

> 1300 °C

Boiling point or initial boiling point and boiling range

No data available

Flammability

Not applicable

Lower and upper explosion limit

No data available

SAFETY DATA SHEET

This Safety Data Sheet complies with Annex II of
830/2015 amending EC No.
1907/2006, Commission Regulation (EU) 2019/521
amending CLP directive 1272/2008, also in
accordance with ISO 11014-1 and ANSI Z400.1

Issued: 2021-04-21



ATOM ARC 9015-B9

Flash point	Not applicable
Auto-ignition temperature	Not applicable
Decomposition temperature	No data available
pH	Not applicable
Kinematic viscosity	Not applicable
Solubility	No data available
Partition coefficient n-octanol/water	Not applicable
Vapour pressure	Not applicable
Density and/or relative density	Not applicable
Relative vapour density	Not applicable
Evaporation Rate	Not applicable
Explosive properties	Not applicable
Oxidising properties	Not applicable

9.2. Other information

Not applicable

SECTION 10: Stability and reactivity

10.1. Reactivity

Reactivity	Non Reactive unless gets in contact with chemical substances like acids or strong bases could cause generation of gas
------------	---

10.2. Chemical stability

Chemical stability	Stable at normal conditions
--------------------	-----------------------------

10.3. Possibility of hazardous reactions

Possibility of hazardous reactions	Not applicable
------------------------------------	----------------

10.4. Conditions to avoid

Conditions to avoid	This product is only intended for normal welding purposes.
---------------------	--

10.5. Incompatible materials

Incompatible materials	Not applicable
------------------------	----------------

SAFETY DATA SHEET

This Safety Data Sheet complies with Annex II of
830/2015 amending EC No.
1907/2006, Commission Regulation (EU) 2019/521
amending CLP directive 1272/2008, also in
accordance with ISO 11014-1 and ANSI Z400.1

Issued: 2021-04-21

ATOM ARC 9015-B9



10.6. Hazardous decomposition products

Hazardous decomposition products

When this product is used in a welding process, hazardous decomposition products would include those from the volatilization, reaction or oxidation of the materials listed in Section 3 and those from the base metal / Coated wire / Coated rod / Bare wire / Bare rod.

Other

Other

Refer to applicable national exposure limits for fume compounds, including those exposure limits for fume compounds found in Section 8.

A significant amount of the chromium in the fumes can be hexavalent chromium, which has a very low exposure limit in some countries. Manganese and nickel have low exposure limits, in some countries, that may be easily exceeded.

Reasonably expected gaseous products would include carbon oxides, nitrogen oxides and ozone. Air contaminants around the welding area can be affected by the welding process and influence the composition and quantity of fumes and gases produced.

SECTION 11: Toxicological information

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

Information on toxicological effects

Inhalation of welding fumes and gases can be dangerous to your health. Classification of welding fumes is difficult because of varying base materials, coatings, air contamination and processes. The International Agency for Research on Cancer has classified welding fumes as carcinogenic to humans (Group 1).

Acute toxicity

Overexposure to welding fumes may result in symptoms like metal fume fever, dizziness, nausea, dryness or irritation of the nose, throat or eyes.

Skin corrosion/irritation

No data available

Serious eye damage/irritation

No data available

Respiratory/skin sensitization

No data available

Germ cell mutagenicity

No data available

Genotoxicity

No data available

Carcinogenicity

*This product contains substance(s) that may cause cancer, which is/are classified as Carcinogenic to humans as per IARC.

**This product contains substance(s) that may cause cancer, which is/are classified as Possibly carcinogenic to humans as per IARC.

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.)

Repeated dose toxicity

No data available

Reproductive toxicity

No data available

STOT-single exposure

No data available

STOT-repeated exposure

No data available

Aspiration hazard

No data available

LD50 Oral

No data available

SAFETY DATA SHEET

This Safety Data Sheet complies with Annex II of
830/2015 amending EC No.
1907/2006, Commission Regulation (EU) 2019/521
amending CLP directive 1272/2008, also in
accordance with ISO 11014-1 and ANSI Z400.1

Issued: 2021-04-21

ATOM ARC 9015-B9



LD50 Dermal	No data available
--------------------	-------------------

LC50 Inhalation	No data available
------------------------	-------------------

Routes of exposure	No data available
---------------------------	-------------------

Symptoms related to the physical, chemical and toxicological characteristics	No data available
---	-------------------

Mixture versus substance information	No data available
---	-------------------

Delayed and immediate effects as well as chronic effects from short and long-term exposure	No data available
---	-------------------

Interactive effects	No data available
----------------------------	-------------------

Toxicity in case of skin contact	No data available
---	-------------------

Absence of specific data	No data available
---------------------------------	-------------------

Toxicity in case of eye contact	No data available
--	-------------------

Mixtures	No data available
-----------------	-------------------

Toxicity in case of ingestion	No data available
--------------------------------------	-------------------

11.2. Information on other hazards

Not applicable

Other

Acute effects	No data available
----------------------	-------------------

Long term effect	Chronic toxicity: Overexposure to welding fumes may affect pulmonary function. 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. disturbances and spastic gait. Inhalable quartz is a respiratory carcinogen however the process of welding converts crystalline quartz to the amorphous form which is not considered to be a carcinogen.
-------------------------	--

Information to doctor	No data available
------------------------------	-------------------

SECTION 12: Ecological information

12.1. Toxicity

Acute toxicity	No data available
-----------------------	-------------------

Toxicity	No data available
-----------------	-------------------

Aquatic	No data available
----------------	-------------------

Soil	No data available
-------------	-------------------

SAFETY DATA SHEET

This Safety Data Sheet complies with Annex II of
830/2015 amending EC No.
1907/2006, Commission Regulation (EU) 2019/521
amending CLP directive 1272/2008, also in
accordance with ISO 11014-1 and ANSI Z400.1

Issued: 2021-04-21



ATOM ARC 9015-B9

Acute fish toxicity No data available

Acute algae toxicity No data available

Acute crustacean toxicity No data available

Chronical toxicity No data available

Product / Substance name CAS / EC no.	Remark
NICKEL POWDER** 7440-02-0 / 231-111-4	This product contains Nickel powder which is classified as harmful to aquatic organisms by 1272/2008 CLP Directive and may cause long-term adverse effects in the aquatic environment.

12.2. Persistence and degradability

Persistence and degradability No data available

Decay/transformation No data available

12.3. Bioaccumulative potential

Bioaccumulative potential No data available

12.4. Mobility in soil

Mobility No data available

12.5. Results of PBT and vPvB assessment

**Results of PBT and vPvB
assessment** No data available

12.6. Endocrine disrupting properties

Not applicable

12.7. Other adverse effects

Other adverse effects No data available

Other

Other Welding consumables and materials could degrade/weather into components originating from the consumables or from the materials used in the welding process. Avoid exposure to conditions that could lead to accumulation in soils or groundwater.

SAFETY DATA SHEET

This Safety Data Sheet complies with Annex II of
830/2015 amending EC No.
1907/2006, Commission Regulation (EU) 2019/521
amending CLP directive 1272/2008, also in
accordance with ISO 11014-1 and ANSI Z400.1

Issued: 2021-04-21

ATOM ARC 9015-B9

SECTION 13: Disposal considerations

13.1. Waste treatment methods

Disposal considerations

Discard any product, residue, disposable container or liner in an environmentally acceptable manner, in full compliance with federal and local regulations. Use recycling procedures if available.

USA RCRA: Unused products or product residue containing chromium is considered hazardous waste if discarded, RCRA ID Characteristic Toxic Hazardous Waste D007.

(<https://rcrainfo.epa.gov/rcrainfoweb/action/modules/main/glossary/waste>)

Residues from welding consumables and processes could degrade and accumulate in soils and groundwater. Welding slag from this product typically contains mainly the following components originating from the coating of the electrode: Fe, O, Mn, Cr, Ni, F, Li, Na, Si, Al, K, Ca, Mo, Ti, Zr

SECTION 14: Transport information

14.1. UN number

Not applicable

14.2. UN proper shipping name

Not applicable

14.3. Transport hazard class(es)

Not applicable

14.4. Packing group

Not applicable

14.5. Environmental hazards

Not applicable

14.6. Special precautions for user

Not applicable

14.7. Transport in bulk according to Annex II of Marpol and the IBC Code

Not applicable

SAFETY DATA SHEET

This Safety Data Sheet complies with Annex II of
830/2015 amending EC No.
1907/2006, Commission Regulation (EU) 2019/521
amending CLP directive 1272/2008, also in
accordance with ISO 11014-1 and ANSI Z400.1

Issued: 2021-04-21

ATOM ARC 9015-B9

SECTION 15: Regulatory information

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

EU regulations

Regulation (EC) No 1907/2006 of the European Parliament and of the Council of 18 December 2006 concerning the Registration, Evaluation, Authorisation and Restriction of Chemicals (REACH), establishing a European Chemicals Agency, amending Directive 1999/45/EC and repealing Council Regulation (EEC) No 793/93 and Commission Regulation (EC) No 1488/94 as well as Council Directive 76/769/EEC and Commission Directives 91/155/EEC, 93/67/EEC, 93/105/EC and 2000/21/EC.

Regulation (EC) No 1272/2008 of the European Parliament and of the Council of 16 December 2008 on classification, labelling and packaging of substances and mixtures, amending and repealing Directives 67/548/EEC and 1999/45/EC, and amending Regulation (EC) No 1907/2006

Commission Regulation (EU) 2015/830 of 28 May 2015 amending Regulation (EC) No 1907/2006 of the European Parliament and the Council concerning the Registration, Evaluation, Authorisation and Restriction of Chemicals (REACH)

DIRECTIVE 2008/98/EC OF THE EUROPEAN PARLIAMENT AND OF THE COUNCIL. of 19 November 2008. on waste and repealing certain Directives.

European Parliament and Council Directive 94/62/EC of 20 December 1994 on packaging and packaging waste.

SAFETY DATA SHEET

This Safety Data Sheet complies with Annex II of
830/2015 amending EC No.
1907/2006, Commission Regulation (EU) 2019/521
amending CLP directive 1272/2008, also in
accordance with ISO 11014-1 and ANSI Z400.1

Issued: 2021-04-21

ATOM ARC 9015-B9

Other regulations, limitations and legal regulations

Poland Regulations:

ACT of 25 February 2011 on the chemical substances and their mixtures (OJ # 63, poz. 322).

Regulation of the Minister of Labour and Social Policy of 6 June 2014 on Maximum Permissible Concentration and Intensity of Agents Harmful to Health in the Working Environment (Dz. u. z. 2014, poz. 817).

The Act on Waste of 14 December 2012, Journal of Laws of 2013, item 21 with amendments

Act of 13th June 2013 on packaging management and packaging waste (Journal of Laws of 2013, item 888).

Regulation of the Minister of the Environment of 9 December 2014 on waste catalogue (Journal of Laws of 2014, item 1923).

Regulation of the Minister of Economy of 21 December 2005. Concerning essential requirements for personal protective equipment (Journal. Laws No. 259, item. 2173).

Regulation of the Minister of Health of 2 February 2011 on tests and measurements of factors harmful to health in the working environment (the Journal of Laws 2011, no. 33, item 166).

USA Regulations :

USA: 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.)

CERCLA/SARA Title III Reportable Quantities (RQs) and/or Threshold Planning Quantities (TPQs):
Product is a solid solution in the form of a solid article. Spills or releases resulting in the loss of any ingredient at or above its RQ require immediate notification to the National Response Center and to your Local Emergency Planning Committee.

EPCRA/SARA Title III 313 Toxic Chemicals: The following metallic components are listed as SARA 313 "Toxic Chemicals" and potential subject to annual SARA 313 reporting. See Section 3 for weight percent.
Manganese: 1.0% de minimis concentration
Nickel Powder: 0.1% de minimis concentration
Chromium: 1.0% de minimis concentration

International Inventories:

Australia: The substance(s) in this product is/are in compliance with the inventory requirements of Australia- Inventory of Industrial Chemicals (AIIC)

United States EPA Toxic Substance Control Act: All constituents of this product are on the TSCA inventory list or are excluded from listing.

Canadian Environmental Protection Act (CEPA): All constituent(s) of this product is/are on the Domestic Substance List (DSL).

15.2. Chemical safety assessment

Chemical safety assessment

No data available

SAFETY DATA SHEET

This Safety Data Sheet complies with Annex II of
830/2015 amending EC No.
1907/2006, Commission Regulation (EU) 2019/521
amending CLP directive 1272/2008, also in
accordance with ISO 11014-1 and ANSI Z400.1

Issued: 2021-04-21

ATOM ARC 9015-B9

Other

Other

Read and understand the manufacturer's instructions, your employer's safety practices and the health and safety instructions on the label. Observe any federal and local regulations. Take precautions when welding and protect yourself and others.

WARNING: Welding fumes and gases are hazardous to your health and may damage lungs and other organs. Use adequate ventilation. ELECTRIC SHOCK can kill.
ARC RAYS and SPARKS can injure eyes and burn skin.

SECTION 16: Other information

Changes to previous revision

This Safety Data Sheet has been revised due to modifications to Sections 1-16. Previous Revision of SDS as per Regulation – April 2019; Latest Revision of SDS as per Regulation – May 2020

References to key literature and data sources

Refer to ESAB "Welding and Cutting - Risks and Measures", F52-529 "Precautions and Safe Practices for Electric Welding and Cutting" and F2035 "Precautions and Safe Practices for Gas Welding, Cutting and Heating" available from ESAB, and to: www.esab.com

Phrase meaning

STOT RE 1 - Specific Target Organ Toxicity — Repeated exposure, hazard category 1
Skin Sens. 1 - Skin sensitisation, hazard category 1
Aquatic Chronic 3 - Hazardous to the aquatic environment — Chronic hazard category 3
Carc. 2 - Carcinogenicity, hazard category 2
H317 May cause an allergic skin reaction.
H351 Suspected of causing cancer.
H372 Causes damage to organs through prolonged or repeated exposure .
H412 Harmful to aquatic life with long lasting effects.

SAFETY DATA SHEET

This Safety Data Sheet complies with Annex II of
830/2015 amending EC No.
1907/2006, Commission Regulation (EU) 2019/521
amending CLP directive 1272/2008, also in
accordance with ISO 11014-1 and ANSI Z400.1

Issued: 2021-04-21

ATOM ARC 9015-B9



Other

Additional information

USA: Contact ESAB at www.esabna.com or 1-800 ESAB-123 if you have any questions about this SDS. American National Standard Z49.1 Safety in Welding and Cutting, ANSI/AWS F1.5 Methods for Sampling and Analyzing Gases from Welding and Allied Processes, ANSI/AWS F1.1 "Method for Sampling Airborne Particles Generated by Welding and Allied Processes", AWSF3.2M/F3.2 "Ventilation Guide for Weld Fume", 550 North Le Jeune Road, Miami Florida 33135. Safety and Health Fact Sheets available from AWS at www.aws.org.

OSHA Publication 2206 (29 C.F.R. 1910), U.S. Government Printing Office, Superintendent of Documents, P.O. Box 371954, Pittsburgh, PA 15250-7954

American Conference of Governmental Hygienists (ACGIH), Threshold Limit Values and Biological Exposure Indices, 6500 Glenway Ave., Cincinnati, Ohio 45211, USA.

NFPA 51B "Standard for Fire Prevention During Welding, Cutting and Other Hot Work" published by the National Fire Protection Association, 1 Batterymarch Park, Quincy, MA 02169

UK: WMA Publication 236 and 237, "Hazards from Welding fume", "The arc welder at work, some general aspects of health and safety".

Germany: Germany: Accident prevention regulation BGV D1, "Welding, cutting and related processes".

Canada: CSA Standard CAN/CSA-W117.2-01 "Safety in Welding, Cutting, and Allied Processes".

This product has been classified according to the hazard criteria of the CPR and the SDS contains all of the information required by the CPR.

ESAB requests the users of this product to study this Safety Data Sheet (SDS) and become aware of product hazards and safety information. To promote safe use of this product a user should: notify its employees, agents and contractors of the information on this SDS and any product hazards/safety information. furnish this same information to each of its customers for the products

Request such customers to notify employees and customers for the same product hazards and safety information.

The information herein is given in good faith and based on technical data that ESAB believes to be reliable. Since the conditions of use is outside our control, we assume no liability in connection with any use of this information and no warranty expressed or implied is given. Contact ESAB for more information.



SAFETY DATA SHEET (SDS)

For Welding Consumables and Related Products
Conforms to the criteria of the Globally Harmonized System of Classification and Labeling of Chemicals (GHS),
OSHA Hazard Communication Standard 29CFR 1910.1200
Standard Must Be Consulted for Specific Requirements

Nickel-Iron Wire & Rod
REVISED 3-2020A
SDS Number : 011A-Ni Wire & Rod

SECTION I – IDENTIFICATION of Product and Company

Manufacturer/Supplier: Washington Alloy Company	Recommended use: Shielded Metal Arc Welding	Restriction on use: Not Known	Telephone No: 704-598-1325
Address: 7010-G Reames Rd , Charlotte, NC 28216			Emergency No: 704-598-1325
Ni-59 (ERNiCrMo-13)Ni-60 (ERNiCu-7), Ni-61 (ERNi-1), Ni-62 (ERNiCrFe-5), Ni-65 (ERNiFeCr-1), Ni-82 (ERNiCr-3), Ni-625 (ERNiCrMo-3), Ni-718 (ERNiFeCr-2), C276 (ERNiCrMo-4), Ni-92 (ERNiCrFe-6), X (ERNiCrMo-2), W (ERNiMo-3), Ni-601 (ErNiCrFe-11), Ni-617 (ERNiCrCoMo-1), 686 (ERNiCrMo-14), 725 (ERNiCrMo-15), B (ERNiMo-1), B-2 (ERNiMo-7), B-3 (ERNiMo-10), C4@ (ERNiCrMo-7)C22@ (ERNiCrMo-10), G@ (ERNiCrMo-1), G3@ (ERNiCrMo-9), G30@ (ERNiCrMo-11), Ni-69 (ERNiCrFe-8) , C2000@ (ERNiCrMo-17), 80/20, Ni-99 (ERNi-CI), Ni-55 (Chemistry to AWS A 5.15 ENiFe-CI , INVAR® 36 (Ni-Fe 36)			Specification: AWS A5.14 (Classification) Nickel and Nickel Alloy Bare Electrodes and Rods
			Others

SECTION II – COMPOSITION / INFORMATION ON INGREDIENTS

GHS Hazard Classification: Not Classified / **Label Elements** - Hazard symbol and Signal word = No symbol or signal word

Hazard statement and Precautionary statement = Not applicable

Other Hazards which do not result in GHS classification and Overview: Electric shock can kill. Wear approved head, hand and body protection, which help to prevent injury from radiation, sparks and electrical shock. Welding arc and sparks can ignite combustibles or flammable materials. See ANSI Z-49.1. This would include wearing welder's gloves and a protective face shield and may include arm protectors, apron, hats, shoulder protection, as well as dark substantial clothing. Welders should be trained not to allow electrically live parts to contract the skin or wet clothing and gloves. The welders should insulate themselves from the work and ground. Arc Rays can injure eyes and burn skin. Read and understand the manufacturer's instructions and precautionary label on this product and your employer's safety practices. See Section XIII.

As shipped these are odorless, solid rods that are nonflammable, non-explosive, non-reactive and non –hazardous and may be copper coated.

Substance: Welding fumes and gases cannot be classified simply. The composition and quantity of these fumes and gases are dependent upon the metal being welded, the procedures followed and the electrodes used. Fumes may affect eyes, skin, respiratory system as well as pancreas and liver.

Workers should be aware that the composition and quantity of fumes and gases to which they may be exposed, are influenced by: coatings which may be present on the metal being welded (such as paint, plating, or galvanizing), the number of welders in operation and the volume of the work area, the quality and amount of ventilation, the position of the welder's head with respect to the fume plume, as well as the presence of contaminants in the atmosphere (such as chlorinated hydrocarbon vapors from cleaning and degreasing procedure). When the filler is consumed, the fumes and gas decomposition products generated are different in percent and form from the ingredients listed in Section III, The composition of these fumes and gases are the concerning matter and not the composition of the electrode itself. Decomposition products include those originating from the volatilization, reaction, or oxidation of the ingredients shown in Section III, plus those from the base metal, coating and the other factors noted above.

Reasonable expected fume constituents of this product would include: Complex oxides or compounds of iron, manganese, silicon, copper, aluminum, chromium, nickel, titanium, and zirconium. (Other complex oxides may be present when using fluxes).

Chemical Identity	CAS No.	EINECS#
Carbon dioxide	124-38-9	204-696-9
Carbon monoxide	630-8-0	211-128-3
Nitrogen dioxide	10102-44-0	233-272-6
Ozone	10028-15-6	233-069-2
Manganese (Mn)	7439-96-5	231-105-1
Nickel (Ni)	7440-02-0	231-111-4
Chromium (Cr)	7440-47-3 (Cr VI) 18540-29-9	231-157-5
Chromium oxide	1308-38-9	215-160-9

SECTION III – COMPOSITION / INFORMATION ON INGREDIENTS

*The term "HAZARDOUS MATERIALS" should be interpreted as a term required and defined in OSHA HAZARD COMMUNICATION STANDARD 29 CFR 1910.1200 however the use of this term does not necessarily imply the existence of any hazard.

Chemical Identity Ingredients	CAS No.	EINECS#	Chemical Identity Ingredients	CAS No.	EINECS#
Iron (Fe) (limits as oxide fume)	7439-89-6	231-096-4	Molybdenum (Mo)	7439-98-7	231-107-2
Manganese (Mn) (limits as fume)	7439-96-5	231-105-1	Nickel (Ni)	7440-02-0	231-111-4
Silicon (Si)	7440-21-3	231-130-8	Copper (Cu)	7440-50-8	231-159-6
Carbon (C)	7440-44-0	231-153-3	Chromium (Cr)	7440-47-3	231-157-5
Tungsten (W)	7440-33-7	231-143-9	Vanadium (V) Respirable dust	7440-62-2	231-171-1
Cobalt (Co)	7440-48-4	231-158-0	Niobium (Nb or Cb)	7440-03-1	231-113-5
Tantalum (Ta)	7440-25-7	231-125-5	Titanium (Ti)	7440-32-6	231-142-3
Aluminum (Al)	7429-90-5	231-072-3			

SAFETY DATA SHEET (SDS)

Nickel-Iron Wire & Rod
REVISED 3-2020A
SDS Number : 011A-Ni Wire & Rod

Chemical Composition Percent by Weight Undiluted Weld Metal

AWS Classification	C	Mn	Fe	P	S	Si	Cu	Ni	Co	Al	Ti	Cr	Nb (Cb) plus Ta	Mo	W
ERNi-1	0.15	1.0	1.0	0.03	0.015	0.75	0.25	93.0 min.		1.5	2.0-3.5				
ERNiCu-7	0.15	4.0	2.5	0.02	0.015	12.5	Bal	62.0-69.0		1.25	1.5-3.0				
ERNiCr-3	0.10	2.5-3.5	3.0	0.03	0.015	0.50	0.50	67.0 min.	(E)		0.75	18.0-22.0	2.0-3.0		
ERNiCrFe-5	0.08	1.0	6.0-10.0	0.03	0.015	0.35	0.50	70.0 min.	(E)			14.0-17.0	1.5-3.0		
ERNiCrFe-6	0.08	2.0-2.7	8.0	0.03	0.015	0.35	0.50	67.0 min.			2.5-3.5	14.0-17.0			
ERNiCrFe-8	0.08	1.0	5.0-9.0	0.03	0.015	0.50	0.50	70.0 min.		0.4-1.0	2.0-2.75	14.0-17.0	0.70-1.20		
ERNiCrFe-11	0.10	1.0	Balance	0.03	0.015	0.50	1.0	58.0-63.0		1.0-1.7		21.0-25.0			
ERNiFeCr-1	0.05	1.0	22.0 min.	0.03	0.03	0.50	1.5-3.0	38.0-46.0		0.20	0.6-1.2	19.5-23.5		2.5-3.5	
ERNiFeCr-2	0.08	0.35	Balance	0.015	0.015	0.35	0.30	50.0-55.0		0.20-0.80	0.65-1.15	17.0-21.0	4.75-5.50	2.8-3.3	
ERNiMo-1 ^{V1}	0.08	1.0	4.0-7.0	0.025	0.03	1.0	0.50	Balance	2.5			1.0		26.0-30.0	1.0
ERNiMo-3 ^{V2}	0.12	1.0	4.0-7.0	0.04	0.03	1.0	0.50	Balance	2.5			4.0-6.0		23.0-26.0	1.0
ERNiMo-7	0.02	1.0	2.0	0.04	0.03	0.10	0.50	Balance	1.0			1.0		26.0-30.0	1.0
ERNiMo-10 ^{V3}	0.01	3.0	1.0-3.0	0.03	0.01	0.10	0.20	65.0 min	3.0	0.50	0.20	1.0-3.0		27.0-32.0	3.0
ERNiCrMo-1	0.05	1.0-2.0	18.0-21.0	0.04	0.03	1.0	1.5-2.5	Balance	2.5			21.0-23.5	1.75-2.50	5.5-7.5	1.0
ERNiCrMo-2 (C)	1.0	17.0-20.0		0.04	0.03	1.0	0.50	Balance	0.5-2.5			20.5-23.0		8.0-10.0	0.2-1.0
ERNiCrMo-3	0.10	0.50	5.0	0.02	0.015	0.50	0.50	58.0 min		0.40	0.40	20.0-23.0	3.15-4.15	8.0-10.0	
ERNiCrMo-4	0.02	1.0	4.0-7.0	0.04	0.03	0.08	0.50	Balance	2.5			14.5-16.5		15.0-17.0	
ERNiCrMo-7	0.015	1.0	3.0	0.04	0.03	0.08	0.50	Balance	2.0		0.70	14.0-18.0		14.0-18.0	0.50
ERNiCrMo-9	0.015	1.0	18.0-21.0	0.04	0.03	1.0	1.5-2.5	Balance	5.0			21.0-23.5	0.50	6.0-8.0	1.5
ERNiCrMo-10 ^{V4}	0.015	0.50	2.0-6.0	0.02	0.010	0.08	0.50	Balance	2.5			20.0-22.5		12.5-14.5	2.5-3.5
ERNiCrMo-11	0.03	1.5	13.0-17.0	0.04	0.02	0.80	1.0-2.4	Balance	5.0			28.0-31.5	0.30-1.50	4.0-6.0	1.5-4.0
ERNiCrMo-13	0.5	1.5	0.015	0.010	0.10	0.10	0.50	Balance	0.3	0.1-0.4		22.0-24.0		15.0-16.5	
ERNiCrMo-14	0.01	1.0	5.0	0.02	0.02	0.08	0.5	Balance		0.4-0.5	0.25	19.0-23.0		15.0-17.0	3.0-4.4
ERNiCrMo-15	0.03	0.35	Balance	0.015	0.01	0.20		55.0-59.0		0.35	1.0-1.7	19.0-22.5	2.75-4.00	7.0-9.5	
ERNiCrMo-17	0.010	0.5	3.0	0.025	0.010	0.08	1.3-1.9	Balance	2.0	0.50		22.0-24.0		15.0-17.0	
ERNiCrCoMo-1 (C)	1.0	3.0		0.03	0.015	1.0	0.50	Balance	10-15	0.8-1.5	0.60	20.0-24.0		8.0-10.0	
Single digits are maximum ; Others Elements Total 0.50 max for alloy above, 1.0 for alloys below ; Vanadium= V1=0.2-0.4 V2=0.60 V3=0.2 V4=0.35 ; C=0.05-0.15 ; Co = 0.12 when specified															
ERNi-CI	1.0	2.5	4.0		0.03	0.75	4.0	90.0 min							
Ni-55 (non AWS)	2.0	2.5	BALANCE		0.03	4.0	2.5	45.0-60.0		1.0					
Ni-Fe 36	0.20	1.0	60.0			1.5	0.75	30-40	1.75			1.0		1.0	
80/20 (Nichrome V)	0.20	2.5	1.5		0.01	2.0		80-90				19-21			

Other elements or ingredients may be present but in quantities much less than 1%.⁽¹⁾ Subject to reporting requirements of Section 302, 304, 311, 312, and 313 of the Emergency Planning and Community Right-To-Know Act of 1986 and 40CFR 370 and 372; (Resp) = Respiratory/ Respiration: Welding and cutting of products that contain Chromium may produce hexavalent chromium and YOU should read and follow OSHA's final rules Fed Register #:71:10099-10385 dated 02-28-2006. Occupational Safety and Health Administration 29 CFR 1910.1000 Permissible Exposure Limit (PEL). American Conference of Governmental Industrial Hygienists (ACGIH) Threshold Limit Value (TLV[R]). *Ceiling Limit **Short Term Exposure Limit

SECTION IV – FIRST AID MEASURES

Contact with skin, eyes, ingestion or injection should not be a source for exposure with proper protection.

Ingestion: Avoid contact with metal fume or powers which may lead to ingestion

Inhalation: If breathing has stop or difficult move to fresh air and as needed perform artificial respiration. Call medical assistance or physician.

Skin Contact: Remove any contaminated clothing, gloves or other personnel equipment and promptly wash/flush with mild soap and water. For reddish or blistered skin from thermal/arc radiation promptly wash/flush with water. Get medical assistance or physician help as needed.

Eye Contact: Arc radiation can injure eyes and also cause an arc flash – if this occurs, move to dark room removing lenses as required and get rest and cover eyes with non-stick dressings (padded dressing) Removal of dust and fumes requires flushing with abundant amounts of clean water for at least 15 minutes. Get medical assistance or physician help as needed or if issues persist.

Most important symptoms/effects, acute and delayed:

Symptoms: Short-term (acute) overexposure to welding fumes may result in discomfort such as metal fume fever, dizziness, nausea, dryness or irritation of nose, throat, or eyes. Pre-existing respiratory issues may be aggregated. Long-term (chronic) over-exposure to welding fumes can lead to siderosis (iron deposits in lung) and is believed to affect pulmonary function. Manganese and Manganese compounds above safe exposure limits can affect or cause irreversible damage to the central nervous system, including the brain: symptoms may result in impaired speech and movement, lack of energy, stiffness in legs, feet, toes, muscular weakness as well as psychological disturbances. Reports of bronchitis and lung fibrosis have also been noted.

Hazards: Welding fumes and gases cannot be classified simply. Refer to Section II under Substance

SECTION V – FIRE-FIGHTING MEASURES

As shipped these are odorless, solid rods that are nonflammable, non-explosive, non-reactive and non –hazardous. Welding arcs and sparks can ignite combustibles or flammable materials Read and understand the manufacturer's instructions and precautionary label on this product and your employer's safety practices. Read and understand: American National Standard ANSI Z49.1 *Safety in Welding, Cutting and Allied Processes*, published by the AMERICAN WELDING SOCIETY, 550 N.W. LeJeune Road, Miami, Florida 33126; OSHA *Safety and Health Standards* are published by the U.S.

Government Printing Office, 732 North Capitol Street NW, Washington, DC 20401.

Also National

Fire Protection Association NFPA 51B, *Standard for Fire Prevention During Welding, Cutting and other Hot Work*

Suitable (and unsuitable) extinguishing media: As shipped these items will not burn however in the event use media recommended for the burning materials and fire situation and surroundings. No unsuitable media known at this time.

Specific hazards arising from the chemicals: Welding arcs and sparks can ignite combustibles or flammable materials

Specific protective equipment and precautions for firefighters: Wear self-contained breathing apparatus and full protective clothing in case of fire or when fumes and vapors are present. Follow general fire-fighting precautions as in the workplace.

SAFETY DATA SHEET (SDS)

Nickel-Iron Wire & Rod
REVISED 3-2020A
SDS Number : 011A-Ni Wire & Rod

SECTION VI – ACCIDENTAL RELEASE MEASURES

Personal Precautions, protective equipment and emergency procedures: With airborne dust and fumes be sure to use adequate engineering ventilation controls and personal protection to prevent overexposure limits recommendations found in Section VIII.

Environment precautions: Control work practices to eliminate environmental release. These products are solid metal rods, with no spill or leak hazards as shipped. If product becomes molten dam up with sand type media until it cools back to a solid and reuse/recycle as scrap.

Methods and Materials for containment and cleaning up: Coated Solid rods can be picked up and placed back in the original container. Clean up immediately while following all safety guidelines as well as using all personal protection safety listed in section VIII. Avoid generating dust and prevent materials from entering and drains, sewers or water sources. Disposal considerations found in Section XIII.

When fumes and vapors are present. Follow general fire-fighting precautions as in the workplace.

SECTION VII – HANDLING AND STORAGE

Precautions for safe handling: Handle with care wearing gloves and keep formation of airborne dust and fumes to a minimum. If needed use adequate engineering ventilation controls and personal protection to prevent overexposure limits recommendations found in Section VIII. Also read American National Standard ANSI Z49.1 *Safety in Welding, Cutting and Allied Processes*, published by the AMERICAN WELDING SOCIETY, 550 N.W. LeJeune Road, Miami, Florida 33126; OSHA *Safety and Health Standards* are published by the U.S. Government Printing Office, 732 North Capitol Street NW, Washington, DC 20401. Do not eat or drink while using these products and ensure proper ventilation is used. Wash hands after use.

Conditions for safe storage, including any incompatibilities: All employees who handle these products should be trained to handle it safely. Open packages of these products/containers on a safe stable surface and must be properly labeled at all times. Store products in original closed packages, cool dry place, while avoiding extreme temperatures or incompatible items such as acids, oxidizers and halogens. Always follow all regulations in accordance with local/regional/state/national guidelines.

SECTION VIII – EXPOSURE CONTROLS/PERSONAL PROTECTION

Control parameters

Flux or other ingredients	CAS No.	EINECS#	Exposure Limit (mg/m ³)		
			OSHA PEL	ACGIH TLV	NIOSH REL
Iron (Fe) (limits as oxide fume)	7439-89-6	231-096-4	10	5 (Resp)	5.0
Carbon (C)	7440-44-0	231-153-3	10 (TOTAL) 2 (Resp)	15 (TOTAL)5 (Resp)	-
Manganese (Mn) (limits as fume) ⁽¹⁾	7439-96-5	231-105-1	1, 3.0** , 5*	0.02 (Resp) 0.1***	1.0, 3.0**
Silicon (Si)	7440-21-3	231-130-8	15 (dust) 5 (Resp)	WITHDRAWN	5 (Resp) 10 (TOTAL)
Copper (Cu) ⁽¹⁾	7440-50-8	231-159-6	1 (dust) 0.1(fume)	1 (dust) 0.2 (fume)	1.0
Chromium (Cr) ^{(C) (1)}	7440-47-3	231-157-5	1 (metal) 0.5 (Cr III) 0.005 (Cr VI)	0.5 (metal) 0.5 (Cr III) 0.05 (Cr VI) ^(SC) 0.01 (Cr VI)	0.5 (metal)
Nickel (Ni) ⁽¹⁾	7440-02-0	231-111-4	1	1.5 (inhalable fraction)	0.015
Tantalum	7440-25-7	231-125-5	5.0	5.0,10.0**	5.0
Niobium	7440-03-1	231-113-5	NA	10.0	NA
Titanium (Ti) Oxide dust (1) (2)	7440-32-6	231-142-3	15(total particulate) 5 (Resp)	10, 20**	NA
Cobalt	7440-48-4	231-158-0	0.1	0.02	0.05
Tungsten (W)	7440-33-7	231-143-9	5.0 ,10.0**	5.0 ,10.0**	5.0
Vanadium (V) Respirable dust ⁽¹⁾	7440-62-2	231-171-1	0.05 as V ₂ O ₅	0.5 * as V ₂ O ₅	1.0
Molybdenum(Mo)	7439-98-7	231-107-2	15(dust), 5 ^(SC)	10***, 3(Resp) , 0.5 (SC)	15
Aluminum (Al) ⁽¹⁾	7429-90-5	231-072-3	15(total dust)5(Resp)	10 (dust)1 (Resp)	10(total)5(Resp)
Carbon dioxide (ppm values)	124-38-9	204-696-9	5,000	5,000 , 30,000**	5,000 , 30,000**
Carbon monoxide (ppm values)	630-8-0	211-128-3	50	25	35, 200*
Nitrogen dioxide (ppm values)	10102-44-0	233-272-6	5	0.2	1** ,
Ozone (ppm values)	10028-15-6	233-069-2	0.1	0.05	0.1*

Emergency Planning and Community Right-To-Know Act of 1986 and 40CFR 370 and 372; (Resp) = Respiratory/ Respiration; ^(C) TLV & PEL for water soluble Cr. III and Cr. VI , Welding and cutting of products that contain Chromium may produce hexavalent chromium and YOU should read and follow OSHA's final rules Fed Register #:71:10099-10385 dated 02-28-2006. Occupational Safety and Health Administration 29 CFR 1910.1000 Permissible Exposure Limit (PEL). American Conference of Governmental Industrial Hygienists (ACGIH) Threshold Limit Value (TLV[R]).*Ceiling Limit**Short Term Exposure Limit***Inhalable fraction ^(SC) = Soluble compounds
ACGIH - American Conference of Governmental Industrial Hygienists, a professional association which establishes exposure limits used a guideline in control for health hazards but not an indication of safe and dangerous exposure limits **TLV - Threshold Limit Value** - an airborne concentration of a substance, which represents conditions under which it is generally believed that nearly all workers, may be repeatedly exposed without adverse effect. The duration must be considered, including the 8-hour & **BEI** - Biological Exposure Indices, represent the levels of determinants which are most likely to be observed in specimens collected from a healthy worker who has been exposed to chemicals to the same extent as a worker with inhalation exposure to the TLV.**OSHA** - U.S. Occupational Safety and Health Administration. **PEL - Permissible Exposure Limit** - this exposure value means the same as a TLV, except that it is limits guideline by OSHA.**Eye Protection:** Wear a helmet or face shield with a filter lens shade number 12-14 or darker for arc welding. Shield other workers by providing screens and flash goggles. Use face-shield with filter lens of appropriate shade number (per ANSI Z49.1-1988, "Safety in Welding and Cutting"). **Protective Clothing:** Wear approved head, hand and body protection, which help to prevent injury from radiation, sparks and electrical shock. See ANSI Z-49.1. This would include wearing welder's gloves and a protective face shield and may include arm protectors, apron, hats, shoulder protection, as well as dark substantial clothing. Welders should be trained not to allow electrically live parts to contract the skin or wet clothing and gloves. The welders should insulate themselves from the work and ground. **Ventilation:** Use plenty of ventilation and/or local exhaust at the arc, to keep the fumes and gases below the threshold limit value within the worker's breathing zone and the general work area. Welders should be advised to keep their head out of the fumes. **Respiratory Protection:** Use respirable fume respirator or air supplied respirator when welding in a confined space or general work area where local exhaust and/or ventilation does not keep exposure below the threshold limit value. **HYGIENE/ WORK PRACTICES:** With all chemicals/materials, avoid getting these products ON YOU or IN YOU. Wash hands after handling these products. Do not eat or drink while handling these products. Use ventilation and other engineering controls to minimize potential exposure to these products.

SAFETY DATA SHEET (SDS)

Nickel-Iron Wire & Rod
REVISED 3-2020A
SDS Number : 011A-Ni Wire & Rod

SECTION IX – PHYSICAL AND CHEMICAL PROPERTIES

Appearance / Color / Odor / Physical state / Form: Silver to gray round solid welding rods that are odorless

Odor Threshold / pH / Flash Point / Evaporation Rate / Flammability (Solid, Gas) / Upper & Lower Flammability or Explosive Limits: No data available

Vapor Pressure & Density / Relative Density / Solubility(water/other) / Partition coefficient (n-octanol/water) / Auto-ignition Decomposition temperature : No data available

SECTION X – STABILITY and REACTIVITY

Chemical stability: These products are considered stable as shipped and under normal conditions **Possibility of hazard reactions:** No data and will not occur **Conditions to avoid:** Avoid exposure to extreme temperatures, Incompatible materials **Incompatible materials:** Incompatible items such as acids, oxidizers and halogens Strong acids, strong oxidizers, mineral acids, and halogens. **Hazardous decomposition products:** Read Substance in Section II. Welding and cutting of products that contain Chromium may produce hexavalent chromium and YOU should read and follow OSHA's final rules Fed Register #:71:10099-10385 dated 02-28-2006. Occupational Safety and Health Administration 29 CFR 1910.1000 Permissible Exposure Limit (PEL). The best method to determine the actual composition of generated fumes and gases is to take an air sample from inside the welder's helmet if worn or in breathing zone. For additional information, refer to the American Welding Society Publication, "Fumes and Gases in the Welding Environment".

SECTION XI- TOXICOLOGICAL INFORMATION

Oral/Dermal/inhalation Iron: (Human-child); TDLo: 77 mg/kg. Oral (rat); LD50:30 gm/kg. Intraperitoneal (rabbit); LDLo: 20 mg/kg. Oral (guinea pig); LD50:20 gm/kg. Oral (rat); TDLo: 63 gm/kg/6W-C. Inhalation (rat); 250 mg/m3/6H/4W-I. Intratracheal (rat); TDLo: 450 mg/kg/15W-I. **Silicon:** Acute oral toxicity (LD50): 3160 mg/kg [Rat]. **Copper:** Acute oral LD50:481 mg/kg (rat); **Cobalt:** Acute Dermal LD50 :> 2000 mg/kg (rat) Acute Inhalation 4hours LD50:165 mg/kg (rat); **Chromium** (IV) Acute oral toxicity LD 50 (Rat): 27-59 mg/kg Inhalation (Rat 4h): 33-70 mg/m³. **Manganese:** Acute oral toxicity (LD50): 9000 mg/kg [Rat]. **Aluminum** Inhalation (LC50) (rat); 7.6 mg/l; **Skin corrosion or irritation / Serious eye damage or irritation / Respiratory or skin sensitization / Germ cell mutagenicity / Reproductive toxicity / Specific target organ toxicity – single exposure / Specific target organ toxicity – repeated exposure:** Not classified **Carcinogenicity:** Arc Rays can injure eyes and burn skin. Skin cancer has been reported. **Information on the likely routes of exposures:** Ingestion is not a likely route of exposure for this product or expected under normal use. If swallowed call physician immediately! Do not induce vomiting unless directed by medical personnel. Rinse mouth with water if person is conscious. Never give fluids or induce vomiting if person is unconscious, having convulsions, or not breathing. **Inhalation** of welding fumes and gases can be dangerous to your health. **Skin/Eye Contact:** Arc Rays can injure eyes and burn skin & Skin cancer has been reported. **International Agency for Research on Cancer IARC-** has classified welding fumes, Titanium dioxide & Nickel as a possible carcinogenic to humans (Group 2B). **Quartz & Chromium** (IV) evaluation as carcinogenic to humans (Group1). **Calcium Fluoride & Chromium oxides** evaluation, not classified as to carcinogenicity to humans (Group 3). **National Toxicology Program (NTP)** list Nickel with Reasonably Anticipated to be a Human Carcinogen; **Quartz & Chromium** (IV) known to be human carcinogen. **OSHA Specifically Regulated Substances Chromium** (IV) Cancer; Symptoms **related to physical, chemical and toxicological characteristics:** **Inhalation:** **Chromium** (IV) and compounds pose a cancer risk to humans; liver damage, allergic and skin rash have been reported. Nickel and compounds pose a respiratory cancer risk, and may give skin itch to dermatitis. Short-term (acute) overexposure to welding fumes may result in discomfort such as metal fume fever, dizziness, nausea, dryness or irritation of nose, throat, or eyes. Pre-existing respiratory issues may be aggregated. Long-term (chronic) over-exposure to welding fumes can lead to siderosis (iron deposits in lung) and is believed to affect pulmonary function. Manganese and Manganese compounds above safe exposure limits can affect or cause irreversible damage to the central nervous system, including the brain; symptoms may result in impaired speech and movement, lack of energy, stiffness in legs, feet, toes, muscular weakness as well as psychological disturbances. Reports of bronchitis and lung fibrosis have also been noted. Copper and copper alloy compounds has effects with GASTRO-INTESTINAL system. **Delayed and immediate effects and also chronic effects from short and long term exposure:** There are no immediate health hazards associated with the wire or rod form of this product. Skin, respiratory, pancreas, and liver disorders may be aggravated by prolonged over-exposures to the dusts or fumes generated by these products. Pre-existing respiratory issues may be aggregated. Long-term (chronic) over-exposure to welding fumes can lead to siderosis (iron deposits in lung) and is believed to affect pulmonary function. Manganese and Manganese compounds above safe exposure limits can affect or cause irreversible damage to the central nervous system, including the brain; symptoms may result in impaired speech and movement, lack of energy, stiffness in legs, feet, toes, muscular weakness as well as psychological disturbances. Reports of bronchitis and lung fibrosis have also been noted. Treat symptoms and eliminate overexposure. **Other information during use: Inhalation acute toxicity:** Carbon dioxide LC Lo (Human, 5 min): 90000 ppm, Carbon monoxide LC 50 (Rat, 4 h): 1,300 mg/l, Nitrogen dioxide LC 50 (Rat, 4 h): 88 ppm, Ozone LC Lo (Human, 30 min): 50 ppm, Chromium (IV) LC 50 (Rat, 4 h): 33-70 mg/m³

SECTION XII- TOXICOLOGICAL INFORMATION

Ecotoxicity / Persistence and Degradability / Bioaccumulative Potential / Mobility in Soil: Acute; Fish /Aquatic Invertebrates Aquatic Environment = Iron= LC50 Channel catfish (Ictalurus punctatus) > 500 mg/l, 96 hours; **Nickel** LC50 Fathead minnows (Pimephales promelas) 2.916 mg/l, 96 hours, **EC50 Water flea** (Daphnia obtusa) 1 mg/l, 48 hours ; **Aluminum** (Al) LC 50 (Grass carp, white amur (Ctenopharyngodon idella) 96 h): 0.21-0.31 mg/l; **Copper** LC50 Fathead minnows (Pimephales promelas) 1.6 mg/l, 96 hours, **EC50 Water flea** (Daphnia obtusa) 0.102 mg/l, 48 hours ; **Molybdenum** LC50 Rainbow trout, Donaldson trout (Oncorhynchus mykiss) 800 mg/l, 96 hours, **Manganese = EC 50 (Water flea** (Daphnia magna), 48 h): 40 mg/l; **Environment-Toxicity to Aquatic Plants; Chronic:** LC50(green algae (scenedesmus dimorphuis) 3 days) 0.0623 mg/l, **Persistence and Degradability / Mobility in Soil:** No data **Bioaccumulative Potential Accumulation/The product contains potentially bioaccumulating substances. Bioaccumulative Potential Bioconcentration Factor (BCF) Product:** No data available. **Specified substance(s):** Nickel Zebra mussel (Dreissana polymorpha), Bioconcentration Factor (BCF): 5,000 – 10,000 (lotic) Biocentration factor calculated using dry weight tissue concentration: Copper and/or copper alloys and compounds (as Cu) Blue-green algae (Anacystis nidulans), Bioconcentration Factor (BCF): 36.01 (Static); Cobalt and compounds (as Co) Brown shrimp (Penaeus aztecus), Bioconcentration Factor (BCF) : >2,250 -<2,500 (Static) **Other Adverse Effects:** Possibly harmful to aquatic life. Do not allow material to be released to the environment without proper governmental permits. Very toxic to aquatic organisms.

SECTION XIII- DISPOSAL CONSIDERATIONS

Disposal Methods: Avoid or minimize generating waste. When possible collect scrap and by-products with proper id for recycling. Waste disposal must be in accordance with appropriate Federal, National, Provincial, State, and local regulations. These products, if unaltered by use, may be disposed of by treatment at a permitted facility or as advised by your local hazardous waste regulatory authority.

SECTION XIV- TRANSPORT INFORMATION

UN Number / UN Proper shipping name / Transport Hazard class (es)/ Packing group / Marine pollutant / Special Precautions: Not Regulated as Dangerous Good or Not Regulated, No international regulations


SECTION XV- REGULATORY INFORMATION

United States: TSCA INVENTORY STATUS: The components of these products are listed on the TSCA Inventory

CERCLA REPORTABLE QUANTITY (RQ): Copper = 5000 lbs. (for particulates less than 100 micrometers in size). Nickel = 100 lbs. Chromium and Chromium compounds or alloys 5000 lbs. Manganese & Cobalt = Reportable quantity: Included in the regulation but with no data values. See regulation (40 CFR 302.4).

EPCRA/SARA Title III 313 Toxic Chemicals The following metallic components are listed as SARA 313 "Toxic Chemicals" and potential subject to annual SARA 313 reporting. See Section 3 for weight percent. Ingredient & Disclosure threshold: Copper 1.0% de minimis concentration; Manganese 1.0% de minimis concentration; Chromium 1.0% de minimis concentration; Nickel 0.1% de minimis concentration

Section 311 Hazard Class: As shipped: Immediate (Acute) In use: Immediate & delayed (Acute)

California Proposition 65:  **WARNING:** This product may expose you to chemicals including [Cobalt (II) Oxide, Titanium dioxide (airborne, unbound particles of respirable size), Chromium (hexavalent compounds), Nickel, Lead and Lead Compounds, Carbon Black, Cadmium, Beryllium and Beryllium Compounds] which are known to the State of California to cause cancer, and [Chromium (hexavalent compounds), Nickel, Lead and Lead Compounds, Cadmium] which are known to the State of California to cause birth defects and/or other reproductive harm. For more information go to <https://www.p65warnings.ca.gov/>

Nickel, Cobalt, Titanium Dioxide, Quartz and Chromium as possible carcinogens

US State Regulations list:

Alaska-Designated Toxic and Hazardous Substances: Carbon Black, Manganese.

California-Hazardous Substances Listed substance: Carbon Black, Chromium, Copper, Manganese, Molybdenum, Silicon, Iron, Iron oxide, Nickel,

California Proposition 65 - Carcinogens & Reproductive Toxicity (CRT): Listed substance: Hexavalent chromium compounds, Nickel -

CRT: Listed date/Carcinogenic substance: Hexavalent chromium compounds (2-27-1987), Nickel (10-1-1989) -

CRT: Listed date/Developmental toxin & Listed date/Male or Female reproductive toxin: Hexavalent chromium compounds (12-19-2008)

Florida-Substance List: Manganese

Illinois-Toxic Substance List: Carbon Black, Copper, Manganese and Silicon.

Kansas-Section 302/313 List: Copper, and Manganese.

Massachusetts-Substance List: Carbon Black, Tantalum, Chromium, Copper, Titanium Dioxide, Manganese, Molybdenum, Nickel, Silicon

Michigan - Critical Materials Register: Copper.

Minnesota-List of Hazardous Substances: Welding Fumes, Carbon Black, Manganese, and Silicon.

Missouri-Employer Information/Toxic Substance List: Carbon Black, Copper, Manganese, Molybdenum, Silicon,

New Jersey-Right to Know Hazardous Substance List: Carbon Black, Tantalum, Chromium, Hexavalent chromium compounds, Copper, Iron, Iron oxide, Manganese, Molybdenum, Nickel, Silicon, Titanium Dioxide

North Dakota-List of Hazardous Chemicals, Reportable Quantities: Copper.

Pennsylvania-Hazardous Substance List: Carbon Black, Copper, Hexavalent chromium compounds, Chromium, Manganese, Molybdenum, Nickel, Silicon, Titanium Dioxide, Tantalum

Rhode Island-Hazardous Substance List: Welding Fumes, Carbon Black, Manganese, Nickel, Silicon, Chromium

Texas-Hazardous Substance List: Carbon Black, Manganese

West Virginia-Hazardous Substance List: Carbon Black, Manganese.

Wisconsin-Toxic and Hazardous Substances: Carbon Black, Manganese.

SECTION XVI- OTHER INFORMATION

Approval Date: 3-11-2020 NEW SDS Number: 011A-Ni-Wire & Rod

HMIS® ratings Health: 2 Flammability: 0 Physical hazard: 0

NFPA CODES: FIRE: 0 HEALTH: 2 REACTIVITY: 0

U.S. DOT = Material is not hazardous and is not considered as a dangerous item.

Washington Alloy Co. Believes that the information contained in this (SDS) Safety Data Sheet is accurate. However,

Washington Alloy Co. does not express or implies any warranty with respect to this information.

Download the most current SDS and product information @ www.weldingwire.com





SAFETY DATA SHEET (SDS)

Document Number: SDS-ARC-NI-0001

1. IDENTIFICATION

Product Type:	Ni-based solid wire electrodes for arc welding
Product Names:	Arcos 111, C-276, 352, 362, 382, 382H, 392, Alloy 59, Alloy 602CA, 622 (Alloy 22), 617, 625, 651, 813, 816, 861, 888, 2216, 2535R, 3545R, Ni55, Ni99
Specifications:	AWS A5.7, A5.14, A5.15 or None
Product Type:	Ni-based electrodes for shielded metal arc welding
Product Names:	Arcos 1N12, 4N11, 4N1A, 8N12, 9N10, C-276, 352, 59, 617, 803, 2216, Alloy 602CA, 622 (Alloy 22), Alloy 59, 2216, 2535R, 3545R
Specifications:	AWS A5.6, A5.11 or None
Product Type:	Ni-based cored electrodes for arc welding
Product Names:	Arcos 82-AP, 182-AP, 622-AP, 625-AP, 625-C, 2216-C, 2216-HT, C276-AP, ArcVar 36, ArcVar36Nb, Ni55-C, Ni65-C
Specifications:	AWS A5.34 or None
Product Intended/Recommended Use:	Arc welding
Manufacturer:	Arcos Industries, LLC 394 Arcos Drive Mt. Carmel, PA 17851 Tel: 1-800-233-8460 Fax: 1-570-339-5206
Emergency Telephone Number:	3E Company Emergency Response Hotline Company Code: 334276 U.S. / Canada / Mexico: 1-866-519-4752 Europe: 1-760-476-3962 Asia Pacific: 1-760-476-3960 Middle East/Africa: 1-760-476-3959

2. HAZARD IDENTIFICATION

Hazard Classification: Not classified as hazardous according to the applicable Globally Harmonized System of Classification and Labelling of Chemicals (GHS) and OSHA Hazard Communication Standard (29 CFR 1910.1200) criteria.

Label Elements:

Hazard Symbol – None

Signal Word – None

Hazard Statement – Not Applicable

Precautionary Statement – Not Applicable

Other Hazards: This product presents no hazards in its intrinsic form. However, several hazards are generated during welding operations that can be harmful.

ELECTRICITY- Electric shock can kill.

HEAT- Molten metal and weld spatter can burn skin and start fires.

RADIATION- Arc rays can injure eyes and burn skin.

FUMES AND GASES - Fumes and gases generated during welding can be dangerous to your health. See Section 11.

3. COMPOSITION/INFORMATION ON INGREDIENTS

Composition: Chemical composition information is shown below for the solid wire electrodes. For the covered and cored electrodes, chemical composition data is given as a maximum weight percentage of the composite electrode, which includes fluxing ingredients. These fluxing ingredients typically consist of manganese, silicon, titanium, aluminum and/or zirconium oxides, as well as certain fluoride, carbonate and silicate compounds.

Solid Wire Electrodes for Arc Welding

Product	Ni	Cr	Mo	Fe	Mn ¹	Si ¹	C	Nb	Ti ¹	Cu	Co	W	Al	Fluoride	Carbonate ²	Silicate ³
111	Bal	21.0		3.0	1.0	1.5										
C-276	Bal	16.5	14.5	6.0			0.02				2.5	4.5				
352	Bal	31.0		10.5	1.0		0.04									
362	Bal	17.0		10.0				3.0								
382	Bal	22.0		3.0	3.5		0.10	3.0								
382H	Bal	20.5		3.0	3.3		0.10	2.5								
392	Bal	17.0		8.0	2.7		0.08	3.5								
Alloy 59	Bal	24.0	16.5	1.5			0.015									
Alloy 602CA	Bal	25.0		9.5			0.25						2.0			
622 (Alloy 22)	Bal	22.5	14.5	6.0			0.015				2.5	4.5				
617	Bal	24.0	10.0	3.0	1.0	1.0	0.15				15.0		1.5			
625	Bal	23.0	10.0	5.0			0.10	4.2								
651	99.9						0.1									
813	32.0			1.0						Bal						
816	69.0	0.15		2.5	4.0		0.15		2.3	Bal						
861	Bal			1.0	1.0		0.15		3.5				1.5			
888	Bal					1.0							6.0			
2216	Bal			49.0	13.5		0.45									
2535R	Bal	26.5		38.7	2.0		0.45									
3545R	Bal	36.0		20.5	2.0		0.50	1.4								
Ni55	Bal			44.5	1.0		0.50									
Ni99	Bal						0.15									

(1) Total for this element and its compounds, which are generally characterized as oxides.

(2) Carbonate compounds consist of calcium carbonate and magnesium carbonate

(3) Silicate compounds consist of sodium and potassium silicates

Covered Electrodes for Arc Welding

Product	Ni	Cr	Mo	Fe	Mn ¹	Si ¹	C	Nb	Ti ¹	Cu	Co	W	Al	Fluoride	Carbonate ²	Silicate ³
1N12	Bal	23.0	10.0	7.0	1.0	3.0	0.10	4.2	5.0				0.5	9.0	7.5	7.5
4N11	Bal				1.0	4.0	0.10		1.2				1.5	7.0	7.5	7.5
4N1A	Bal	17.0	2.5	12.0	4.5	3.0	0.10	3.0	5.0				0.5	7.0	7.5	7.5
8N12	Bal	17.0		10.0	10.5	7.0	0.10	2.5	5.0				0.5	9.0	7.5	7.5
9N10	Bal				5.0	4.5	0.15		5.0	38.0			0.5	7.0	7.5	7.5
C-276	Bal	16.5	17.0	7.0	2.0	3.0	0.02	2.5	5.0		2.5	4.5	0.5	9.0	7.5	7.5
352	Bal	31.5	1.0	12.0	2.0	3.0	0.05	2.5	5.0				0.5	9.0	7.5	7.5
Alloy 59	Bal	24.0	16.5	1.5	2.0	3.0	0.02		5.0				0.5	9.0	7.5	7.5
617	Bal	26.0	10.0	2.5	3.5	4.0	0.15		5.0		15.0		2.0	9.0	7.5	7.5
803	33.0			0.75	2.5	2.5			5.0	Bal			1.5	9.0	7.5	7.5
2216	Bal			49.0	14.5	3.0	0.45		5.0				0.5	9.0	7.5	7.5
Alloy 602CA	Bal	25.0		9.5	1.0	3.0	0.25		5.0				0.5	9.0	7.5	7.5
622 (Alloy 22)	Bal	22.5	14.5	6.0	1.0	3.0	0.02		5.0		2.5	3.5	0.5	9.0	7.5	7.5
2535R	Bal	26.5		39.0	3.0	3.0	0.45		5.0				0.5	9.0	7.5	7.5
3545R	Bal	36.0		20.5	3.0	3.0	0.50	1.4	5.0				0.5	9.0	7.5	7.5

(1) Total for this element and its compounds, which are generally characterized as oxides.

(2) Carbonate compounds consist of calcium carbonate and magnesium carbonate

(3) Silicate compounds consist of sodium and potassium silicate

Cored Electrodes for Arc Welding

Product	Ni	Cr	Mo	Fe	Mn ¹	Si ¹	C	Nb	Ti ¹	Mg ¹	Co	W	Zr ¹	Fluoride	Carbonate ²	Silicate ³
82-AP	Bal	22.0		3.0	3.5	1.0	0.10	3.0	7.0				1.0	0.5		
182-AP	Bal	17.0		10.0	10.5	1.0	0.10	2.5	7.0				1.0	0.5		
622-AP	Bal	22.5	14.5	6.0		1.0	0.02		7.0		2.5	4.5	1.0	0.5		
625-AP	Bal	23.0	10.0	5.0		1.0	0.10	4.2	7.0				1.0	0.5		
625-C	Bal	23.0	10.0	5.0		1.0	0.10	4.2					1.0	0.5		
2216-C	Bal			49.0	13.5	1.0	0.45							0.5		
2216-HT	45.0	7.0		Bal	11.5		0.05	1.0						0.5		
C276-AP	Bal	16.5	14.5	6.0			0.02		7.0		2.5	4.5	1.0	0.5		
ArcVar 36	37.0			Bal	1.0	1.0	0.04		10.0	1.5				0.5		
ArcVar 36Nb	37.0			Bal	1.0	1.0	0.10	2.0	10.0	1.5				0.5		
Ni55-C	Bal			43.0	3.5	1.0	0.04		1.0				0.5			
Ni65-C	Bal			32.0	0.5	1.0	0.04		1.0				0.5			

- (1) Total for this element and its compounds, which are generally characterized as oxides.
(2) Carbonate compounds consist of calcium carbonate and magnesium carbonate
(3) Silicate compounds consist of sodium and potassium silicates

4. FIRST AID MEASURES

Inhalation - If breathing has stopped, immediately seek medical assistance. Begin performing cardio pulmonary resuscitation (CPR) if you are trained to do so. If breathing is difficult, move to area with fresh air and seek medical attention immediately.

Skin contact - For skin burns due to arc radiation flush with cold water. If burn and irritation persists seek medical attention. In case of skin contact with fume or dust, wash affected areas with soap and water. Thoroughly clean shoes and wash clothing. Seek medical attention if irritation develops and persists.

Eye contact - In case of radiation burns due to arc flash move to a dark room and seek medical attention. To remove fume or dust flush with plenty of lukewarm water. Seek medical attention if irritation develops. In case of foreign metallic or slag material lodged in the eye, seek medical attention to remove it. Do not rub or agitate the eyes.

Ingestion - Although unlikely due to product form, immediately seek medical attention if wire pieces or metal powders from inside the wire are ingested. Do not induce vomiting unless directed to do so by medical personnel.

Electric Shock - Disconnect power. Use non-conductive material to pull victim from contact with live wires. If no detectible pulse, seek medical attention immediately and begin cardio pulmonary resuscitation (CPR) if you are trained to do so.

Most Serious Symptoms:

Short Term Exposure - Acute overexposure to welding fumes may result in discomfort such as irritation of the respiratory system, metal fume fever, nausea, and may aggravate pre-existing respiratory conditions.

Long Term Exposure - Chronic overexposure to welding fume may lead to iron deposits in the lungs (siderosis) and reduced pulmonary function. Manganese overexposure can lead to irreversible damage to the central nervous system resulting in impaired speech and movement. Chronic overexposure to nickel fumes and hexavalent chromium can cause cancer. Some of the products contain silica quartz, but not in an inhalable fraction. Silica quartz is a listed carcinogen.

Refer to Section 11 for more information.

5. FIRE FIGHTING MEASURES

General - Products are non-flammable as shipped. Welding arcs and spatter can ignite nearby combustible materials.

Suitable Extinguishing Media- Use methods and materials appropriate for the combustible material.

Specific Hazards Arising from the Chemical - Welding arcs and spatter can ignite nearby combustible materials.

General Firefighting Procedures- Keep people away. Isolate fire and deny entry to the area by any non-essential personnel. Fight fire from protected location or safe distance.

Special Actions for Firefighters- Firefighters should be equipped with self-contained breathing apparatus to protect against potentially toxic and hazardous fumes. Toxic and irritating fumes and gases may be given off during burning or thermal decomposition.

6. ACCIDENTAL RELEASE MEASURES

Personal Precautions, Protective Equipment and Emergency Procedures:

For Non-Emergency Personnel – Isolate the area and keep non-essential people away. Do not touch or walk through spilled material. Allow the molten metallic material to solidify and cool before disposal. If molten metal spills out of the weldment, turn off the power. Contain the flow using sand or submerged arc flux. If airborne dust and or fumes are present, wear appropriate personal protective equipment (PPE) to avoid overexposure.

For Emergency Personnel – Wear appropriate personal protective equipment (PPE), including clothes, gloves and breathing protection. Evacuate non-essential personnel.

Environmental Precautions: Keep material out of waterways and drains.

Methods and Materials for Containment and Cleaning Up: Isolate and clean up spills immediately. Avoid generating dust or airborne particles during clean up. Dispose of solidified mass per Federal, State and Local regulations.

7. HANDLING AND STORAGE

Precautions for Safe Handling: Wear safety glasses and gloves to avoid cuts and abrasion when handling welding consumables and their packaging. Do not eat drink or smoke in areas where these products are being used.

Conditions for Safe Storage, Including Any Incompatibilities: Store in a cool, dry area in the original packaging. Keep products away from heat, flame and moisture.

8. EXPOSURE CONTROLS/PERSONAL PROTECTION

Appropriate Engineering Controls: Provide adequate ventilation and/or local exhaust at the weld station to keep fumes and gases away from the welder. Train welders and welding operators to keep their head out of the fumes. See ANSI Z49.1 "Safety in Welding, Cutting, and Allied Processes" for recommendations of safe work practices.

Personal Protective Equipment:

Eye/Face Protection – Wear safety glasses or goggles with appropriate side shields. Wear a helmet or face shield with an appropriate filter lens. Use protective screens to shield others in the work area.

Skin/Body Protection – Wear hand, head and body protection including welder's gloves, protective face shield and long sleeved protective clothing.

Respiratory Protection – Use NIOSH approved fume respirator or air supplied respirator when where ventilation is inadequate, welding in confined spaces or where required to by OSHA regulations. Fume sampling per AWS F1.1 "Method for Sampling Airborne Particulates Generated by Welding and Allied Processes" may be required. Other appropriate standards that may be considered include, but are not limited to, AWS F1.2 "Laboratory Method for Measuring Fume Generation Rate and Total Fume Emission of Welding and Allied Processes" and AWS F3.2

“Ventilation Guide for Weld Fume”. For actual weld fume and particulate analysis, refer to the appropriate analytical methods recommended by NIOSH or OSHA, and consult an industrial hygiene professional.

Control Parameters:

Exposure Limits - USA

Common Name	CAS Number	Form	Exposure Limit	Source
Aluminum Metal	7429-90-5	Total Dust	15 mg/m ³	USA. OSHA PELs
		Total Dust	10 mg/m ³	USA. California OSHA PELs
		Respirable	5 mg/m ³	USA. OSHA PELs
		Respirable	1 mg/m ³	USA. ACGIH TLVs
Aluminum Oxide	1344-28-1	Total Dust	15 mg/m ³	USA. OSHA PELs
		Respirable	5 mg/m ³	USA. OSHA PELs
		Respirable	1 mg/m ³	USA. ACGIH TLVs
Barium Compounds	7440-39-3	Soluble Compounds	0.5 mg/m ³	USA. OSHA PELs
		Soluble Compounds	0.5 mg/m ³	USA. ACGIH TLVs
Calcium Carbonate	1317-65-3	Total Dust	15 mg/m ³	USA. OSHA PELs
		Total Dust	10 mg/m ³	USA. California OSHA PELs
		Respirable	5 mg/m ³	USA. OSHA PELs
Chromium	7440-47-3	Metal	1 mg/m ³	USA. OSHA PELs
		Metal	0.5 mg/m ³	USA. ACGIH TLVs
		Cr II compounds	0.5 mg/m ³	USA. OSHA PELs
		Cr III Compounds, Inorganic	0.5 mg/m ³	USA. OSHA PELs
	18540-29-9	Cr III Compounds, Inorganic	0.5 mg/m ³	USA. ACGIH TLVs
		Cr VI Compounds	0.1 mg/m ³	USA. OSHA PELs Ceiling
		Cr VI Compounds, Soluble (as Cr VI)	0.005 mg/m ³	USA. OSHA PELs
		Cr VI Compounds, Soluble (as Cr)	0.05 mg/m ³	USA. ACGIH TLVs
		Cr VI Compounds, Insoluble (as Cr VI)	0.005 mg/m ³	USA. OSHA PELs
		Cr VI Compounds, Insoluble (as Cr)	0.01 mg/m ³	USA. ACGIH TLVs
Cobalt	7440-48-4	As Metal, Dust & Fume	0.1 mg/m ³	USA. OSHA PELs
		As Metal, Dust & Fume	0.02 mg/m ³	USA. California OSHA PELs
		As Metal, Dust & Fume	0.02 mg/m ³	USA. ACGIH TLVs
Copper	7440-50-8	Dust	1 mg/m ³	USA. OSHA PELs & ACGIH TLVs
		Fume	0.1 mg/m ³	USA. OSHA PELs
		Fume	0.2 mg/m ³	USA. ACGIH TLVs
Fluorides	7789-75-5	As Fluorides	2.5 mg/m ³	USA. OSHA PELs & ACGIH TLVs
Iron & Iron Oxide	1309-37-1	Iron Oxide (As Fume)	10 mg/m ³	USA. OSHA PELs
		Iron Oxide (As Fume)	5 mg/m ³	USA. California OSHA PELs
		Respirable	5 mg/m ³	USA. ACGIH TLVs
Graphite	7782-42-5	Total Dust	15 mg/m ³	USA. OSHA PELs
		Total Dust	10 mg/m ³	USA. California OSHA PELs
		Respirable	5 mg/m ³	USA. OSHA PELs

		Respirable	2 mg/m ³	USA. ACGIH TLVs
Magnesite	546-93-0	Total Dust	15 mg/m ³	USA. OSHA PELs
		Total Dust	10 mg/m ³	USA. California OSHA PELs
		Total Dust	10 mg/m ³	USA. ACGIH TLVs
		Respirable	5 mg/m ³	USA. OSHA PELs
		Respirable	2 mg/m ³	USA. ACGIH TLVs
Magnesium Oxide	1309-48-4	Fume	15 mg/m ³	USA. OSHA PELs
		Fume	10 mg/m ³	USA. California OSHA PELs
		Fume (Inhalable)	10 mg/m ³	USA. ACGIH TLVs
Manganese & Mn Compounds	7439-96-5	Fume	5 mg/m ³	USA. OSHA PELs Ceiling
		Fume	0.2 mg/m ³	USA. California OSHA PELs
		Fume (Respirable)	0.02 mg/m ³	USA. ACGIH TLVs
		Fume (Inhalable)	0.1 mg/m ³	USA. ACGIH TLVs
		Inorganic	5 mg/m ³	USA. OSHA PELs Ceiling
		Inorganic	0.2 mg/m ³	USA. California OSHA PELs
		Inorganic (Respirable)	0.02 mg/m ³	USA. ACGIH TLVs
		Inorganic (Inhalable)	0.1 mg/m ³	USA. ACGIH TLVs
Molybdenum	7439-98-7	Soluble Compounds	5 mg/m ³	USA. OSHA PELs
		Soluble Compounds (Respirable)	0.5 mg/m ³	USA. ACGIH TLVs
		Insoluble compounds (Total Dust)	15 mg/m ³	USA. OSHA PELs
		Insoluble compounds (Total Dust)	10 mg/m ³	USA. California OSHA PELs
		Insoluble compounds (Respirable)	3 mg/m ³	USA. ACGIH TLVs & California OSHA PELs
		Insoluble compounds (Inhalable)	10 mg/m ³	USA. ACGIH TLVs
Nickel	7440-02-0	Metal	1 mg/m ³	USA. OSHA PELs
		Metal (Inhalable)	1.5 mg/m ³	USA. ACGIH TLVs
		Metal	0.015 mg/m ³	USA. NIOSH RELs
		Soluble Compounds	1 mg/m ³	USA. OSHA PELs
		Soluble Compounds (Inorganic)	0.1 mg/m ³	USA. ACGIH TLVs
		Insoluble Compounds	1 mg/m ³	USA. OSHA PELs
		Insoluble Compounds (Inorganic)	0.2 mg/m ³	USA. ACGIH TLVs
Potassium Silicate	1312-76-1	Total	10 mg/m ³	USA. ACGIH TLVs
Sodium Silicate	1344-09-8	Total	10 mg/m ³	USA. ACGIH TLVs
Silicon	7440-21-3	Total Dust	15 mg/m ³	USA. OSHA PELs
		Total Dust	10 mg/m ³	USA. California OSHA PELs
		Respirable	5 mg/m ³	USA. OSHA PELs
Silica (Quartz)	14808-60-7	Respirable	0.1 mg/m ³	USA. OSHA PELs
		Respirable	0.025 mg/m ³	USA. ACGIH TLVs
		Total Dust	0.3 mg/m ³	USA. OSHA PELs
Titanium Dioxide	13463-67-7	Total Dust	15 mg/m ³	USA. OSHA PELs

		Total Dust	10 mg/m ³	USA. ACGIH TLVs
Tungsten	7440-33-7	Insoluble	5.0 mg/m ³	USA. ACGIH TLVs
		Insoluble	10.0 mg/m ³	USA. ACGIH TLVs Ceiling
		Soluble	1.0 mg/m ³	USA. ACGIH TLVs
		Soluble	3.0 mg/m ³	USA. ACGIH TLVs Ceiling
Vanadium	7440-62-2	Oxide Dust	0.5 mg/m ³	USA. OSHA PELs Ceiling
		Oxide Dust (Inhalable)	0.05 mg/m ³	USA. ACGIH TLVs & California OSHA PELs
		Oxide Fume	0.1 mg/m ³	USA. OSHA PELs Ceiling
		Oxide Fume (Inhalable)	0.05 mg/m ³	USA. ACGIH TLVs & California OSHA PELs
Zirconium & Zr Compounds	7440-67-7	Metal	5 mg/m ³	USA. ACGIH TLVs
		Metal	10 mg/m ³	USA. ACGIH TLVs Ceiling
		Compound	5 mg/m ³	USA. OSHA PELs
		Compound	5 mg/m ³	USA. ACGIH TLVs
		Compound	10 mg/m ³	USA. ACGIH TLVs Ceiling

Exposure Limits – Canada

Common Name	CAS Number	Form	Exposure Limit	Source
Calcium Carbonate	1317-65-3	Total Dust	10 mg/m ³	Canada. Alberta OEL TWA
		Total Dust	20 mg/m ³	Canada. British Columbia OEL TWA STEL
		Total Dust	10 mg/m ³	Canada. British Columbia OEL TWA
		Respirable	3 mg/m ³	Canada. British Columbia OEL TWA
		Total Dust	10 mg/m ³	Canada. Saskatchewan OEL for 8hr ACL
		Total Dust	20 mg/m ³	Canada. Saskatchewan OEL for 15min ACL
		Total Dust	10 mg/m ³	Canada. Quebec OEL TWA
Manganese & Mn Compounds	7439-96-5	As Mn	0.2 mg/m ³	Canada. Alberta OEL TWA
		As Mn	0.2 mg/m ³	Canada. British Columbia OEL TWA
		As Mn (Inhalable)	0.1 mg/m ³	Canada. Manitoba OEL TWA
		As Mn (Respirable)	0.02 mg/m ³	Canada. Manitoba OEL TWA
		As Mn	0.2 mg/m ³	Canada. New Brunswick OEL TWA
		As Mn	0.1 mg/m ³	Canada. Newfoundland & Labrador OEL TWA
		As Mn	0.1 mg/m ³	Canada. Nova Scotia OEL TWA
		As Mn	1 mg/m ³	Canada. Nunavut OEL TWA
		As Mn	3 mg/m ³	Canada. Nunavut OEL STEL
		As Mn	5 mg/m ³	Canada. Nunavut OEL Ceiling
		As Mn	1 mg/m ³	Canada. Northwest Territories OEL TWA
		As Mn	3 mg/m ³	Canada. Northwest Territories OEL STEL
		As Mn	5 mg/m ³	Canada. Northwest Territories OEL Ceiling

		As Mn	0.2 mg/m ³	Canada. Ontario OEL TWA
		As Mn	0.2 mg/m ³	Canada. Prince Edward Island OEL TWA
		As Mn	0.2 mg/m ³	Canada. Quebec OEL TWA
		As Mn	0.2 mg/m ³	Canada. Saskatchewan OEL TWA
		As Mn	0.6 mg/m ³	Canada. Saskatchewan OEL STEL
		As Mn	5 mg/m ³	Canada. Yukon OEL Ceiling
Silicon	7440-21-3	Total Dust	10 mg/m ³	Canada. British Columbia OEL TWA
		Total Dust	3 mg/m ³	Canada. New Brunswick OEL TWA
		Total Dust	10 mg/m ³	Canada. Nunavut OEL TWA
		Total Dust	10 mg/m ³	Canada. Northwest Territories OEL TWA
		Total Dust	10 mg/m ³	Canada. Ontario OEL TWA
		Total Dust	10 mg/m ³	Canada. Quebec OEL TWA
		Total Dust	10 mg/m ³	Canada. Saskatchewan OEL TWA
		Total Dust	20 mg/m ³	Canada. Saskatchewan OEL STEL
		Total Dust	10 mg/m ³	Canada. Yukon OEL TWA
		Total Dust	20 mg/m ³	Canada. Yukon OEL STEL
Silica (Quartz)	14808-60-7	Respirable Fraction	0.025 mg/m ³	Canada. Alberta OEL TWA
		Respirable Fraction	0.025 mg/m ³	Canada. British Columbia OEL TWA
		Respirable Fraction	0.025 mg/m ³	Canada. Manitoba OEL TWA
		Respirable Fraction	0.1 mg/m ³	Canada. Ontario OEL TWA
		Respirable Fraction	0.05 mg/m ³	Canada. Quebec OEL TWA
		Respirable Fraction	0.1 mg/m ³	Canada. Saskatchewan OEL TWA
Titanium Dioxide	13463-67-7	Total Dust	10 mg/m ³	Canada. Alberta OEL TWA
		Dust (Respirable)	3 mg/m ³	Canada. British Columbia OEL TWA
		Total Dust	10 mg/m ³	Canada. British Columbia OEL TWA
		Total Dust	10 mg/m ³	Canada. Manitoba OEL TWA
		Total Dust	10 mg/m ³	Canada. Ontario OEL TWA
		Total Dust	10 mg/m ³	Canada. Quebec OEL TWA
		Total Dust	10 mg/m ³	Canada. Saskatchewan OEL TWA
		Total Dust	20 mg/m ³	Canada. Saskatchewan OEL STEL

Exposure Limits – Mexico

Common Name	CAS Number	Form	Exposure Limit	Source
Calcium Carbonate	1317-65-3	Total Dust	20 mg/m ³	Mexico. OEL CTT
		Total Dust	10 mg/m ³	Mexico. OEL CPT
Manganese & Mn Compounds	7439-96-5	As Mn	0.2 mg/m ³	Mexico. OEL CPT
		As Mn Fume	1.0 mg/m ³	Mexico. OEL CPT
		As Mn Fume	3.0 mg/m ³	Mexico. OEL CTT
Silicon	7440-21-3	Total Dust	10 mg/m ³	Mexico. OEL CPT
		Total Dust	20 mg/m ³	Mexico. OEL CTT
Silica	69012-46-2	Fume	10 mg/m ³	Mexico. OEL CPT
		Fume (Respirable)	3 mg/m ³	Mexico. OEL CPT
Silica (Quartz)	14808-60-7	Respirable Fraction	0.1 mg/m ³	Mexico. OEL CPT

Titanium Dioxide	13463-67-7	Total Dust	20 mg/m ³	Mexico. OEL CTT
		Total Dust	10 mg/m ³	Mexico. OEL CPT

9. PHYSICAL AND CHEMICAL PROPERTIES

Appearance	Solid or tubular wire
Color:	Various
Odor:	None
Odor threshold:	Not Applicable
pH:	Not Applicable
Melting point	>2000F (1100C)
Initial Boiling Point & Range:	Data Not Available
Flash point	Data Not Available
Evaporation rate	Data Not Available
Flammability	Data Not Available
Upper flammability/explosive limit:	Data Not Available
Lower flammability/explosive limit:	Data Not Available
Vapor pressure	Not Applicable
Vapor density:	Not Applicable
Relative density	0.2-0.3 lbs/in ³
Solubility in water	Data Not Available
Solubility (other)	Data Not Available
Partition coefficient	Data Not Available
Auto-ignition temperature	Data Not Available
Decomposition temperature:	Data Not Available
Viscosity :	Data Not Available

10. STABILITY AND REACTIVITY

Reactivity – This product is not reactive under normal conditions as shipped.

Chemical stability – This product is chemically stable under normal conditions as shipped.

Possibility of hazardous reactions – Polymerization reactions will not occur.

Conditions to avoid – Protect product from moisture and contamination.

Incompatible materials – Data not available

Hazardous decomposition products – Welding electrodes and wires emit fumes and gases when used under normal conditions. These fumes and gases produced during welding operations cannot be easily classified, and will differ in quantity and form from those ingredients listed in Section 3 of this SDS. The composition and quantity of these fumes and gases are directly dependent upon the metal being welded, any material coatings (such as primer or galvanizing), the welding process, the welding consumables and the welding procedures. Other conditions which also influence the composition and quantity of the fumes and gases produced include the number of welders in the work area, the volume of the work area, the quality and amount of ventilation or exhaust, and the proximity of the welder's head to the fume plume.

Decomposition products of welding consumables under normal operation include oxides of elements present in the welding consumable and base material. Manganese compounds may be present in the fume from manganese bearing electrodes. Hexavalent chromium may be present in the fume from electrodes containing chromium. Nickel compounds may be present in the fume from nickel bearing electrodes. Fluoride containing consumables may generate gaseous and particulate fluoride. Gases such as carbon monoxide, carbon dioxide, ozone and nitrogen oxides may also be produced in the arc area.

11. TOXICOLOGICAL INFORMATION

Information on likely routes of exposure:

Oral – Unknown health effects, but this exposure is unlikely to occur.

Inhalation – Inhalation of welding fumes may lead to acute and/or chronic health hazards (see table below).

Skin – Arc rays can burn the skin. Weld fume deposited on the skin may cause irritation (see table below).

Eye – Arc rays can injure the eyes. Weld fume contact with the eyes may cause irritation (see table below).

Information on toxicological effects:

The acute and chronic effects of compounds which may be exposed to the welder are listed in the table below. Also listed are the available measured values of toxicity for that substance and whether it is classified as carcinogenic.

Substance	Short-Term Exposure Effects	Long Term Exposure Effects	Toxicity Measure	Carcinogenicity
Aluminium Oxide	May cause eye & respiratory irritation.	May cause effects on central nervous system.	LC50 (Rat, Oral Exposure) >5,000 mg/kg	Not classifiable
Barium Compounds	May cause irritation to the nose, throat, and respiratory tract.	May cause baritosis (deposits of barium in lungs). Baritosis is benign & does not progress to fibrosis.	LD50 (Rat, Oral Exposure) = 418 mg/kg	Not classifiable
Chromium as Cr+3	May cause eye, skin & respiratory irritation.	May cause chronic bronchitis, sinusitis, rhinitis and asthma.	LC50 (Rat, 14 day Oral Exposure) >5,000 mg/kg	Not classifiable
Chromium as Cr+6	May cause eye, skin & respiratory irritation.	May cause lung, nasal and sinus cancer, ulceration and perforation of the nasal septum and skin rash.	LC50 (Rat, Oral Exposure) = 29 mg/kg	IARC-1 NTP-known OSHA
Cobalt Compounds	May cause respiratory irritation and cardiovascular inflammation.	May cause chronic irritation, diminished pulmonary function, asthma and fibrosis.	LC50 (Rat, 30 min Inhalation Exposure) = 165mg/m ³	Not classifiable
Copper Oxide	May cause metal fume fever with upper respiratory irritation, chills, and aching muscles.	Prolonged contact may cause skin sensitization.	LD50 (Rat, Oral Exposure) = 470mg/kg	Not classifiable
Fluorides	May cause eye, skin & respiratory irritation.	May cause serious bone erosion and mottling of teeth (fluorosis).	LD50 (Rat, Oral Exposure) = 31 mg/kg	Not classifiable
Iron Oxide	May cause respiratory irritation.	May cause siderosis (deposits of iron in lungs). Siderosis is benign and does not progress to fibrosis.	LD50 (Rat, Oral Exposure) > 10,000 mg/kg	Not classifiable
Lithium Compounds	May cause eye & skin irritation.	May adversely affect the central nervous system & kidneys, and may be a reproductive toxin.	LC50 (Rat, 4 hour Inhalation Exposure) > 2.17 mg/L	Not classifiable
Magnesium Oxide	May cause eye & respiratory irritation.	May cause decreased lung function.	LD50 (Rat, Oral Exposure) = 3870 mg/kg	Not classifiable
Manganese Oxide	May cause respiratory irritation, metal fume fever with chills, fever, upset stomach, body ache, vomiting.	May cause brain and central nervous system effects resulting in arm and leg tremors, slurred speech and poor coordination.	LD50 (Rat, 4 hour Inhalation Exposure) = 19 mg mg/kg	Not classifiable
Molybdenum	May cause eye & respiratory irritation.	Not found.	Not found	Not classifiable

Substance	Short-Term Exposure Effects	Long Term Exposure Effects	Toxicity Measure	Carcinogenicity
Nickel Oxide	May cause respiratory irritant, inhalation of fumes may cause pneumonitis.	Prolonged exposure may lead to asthma. Nickel refinery workers showed a higher incidence of lung and nasal cancers.	LD50 (Rat, Inhalation Exposure) > 5,000 mg/kg	IARC-1 NTP-known
Niobium	May cause respiratory irritation.	Not found.	Not found	Not classifiable
Silica	May cause eye & respiratory irritation.	Crystalline silica is a known carcinogen. Overexposure may also result in silicosis.	Not found	IARC-1 NTP-known
Titanium Dioxide	May cause respiratory irritation.	May be carcinogenic.	LD50 (Rat, Oral Exposure) > 10 g/kg	IARC-2B
Tungsten compounds	May cause respiratory irritation.	Not found.	Not found	Not found
Vanadium Oxide	May cause eye, skin & respiratory irritation.	Exposure to high concentrations of fume may lead to chronic nasal hyperplasia.	LD50 (Rat, Oral Exposure) =10 mg/kg	Not classifiable
Zirconium Oxide	May cause eye & respiratory irritation.	May cause decreased lung function.	Not found	Not classifiable
Carbon Dioxide	At low levels, may cause headache, dizziness, loss of coordination, nausea. At high levels can cause coma and possibly death.	Long term exposure may affect the body's metabolism.	LC50 (Human, Inhalation Exposure) =100,000 ppm/min	Not classifiable
Carbon Monoxide	May cause effects on the blood, resulting in carboxyhaemoglobinemia and cardiac disorders. High levels may result in death.	May have effects on the cardiovascular system and central nervous system. May cause toxicity to human reproduction or development.	LC50 (Rat, 4 hour Inhalation Exposure) =1807 ppm	Not classifiable
Ozone	May cause eye and respiratory tract irritation. Inhalation may cause lung oedema. May cause effects on the central nervous system, resulting in headache and impaired performance.	May cause decreased lung function.	LC50 (Rat, 3 hour Inhalation Exposure) =4.5 mg/m ³	Not classifiable
Nitric Oxide	May cause respiratory irritation. Inhalation may cause lung oedema. Exposure far above the OEL may result in death.	May cause decreased lung function.	LC50 (Rat, Inhalation Exposure) =160 mg/m ³	Not classifiable
Nitrogen Dioxide	Corrosive to the skin and respiratory tract. Inhalation may cause lung oedema. Exposure far above the OEL may result in death.	May cause effects on the immune system and lungs, resulting in decrease in resistance to infection.	LC50 (Rat, 4 hour Inhalation Exposure) =88 ppm	Not classifiable

Other information on toxicological effects:

Germ cell mutagenicity – Not classified

Reproductive toxicity – Not classified

Specific target organ toxicity (Single exposure) – Not classified

Specific target organ toxicity (Repeated exposure) – Not classified

Aspiration hazard – Not classified

12. ECOLOGICAL INFORMATION

Toxicity:	Not classified
Persistence and degradability:	No information available
Bioaccumulative potential:	No information available
Mobility in soil:	No information available
Other adverse effects:	Unknown

13. DISPOSAL CONSIDERATIONS

Discard any product, residue, waste or packaging in an environmentally acceptable manner in compliance with federal, State, or local laws. Do not dispose of any waste, remaining product or by-product in the sewer.

14. TRANSPORT INFORMATION

UN Number:	Not regulated
UN Proper Shipping Name:	Not regulated
Transport Hazard Class:	Not regulated
Packing Group:	Not regulated
IMDG:	Not regulated
ICAO/IATA:	Not regulated

15. REGULATORY INFORMATION

U.S. Federal Regulations:

Emergency Planning & Community Right-To-Know Act (EPCRA) of 1986

Section 313 Hazardous Chemicals:

Aluminum, Aluminum Oxide, Barium and Barium Compounds, Chromium, Copper, Lithium Carbonate, Manganese, Nickel, Silicon & Silica, Iron & Iron Oxide, Magnesium, Zirconium and Vanadium.

Superfund Amendments and Reauthorization Act of 1986 (SARA):

Hazard categories – Acute (Immediate) and Chronic (Delayed)

Toxic Substances Control Act (TSCA) Inventory:

Iron – Listed

Silicon – Listed

U.S. State Laws:

California Proposition 65:

Titanium Dioxide – Carcinogenic

Silica (Quartz) - Carcinogenic

Warning: These products contain chemicals known to the State of California to cause cancer, birth defects, or other reproductive harm.

New Jersey Community Worker and Right-to-Know Act

Titanium Dioxide – Listed

Manganese – Listed

Massachusetts Right-to-Know Act Substance List

Titanium Dioxide – Listed

Manganese – Listed

Silica (Quartz) – Listed

Pennsylvania Right-to-Know Act Hazardous Substances List

Titanium Dioxide – Listed

Manganese – Listed

Rhode Island Right-to-Know Act Substance List

Manganese – Listed

Minnesota Right-to-Know Act Hazardous Substances List

Titanium Dioxide – Listed

Manganese – Listed

Silica (Quartz) – Listed

Canadian Regulations:

This product is classified according to the requirements of the Canadian Controlled Products Regulations Section 33, and this SDS contains all required information.

16. OTHER INFORMATION

DISCLAIMER: Users should take all standard and reasonable precautions when using this product for its intended use. The manufacturer does not recommend this product for any uses other than that described. The manufacturer makes no claims and provides no warranty for non-standard use.

NFPA 704:	HEALTH:	2	FLAMMABILITY:	0	REACTIVITY:	0
HMIS:	HEALTH:	2	FLAMMABILITY:	0	PHYSICAL HAZARD:	0

SDS Revisions

Preparation date:	5/12/2015	Revision date:	6/8/2015	Revision number:	1
-------------------	-----------	----------------	----------	------------------	---

Note: Although the information and recommendations set forth herein (hereinafter "information") are presented in good faith and believed to be correct as of the date hereof, Arcos Industries makes no representations as to the completeness or accuracy thereof. Information is supplied upon the condition that persons receiving same will make their own determination as to its suitability for their purposes prior to use. In no event will Arcos Industries be responsible for damages of any nature whatsoever resulting from the use of, misuse or reliance upon information. No representations or warranties, either express or implied, or merchantability, fitness for a particular purpose or any other nature are made hereunder with respect to information or the product to which information refers. Regulatory requirements are subject to change and may differ from one location to another. It is the buyer's responsibility to ensure its activities comply with federal, State, Provincial, and local laws and regulations.



SAFETY DATA SHEET

CROWN ALLOYS COMPANY

Section 1 – PRODUCT AND COMPANY IDENTIFICATION

PRODUCT NAME: Titanium Bare Wire

PRODUCT IDENTIFICATION:

ROYAL ER Ti-1	ROYAL ER Ti-2
ER Ti-1	ER Ti-2
AWS A5.16	

SPECIFICATION:

RECOMMENDED USE: GTAW (Gas Tungsten Arc Welding)

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

STOT SE 3	H336	Acute Tox. 4 (Oral)	H302
STOT SE 3	H335	Skin Sens. 1	H317

2.2 Label elements

GHS-US labelling

Hazard Pictograms (GHS-US):



GHS07



GHS08

Signal word (GHS-US):

Danger

Hazard statements (GHS-US):

H335 – May cause respiratory irritation
H336 – May cause drowsiness or dizziness

H302 – Harmful if swallowed
H317 – May cause an allergic skin reaction

Precautionary statements (GHS-US):

P201 – Obtain special instructions before use
P202 – Do not handle until all safety precautions have been read and understood
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
P280 – Wear protective gloves/protective clothing/eye protection/face protection
P271 – Use only outdoors or in a well-ventilated area

P304+P340 – IF INHALED: Remove person to fresh air and keep comfortable for breathing
P312 – Call a POISON CENTER or physician if you feel unwell

P314 – Get medical advice and attention if you feel unwell
P403+P233 – Store in a well-ventilated place. Keep container tightly closed
P405 – Store locked up
P501 – Dispose of contents/container in accordance with local / regional / national / international regulations

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	Ozone	10028-15-6	Nitrogen Dioxide	10102-44-0
Carbon Monoxide	630-08-0				



SAFETY DATA SHEET

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
Carbon	7440-44-0	0.03 max.	Not classified
Iron (Fe)	7439-89-6	0.12 max.	Acute Tox. 4 (Oral), H302
Titanium (Ti)	7440-32-6	99.70 min.	Not classified

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. Unless the poison control center advises otherwise, wash out mouth thoroughly with water. If symptoms develop, seek medical attention at once.

Inhalation: Move to fresh air if breathing is difficult. If not breathing, perform artificial respiration. If breathing is difficult, give oxygen. Seek medical assistance immediately.

Skin Contact: Flush with soap and 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 inhalation: Short-term (acute) overexposure to the gases, fumes, and dusts may include irritation of the eyes, lungs, nose, and throat. Some toxic gases associated with welding may cause pulmonary edema, asphyxiation, and death. 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. 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.

Symptoms/injuries after skin contact: Dusts may cause irritation.

Symptoms/injuries after eye contact: Causes eye irritation.

Symptoms/injuries after ingestion: Not an anticipated route of exposure during normal product handling. May be harmful if ingested.

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: Do not spray water on burning fines, chips or powder as a violent explosion may result. The hazard increases with finer titanium particles. Carbon dioxide is not effective in extinguishing burning titanium alloys.

5.2 Special hazards arising from the substance

Fire hazard: May be a potential hazard under the following conditions:

- The Royal ER Ti-1 and Royal ER Ti-2 in their solid form will not ignite. However, high surface material such as 5 micron powder may auto-ignite at room temperature. A dust cloud can ignite at 330°C to 590°C (NFPA 481, Appendix A). Machining of titanium alloys may result in fine turnings, chips or dust. Keep these chips, turnings and/or dust away from any source of ignition.

Explosion hazard: None known.



SAFETY DATA SHEET

CROWN ALLOYS COMPANY

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: Firefighters should wear full protective gear.

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. 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.

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

Section 8 – EXPOSURE CONTROLS / PERSONAL PROTECTION

8.1 Control parameters

Chemical Identity (CAS-No.)	ACGIH TLV (TWA)	OSHA PEL (TWA)	NIOSH REL	NIOSH STEL
Iron (7439-89-6)	5.0 mg/m ³ (as Fe ₂ O ₃) respirable fraction	10.0 mg/m ³ (fume, as Fe ₂ O ₃)	N/A	N/A
Titanium (7440-32-6)	10 mg/m ³ as oxide dust	15 mg/m ³ as oxide dust (total particulate)	N/A	N/A

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. No specific lens shade recommendation for submerged arc processes. 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.



SAFETY DATA SHEET

CROWN ALLOYS COMPANY

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).

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	Solid welding wire or rod
Physical state	Solid
Form	Solid
Color	Metallic
Odor	None
Odor threshold	No data available
pH	Not applicable
Melting point/freezing point	No data available
Flammability (solid, gas)	No data available
Flash Point	Not applicable
Evaporation rate	Not applicable
Initial boiling point and boiling range	No data available

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
Relative density	No data available
Solubility in water	None
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

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 conditions.

10.3 Possibility of hazardous reactions

Will not occur.

10.4 Conditions to avoid

Uncontrolled exposure to extreme temperatures and/or contamination. Also, it is important to prevent the body's natural oils from contaminating the filler rod or the base titanium. Be sure to wear nitrile or clean white cotton gloves when handling titanium.

10.5 Incompatible materials

Strong acids, strong oxidizers, mineral acids, some halogenated compounds, phosphorus and mercury. Titanium based alloys are rapidly dissolved by hydrofluoric acid or hydrofluoric-nitric acid mixtures. Titanium alloys will ignite in cold fluorine, and above 200°C titanium alloys will react exothermically with chlorine, bromine, and halocarbons such as carbon tetrachloride, carbon tetrafluoride and freons.

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 these titanium rods 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 these titanium rods would include: Complex oxides of iron, titanium, carbon dioxide, carbon monoxide, ozone and nitrogen oxides. 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.



SAFETY DATA SHEET

Section 11 – TOXICOLOGICAL INFORMATION

Information on likely routes of exposure

Ingestion:	Health injuries from ingestion are not known or expected under normal use.
Inhalation:	Potential chronic health hazards related to the use of welding consumables are most applicable to the inhalation route of exposure. Refer to Inhalation statements in this section.
Skin Contact:	Arc rays can burn skin. Skin cancer has been reported.
Eye contact:	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.
--------------------	--

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: CARBON LD50 (oral, rat) > 10000 mg/kg
--	--

Titanium: Elemental titanium is an inert material. Titanium dioxide is generated in welding fumes from this product. At extremely high concentrations, titanium dioxide has induced lung cancer in rats. Titanium dioxide dust is a mild pulmonary, eye and skin irritant. Rats exposed to titanium dioxide developed small focal areas of emphysema, which were attributable to large deposits of dust. Excessive exposure in humans may result in slight changes in the lung function. Some studies have suggested that titanium dioxide is a carcinogen, but it is not classified as a "Human Carcinogen" by the ACGIH. The titanium dioxide is considered in the "Nuisance Dust" category.

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):

NTP:	No
IARC:	No
OSHA:	No
ACGIH:	No

Reproductive toxicity (product):	Not classified
Specific target organ toxicity - single exposure (product):	May cause drowsiness or dizziness. May cause respiratory irritation.
Specific target organ toxicity - repeated exposure (product):	Not classified
Aspiration hazard (product):	Not classified

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: Not classified

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: Not classified

Section 12 – ECOLOGICAL INFORMATION

Eco-toxicity

Acute hazards to the aquatic environment:

Fish

Specified substance: IRON and/or iron alloys (as Fe)
LC50 (Cyprinus carpio) [semi-static, 96 h]: 0.56 mg/l

Aquatic Invertebrates: Not classified



CROWN ALLOYS COMPANY

SAFETY DATA SHEET

Chronic hazards to the aquatic environment:

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

Persistence and Degradability

Biodegradation (product):	No data available
---------------------------	-------------------

Bioaccumulative Potential

Bioconcentration Factor (BCF) (product):	No data available
--	-------------------

Mobility in Soil:	No data available
-------------------	-------------------

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.

Section 14 – TRANSPORT INFORMATION

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

14.1 UN number

Not a dangerous good in sense of transport regulations

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

Iron (7439-89-6) Listed on the United States TSCA (Toxic Substances Control Act) inventory	Carbon (7440-44-0) Listed on the United States TSCA (Toxic Substances Control Act) inventory
Titanium (7440-32-6) Listed on the United States TSCA (Toxic Substances Control Act) inventory	

15.2 US State regulations

Titanium (7440-32-6)
U.S. - New Jersey - Right to Know Hazardous Substance List

Section 16 – OTHER INFORMATION

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



SAFETY DATA SHEET

Section 16 – OTHER INFORMATION (continued)

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 38-93°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 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:

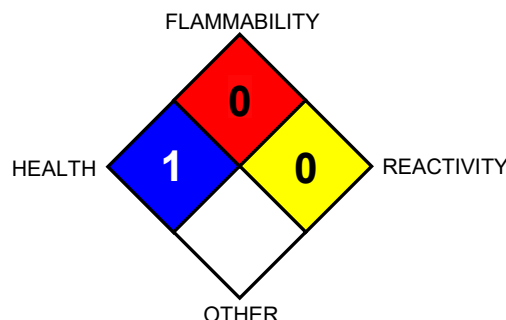
Health Hazard: 0 (material that on exposure under fire conditions would offer no hazard beyond that of ordinary combustible materials);

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)"

NFPA RATING



DEFINITIONS OF TERMS

ACGIH - American Conference of Governmental Industrial Hygienists

CAS No. - Chemical Abstracts Service Number

EPA - Environmental Protection Agency

GHS - Globally Harmonized System

IARC - International Agency for Research on Cancer

LC50 - Lethal Concentration (50 percent kill)

LCLO - Lowest published lethal concentration

LD50 - Lethal dose (50 percent kill)

LDLO - Lowest published lethal dose

NIOSH - National Institute of Occupational Safety and Health

NTP - National Toxicology Program

OSHA - U.S. Occupational Safety and Health Administration

PEL - Permissible Exposure Limit

SARA - Superfund Amendments and Reauthorization Act

STEL - Short Term Exposure Limit

TCLO - the lowest concentration to cause a symptom

TDLo - the lowest dose to cause a symptom

TLV - Threshold Limit Value

TSCA - Toxic Substances Control Act

TWA - Time Weighted Average

Full text of H-phrases (from Section 2)

H317	May cause an allergic skin reaction
H302	Harmful if swallowed
H335	May cause respiratory irritation
H336	May cause drowsiness or dizziness

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.