Oxford® ALLOYS, Inc.
Supplier of Welding Alloys

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Oxford ALLOYS, Inc.
Supplier of Welding Alloys

Important Notice

Oxford Alloys, Inc. sells all of its products subject to the "Terms and Conditions of Sale" which are issued by Oxford Alloys, Inc. and are available for review upon request. There are no warranties whatsoever, whether written, oral, implied, express or statutory, other than those specified in these Terms and Conditions of Sale. There is no warranty of merchantability or fitness for a particular purpose. The data contained in this Catalog is intended for general information only, and not for specification purposes. Applications suggested for these alloys are made to permit you to make your own evaluation and decision, and are not to be construed as either express or implied warranties of fitness for these or other applications. All analyses should be considered as typical or average values, and are minimum or maximum only when indicated. They are not for specification purposes.

WARNING

PROTECT YOURSELF AND OTHERS. BEFORE USE, READ AND UNDERSTAND THIS WARNING, THE APPROPRIATE MATERIAL SAFETY DATA SHEET (MSDS) AND YOUR EMPLOYER'S SAFETY PRACTICES. THE MSDS WAS SENT WITH THE SHIPMENT AND IS ALSO AVAILABLE ON OUR WEBSITE WWW.OXFORDALLOYS.COM. YOU MAY ALSO REQUEST THE MSDS FROM YOUR DISTRIBUTOR OR EMPLOYER. BE SURE THAT BOTH THE LABEL AND THE MSDS ARE READ BY THE WELDER (END USER).

FUMES AND GASES can be dangerous to your health and may cause lung damage or siderosis. CHROMATES in fumes may be carcinogenic. Manganese over exposure may affect your NERVES, resulting in impaired speech and movement. ARC RAYS can injure eyes and burn skin. ELECTRIC SHOCK can kill.

- Read and understand the manufacturer's instructions and your employer's safety practices.
- Keep your head out of the fumes.
- Use enough ventilation, local exhaust or both to keep fumes and gases from your (or others) 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 and Cutting", published by the American Welding Society, 550 NW LeJeune Rd, Miami, FL 33126: OSHA Safety and Health Standards, 29 CFR 1910, available from the U.S. Government Printing Office, Washington, D.C. 20402.
  WARNING: This product may contain detectable amounts of chemicals known to the State of California (and other applicable states) to cause cancer, birth defects, or other reproductive harm. (Proposition 65, California Health and Safety Code Section 25249.5 et seq.)

  WARNING: This product contains Chromium and/or Nickel components which are listed by OSHA, NTP or IARC as being a carcinogen or potential carcinogen. Use of this product may expose you or others to fumes and gases at levels which exceed those established by the ACGIH and OSHA. See the MSDS for further information.

IMPORTANT: SPECIAL VENTILATION AND/OR EXHAUST REQUIRED: Manganese over exposure may affect your central nervous system resulting in impaired speech and movement. The TLV (threshold limit value) for manganese exposure, 0.2mg/m^3,may be exceeded. Use enough ventilation, exhaust at the arc and respirators to keep the fumes and gases from your (or others) breathing zone and the general area below the TLV for exposure to manganese.

*IN CASE OF EMERGENCY, CALL FOR MEDICAL AID.

Oxford® ALLOYS, Inc.
Supplier of Welding Alloys

Stainless Steel Coated Electrodes

Oxford Alloy® 308/308H-16

SPECIFICATIONS
AWS 5.4
ASME SFA 5.4

CLASSIFICATIONS
AWS E308/308H-16
UNS W30810

DESCRIPTION / APPLICATION
Oxford Alloy E308/308H-16 is an electrode designed to run on direct current, reversed polarity as well as alternating current. This electrode is used to weld base metal of similar composition such as AISI 301, 302, 304, 304H, 308, 308H and 347. Carbon content 0.04% minimum. This dual classification will help eliminate redundancy.

AWS Chemical Composition						
C	Cr	Ni	Mn	Si	P	S
0.04-0.08	18.0-21.0	9.0-11.0	0.5-2.5	1.0 max	0.04 max	0.03 max
Cu	Mo					
0.75 max	0.75 max					

TYPICAL MECHANICAL PROPERTIES

Tensile strength:	83,810 psi	578 MPa
Yield strength:	58,725 psi	405 MPa
Elongation:	46%	

Oxford Alloy® 308/308L-16

SPECIFICATIONS
AWS 5.4
ASME SFA 5.4

CLASSIFICATIONS
AWS E308/308L-16
UNS W30813

DESCRIPTION / APPLICATION
Oxford Alloy E308/308L-16 is an electrode designed to run on direct current, reversed polarity as well as alternating current. The weld deposit contains a maximum of .04% carbon, which minimizes the formation of chromium carbides, and consequent susceptibility to intergranular corrosion. This electrode is used to weld base metal of similar composition such as AISI 301, 302, 304, 304L, 305, 308, 308L and 347. This dual classification will help eliminate redundancy.

AWS Chemical Composition						
C	Cr	Ni	Mn	Si	P	Cu
0.04 max	18.0-21.0	9.0-11.0	0.5-2.5	1.0 max	0.04 max	0.75 max
Mo	S					
0.75 max	0.03 max					

TYPICAL MECHANICAL PROPERTIES

Tensile strength:	78,300 psi	540 MPa
Yield strength:	56,550 psi	390 MPa
Elongation:	45%	

Oxford Alloy® 309/309H-16

SPECIFICATIONS
AWS 5.4
ASME SFA 5.4

CLASSIFICATIONS
AWS E309/309H-16
UNS W30910

DESCRIPTION / APPLICATION
Oxford Alloy E309/309H-16 has restricted weld metal carbon content to eliminate the lowest carbon levels. It is used for welding type 309 base metal for all service temperatures designed for type 309. The Carbon content is 0.04% minimum. The Oxford Alloy E309/309H-16 is also used in applications where greater strength is required and a limited quality of ferrite. It can also be used to weld low alloy to stainless steel dissimilar joints where a lower ferrite content is desired and is acceptable. In the latter case, the service temperature should not exceed 700℉ (370℃). The carbon restriction will provide highe r tensile and creep strengths at elevated temperatures. This together with a typical ferrite content of about 6 FN make these electrodes suitable for the welding of 24 Cr 12 Ni wrought and cast steels designed for corrosion and oxidation resistance. This grade of material is a good choice for a multitude of welding applications including tight joints. It can also be used for carbon and low alloy steel dissimilar joints.

AWS Chemical Composition						
C	Cr	Ni	Mn	Si	P	S
0.04-0.15	22.0-25.0	12.0-14.0	0.5-2.5	1.0 max	0.04 max	0.03 max
Cu	Mo					
0.75 max	0.75 max					

TYPICAL MECHANICAL PROPERTIES

Tensile strength:	89,900 psi	620 MPa
Yield strength:	55,100 psi	380 MPa
Elongation:	40%	

Oxford® ALLOYS, Inc.
Supplier of Welding Alloys

Stainless Steel Coated Electrodes

Oxford Alloy® 309/309L-16

SPECIFICATIONS
AWS 5.4
ASME SFA 5.4

CLASSIFICATIONS
AWS E309/309L-16
UNS W30913

DESCRIPTION / APPLICATION
Oxford Alloy E309/309L-16 is designed to run on direct current, reversed polarity as well as alternating current. The low carbon content of the weld metal lowers the risk of intergranular corrosion by reducing the possibility of carbide precipitation at the grain boundary. This electrode can be used to join dissimilar metals for service temperatures up to 600°F and metals of 309 and 309L composition. Oxford Alloy E309/309L-16 can also be used to join stainless steels to themselves or to carbon or low alloy steels. The molybdenum content provides creep resistance at elevated temperatures. This dual classification will help eliminate redundancy.

AWS Chemical Composition

C	Cr	Ni	Mn	Si	P	S
0.04 max	22.0-25.0	12.0-14.0	0.5-2.5	1.0 max	0.04 max	0.03 max
Cu	**Mo**					
0.75 max	0.75 max					

TYPICAL MECHANICAL PROPERTIES
Tensile strength: 79,605 psi 549 MPa
Yield strength: 59,450 psi 410 MPa
Elongation: 45%

Oxford Alloy® 309LMo-16

SPECIFICATIONS
AWS 5.4
ASME SFA 5.4

CLASSIFICATIONS
AWS E309LMo-16
UNS W30923

DESCRIPTION / APPLICATION
Oxford Alloy E309LMo-16 is an electrode designed to run on direct current, reversed polarity as well as alternating current. This electrode is designed for applications requiring molybdenum with a standard 309L analysis. This electrode is used primarily for welding type 316L and 316 clad steels, or welding molybdenum containing austenitic stainless steel to carbon steel, provided the service temperature is less than 600°F (316°C). Carbon content 0.04% maximum.

AWS Chemical Composition

C	Cr	Ni	Mn	Si	Mo	P
0.04 max	22.0-25.0	12.0-14.0	0.5-2.5	1.0 max	2.0-3.0	0.04 max
S	**Cu**					
0.03 max	0.75 max					

TYPICAL MECHANICAL PROPERTIES
Tensile strength: 89,610 psi 618 MPa
Yield strength: 63,800 psi 440 MPa
Elongation: 40%

Oxford Alloy® 310-16

SPECIFICATIONS
AWS 5.4
ASME SFA 5.4

CLASSIFICATIONS
AWS E310-16
UNS W31010

DESCRIPTION / APPLICATION
Oxford Alloy E310-16 is an electrode designed to run on direct current, reversed polarity as well as alternating current. Oxford Alloy E310-16 electrode is used for joining heat resistant austenitic steels of type AISI 310 and for surfacing low or non-alloyed steels where a 310-type deposit is desired. This electrode can be used in air up to about 2000°F, in oxidizing sulphurous atmospheres up to 2000°F and in reducing sulphurous atmospheres up to 1200°F.

AWS Chemical Composition

C	Mn	Si	Cr	Ni	S	P
0.08-0.20	1.0-2.5	0.75 max	25.0-28.0	20.0-22.5	0.03 max	0.03 max
Mo	**Cu**					
0.75 max	0.75 max					

TYPICAL MECHANICAL PROPERTIES
Tensile strength: 85,260 psi 588 MPa
Yield strength: 59,450 psi 410 MPa
Elongation: 38%

Oxford® ALLOYS, Inc.
Supplier of Welding Alloys

Stainless Steel Coated Electrodes

Oxford Alloy® 312-16

SPECIFICATIONS
AWS 5.4
ASME SFA 5.4

CLASSIFICATIONS
AWS E312-16
UNS W31310

DESCRIPTION / APPLICATION
Oxford Alloy E312-16 is an electrode designed to run on direct current, reversed polarity as well as alternating current. This electrode is used for welding AISI 312 pipe and other steels of this composition where high strength is needed or where high abrasive conditions are present. Oxford Alloy E312-16 is recommended for dissimilar metal joint welding such as mild or low alloy steels to stainless steels, and austenitic manganese steels.

AWS Chemical Composition						
C	**Cr**	**Ni**	**Mn**	**Si**	**P**	**S**
0.15 max	28.0-32.0	8.0-10.5	0.5-2.5	1.0 max	0.04 max	0.03 max
Mo	**Cu**					
0.75 max	0.75 max					

TYPICAL MECHANICAL PROPERTIES
Tensile strength: 110,200 psi 760 MPa
Yield strength: 88,450 psi 610 MPa
Elongation: 29%

Oxford Alloy® 316/316H-16

SPECIFICATIONS
AWS 5.4
ASME SFA 5.4

CLASSIFICATIONS
AWS E316/316H-16
UNS W31610

DESCRIPTION / APPLICATION
Oxford Alloy E316/316H-16 has restricted weld metal carbon content to eliminate the lowest carbon levels. It is used in applications where type 316 stainless steel needs improved tensile strength at high temperatures. The Carbon range of 0.04 – 0.08 percent provides higher tensile and creep strengths at elevated temperatures. The Oxford Alloy E316/316H-16 is an all position electrode and has a high resistance to cracking. This grade of material is a good choice for a multitude of welding applications including tight joints.

AWS Chemical Composition						
C	**Cr**	**Ni**	**Mn**	**Si**	**P**	**S**
0.04-0.08	17.0-20.0	11.0-14.0	0.5-2.5	1.0 max	0.04 max	0.03 max
Mo	**Cu**					
2.0-3.0	0.75 max					

TYPICAL MECHANICAL PROPERTIES
Tensile strength: 95,700 psi 660 MPa
Yield strength: 71,050 psi 490 MPa
Elongation: 40%

Oxford Alloy® 316/316L-16

SPECIFICATIONS
AWS 5.4
ASME SFA 5.4

CLASSIFICATIONS
AWS E316/316L-16
UNS W31613

DESCRIPTION / APPLICATION
Oxford Alloy E316/316L-16 is an electrode designed to run on direct current, reversed polarity as well as alternating current. The low carbon content of the weld metal lowers the risk of intergranular corrosion by reducing the possibility of carbide precipitation at the grain boundary. Oxford Alloy E316/316L-16 is recommended for welding base metals of similar composition such as 316 and 316L. The molybdenum content provides creep resistance at elevated temperatures. This dual classification will help eliminate redundancy.

AWS Chemical Composition						
C	**Cr**	**Ni**	**Mo**	**Mn**	**Si**	**P**
0.04 max	17.0-20.0	11.0-14.0	2.0-3.0	0.5-2.5	1.0 max	0.04 max
S	**Cu**					
0.03 max	0.75 max					

TYPICAL MECHANICAL PROPERTIES
Tensile strength: 78,300 psi 540 MPa
Yield strength: 58,000 psi 400 MPa
Elongation: 41%

Oxford® ALLOYS, Inc.
Supplier of Welding Alloys

Stainless Steel Coated Electrodes

Oxford Alloy® 317L-16

SPECIFICATIONS
AWS 5.4
ASME SFA 5.4

CLASSIFICATIONS
AWS E317L-16
UNS W31713

DESCRIPTION / APPLICATION
Oxford Alloy E317L-16 is an electrode designed to run on direct current, reversed polarity as well as alternating current. The low carbon content of the weld metal lowers the risk of intergranular corrosion by reducing the possibility of carbide precipitation at the grain boundary. At elevated temperatures the tensile property values are lower than the E317-16 grade. Oxford Alloy E317L-16 is used for joining AISI 317L type stainless steel for use in especially severe corrosion conditions such as those in the petrochemical or paper industries.

AWS Chemical Composition

C	Cr	Ni	Mo	Mn	Si	P
0.04 max	18.0-21.0	12.0-14.0	3.0-4.0	0.5-2.5	1.0 max	0.04 max
S	**Cu**					
0.03 max	0.75 max					

TYPICAL MECHANICAL PROPERTIES

Tensile strength:	78,735 psi	543 MPa
Yield strength	62,350 psi	430 MPa
Elongation:	42%	

Oxford Alloy® 320LR-16

SPECIFICATIONS
AWS 5.4
ASME SFA 5.4

CLASSIFICATIONS
AWS E320LR-16
UNS W88022

DESCRIPTION / APPLICATION
Oxford Alloy E320LR-16 is an electrode designed to run on direct current, reversed polarity as well as alternating current. Oxford Alloy E320LR-16 is designed for welding on alloy 20 and alloy 20 Cb-3® or alloys of similar composition in wrought or cast forms. This electrode is specifically designed to resist the hot cracking and microfissuring often encountered when welding fully austenitic stainless steels. These properties are achieved by closely controlling the residual elements detrimental to the weld deposit.

AWS Chemical Composition

C	Mn	Si	P	S	Cr	Ni
0.03 max	1.5-2.5	0.30 max	0.020 max	0.015 max	19.0-21.0	32.0-36.0
Cu	**Mo**	**Cb+Ta**				
3.0-4.0	2.0-3.0	8 x C, min to 0.40 max				

TYPICAL MECHANICAL PROPERTIES

Tensile strength:	85,000 psi	590 MPa
Yield strength:	57,000 psi	390 MPa
Elongation:	34%	

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Oxford Alloy® 330-16

SPECIFICATIONS
AWS 5.4
ASME SFA 5.4

CLASSIFICATIONS
AWS E330-16
UNS W88331

DESCRIPTION / APPLICATION
Oxford Alloy E330-16 is an electrode designed to run on direct current, reversed polarity as well as alternating current. The high nickel content of Oxford Alloy E330-16 gives a strong adherent surface oxide that resists scaling at elevated temperature above 1800°F. This electrode is used primarily for repairing defects in alloy castings and in welding alloys of similar chemical composition.

AWS Chemical Composition

C	Cr	Ni	Mn	Si	P	S
0.18-0.25	14.0-17.0	33.0-37.0	1.0-2.5	1.0 max	0.04 max	0.03 max
Mo	**Cu**					
0.75 max	0.75 max					

TYPICAL MECHANICAL PROPERTIES

Tensile strength:	84,500 psi	580 MPa
Yield strength:	57,000 psi	390 MPa
Elongation:	26%	

Oxford® ALLOYS, Inc.
Supplier of Welding Alloys

Stainless Steel Coated Electrodes

Oxford Alloy® 347-16

SPECIFICATIONS
AWS 5.4
ASME SFA 5.4

CLASSIFICATIONS
AWS E347-16
UNS W34710

DESCRIPTION / APPLICATION
Oxford Alloy E347-16 is an electrode designed to run on direct current, reversed polarity as well as alternating current. The addition of columbium to Oxford Alloy E347-16 makes it resistant to intergranular corrosion by reducing the possibility of intergranular carbide precipitation. This electrode is recommended for welding grades of similar composition such as 304, 302, 321 and 347. Due to the strengthening effect of columbium, this grade is recommended if the weld metal is to be subjected to high temperatures above 700°F.

AWS Chemical Composition

C	Cr	Ni	Cb+Ta	Mn	Si	P
0.08 max	18.0-21.0	9.0-11.0	8 x C, min to 1.00 max	0.5-2.5	1.0 max	0.04 max
S	**Mo**	**Cu**				
0.03 max	0.75 max	0.75 max				

TYPICAL MECHANICAL PROPERTIES

Tensile strength:	85,260 psi 588 MPa
Yield strength:	60,900 psi 420 MPa
Elongation:	42%

Oxford Alloy® 385-16 (904L)

SPECIFICATIONS
AWS 5.4
ASME SFA 5.4

CLASSIFICATIONS
AWS E385-16
UNS W88904

DESCRIPTION / APPLICATION
Oxford Alloy E385-16 is an electrode designed to run on direct current, reversed polarity as well as alternating current. This electrode gives a chromium-nickel-molybdenum weld metal with especially low carbon content and copper addition. Oxford Alloy E385-16 can be used for joining high alloyed, fully austenitic stainless steels such as W.-Nr. 1.4539 (ASTM B-625 and 904L), which have high corrosion resistance in sulphuric and phosphoric acids and good pitting resistance in acidic solutions containing chlorides and fluorides, such as seawater. This electrode can also be used for surfacing mild and low-alloyed steel to give protection against pitting corrosion in chloride containing solutions.

AWS Chemical Composition

C	Cr	Ni	Mo	Mn	Si	P
0.03 max	19.5-21.5	24.0-26.0	4.2-5.2	1.0-2.5	0.9 max	0.03 max
S	**Cu**					
0.02 max	1.2-2.0					

TYPICAL MECHANICAL PROPERTIES

Tensile strength:	88,000 psi 610 MPa
Yield strength:	65,500 psi 450 MPa
Elongation:	32%

Oxford Alloy® 410-16

SPECIFICATIONS
AWS 5.4
ASME SFA 5.4

CLASSIFICATIONS
AWS E410-16
UNS W41010

DESCRIPTION / APPLICATION
Oxford Alloy E410-16 is an electrode designed to run on direct current, reversed polarity as well as alternating current. This electrode is an air hardening steel which requires preheat and post weld heat treatment to obtain the required ductility. The preheat and interpass temperature for work pieces ¾ inch and under is 400 ° F. Work pieces over ¾ inch thick should use a preheat and interpass of 500 ° F. The post weld heat treatment temperature is 1350-1400 ° F; the holding time should be 1 hour per inch of thickness but no less than 30 minutes. The temperature should be raised and lowered at a rate of 200 ° F per hour. The weld metal has similar corrosion resistance to that of the corresponding base metal. Oxford Alloy E410-16 has good scaling resistance but is prone to slow attack by certain acids.

AWS Chemical Composition

C	Cr	Mn	Si	P	S	Ni
0.12 max	11.0-13.5	1.0 max	0.90 max	0.04 max	0.03 max	0.7 max
Mo	**Cu**					
0.75 max	0.75 max					

TYPICAL MECHANICAL PROPERTIES

Tensile strength:	78,735 psi 543 MPa
Yield strength:	46,400 psi 320 MPa
Elongation:	28%

Oxford® ALLOYS, Inc.
Supplier of Welding Alloys

Stainless Steel Coated Electrodes

Oxford Alloy® 410NiMo-16

SPECIFICATIONS
AWS 5.4
ASME SFA 5.4

CLASSIFICATIONS
AWS E410NiMo-16
UNS W41016

DESCRIPTION / APPLICATION
Oxford Alloy E410NiMo-16 is an electrode designed to run on direct current, reversed polarity as well as alternating current. This electrode is designed to weld materials of similar chemical composition in cast and wrought forms. Preheat and interpass temperatures of not less than 300℉ (150℃) are rec ommended during welding. Post-weld heat treatment should be between 1100℉ (629℃) and not to exceed 1150℉ (620℃), as high temperatures may result in hardening.

AWS Chemical Composition

C	Mn	Si	Cr	Ni	Mo	S
0.06 max	1.0 max	0.90 max	11.0-12.5	4.0-5.0	0.40-0.70	0.03 max
P	**Cu**					
0.04 max	0.75 max					

TYPICAL MECHANICAL PROPERTIES
Tensile strength: 126,150 psi 870 MPa
Yield strength: 108,750 psi 750 MPa
Elongation: 22%

Note: Mechanical properties listed reflect utilization of a post-weld heat treatment between 1100℉ (629℃) and 1150℉ (620℃) for one hour.

Oxford Alloy® 630-16 (17-4PH)

SPECIFICATIONS
AWS 5.4
ASME SFA 5.4

CLASSIFICATIONS
AWS E630-16
UNS W37410

DESCRIPTION / APPLICATION
Oxford Alloy E630-16 is an electrode designed to run on direct current, reversed polarity as well as alternating current. This electrode offers the combined characteristics of a strong, corrosion resistant, easily machinable weld metal. This electrode is primarily designed for welding ASTM A-564, type 630 (17 chromium, 4 nickel), and precipitation hardenable steel. The composition of the weld deposit is modified to eliminate ferrite stringers in the martensitic microstructure that would inhibit the mechanical properties. Depending on the weld dimensions and applications, Oxford Alloy E630-16 may be used in the as welded, welded plus precipitation hardened, or welded plus solution treated plus precipitation hardened condition.

AWS Chemical Composition

C	Cr	Ni	Mn	Si	P	S
0.05 max	16.00-16.75	4.5-5.0	0.25-0.75	0.75 max	0.04 max	0.03 max
Cu	**Mo**	**Cb+Ta**				
3.25-4.00	0.75 max	0.15-0.30				

TYPICAL MECHANICAL PROPERTIES
Tensile strength: 150,000 psi 1030 MPa
Yield strength: 133,800 psi 920 MPa
Elongation: 10%

Oxford Alloy® 2209-16

SPECIFICATIONS
AWS 5.4
ASME SFA 5.4

CLASSIFICATIONS
AWS E2209-16
UNS W39209

DESCRIPTION / APPLICATION
Oxford Alloy E2209-16 is an electrode designed to run on direct current, reversed polarity as well as alternating current. This electrode is used for welding ferritic-austenitic (duplex) steels, especially those with high resistance to stress corrosion cracking. Oxford Alloy E2209-16 is also used for welding on stainless structures where a particularly high strength is required. This electrode deposits weld metal of ferritic-austenitic chromium-nickel-molybdenum steel with low carbon content for service temperature up to 540℉.

AWS Chemical Composition

C	Cr	Ni	Mo	Mn	Si	P
0.04 max	21.5-23.5	8.5-10.5	2.5-3.5	0.5-2.0	1.0 max	0.04 max
S	**N**	**Cu**				
0.03 max	0.08-0.20	.075 max				

TYPICAL MECHANICAL PROPERTIES
Tensile strength: 124,700 psi 860 MPa
Yield strength: 94,250 psi 650 MPa
Elongation: 32%

Oxford® ALLOYS, Inc.
Supplier of Welding Alloys

Stainless Steel Coated Electrodes

Oxford Alloy® 2594-16

SPECIFICATIONS
AWS 5.4
ASME SFA 5.4

CLASSIFICATIONS
AWS E2594-16
UNS W39594

DESCRIPTION / APPLICATION

Oxford Alloy E2594-16 is a superduplex coated electrode. The Pitting Resistance Equivalent Number (PREN) is at least 40, thereby allowing the weld metal to be called a superduplex stainless steel. These coated electrodes provide matching chemistry and mechanical property characteristics to wrought super duplex alloys such as 2507 and Zeron 100 as well as superduplex casting alloys (ASTM A890). This electrode is overalloyed 2 – 3 percent in Nickel to provide optimum ferrite/austenite ratio in the finished weld. This structure results in high tensile and yield strength along with superior resistance to SCC and pitting corrosion.

Set the parameters to obtain a heat input of 13,000 – 38,000 Joules/inch. Pre-heat is not required. The interpass temperature should be maintained at 300℉ max. If post weld annealing is required this weld metal will require a higher annealing temperature than that required by the duplex base metal.

AWS Chemical Composition

C	Cr	Ni	Mo	Mn	Si	P
0.04 max	24.0-27.0	8.0-10.5	3.5-4.5	0.5-2.0	1.0 max	0.04 max
S	**N**	**Cu**				
0.03 max	0.20-0.30	0.75 max				

TYPICAL MECHANICAL PROPERTIES

Tensile strength:	130,500 psi 900 MPa
Yield strength:	100,775 psi 695 MPa
Elongation:	31%

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Oxford® ALLOYS, Inc.
Supplier of Welding Alloys

Stainless Steel TIG, MIG and SUB-ARC Wire

Oxford Alloy® 308/308H

SPECIFICATIONS
AWS 5.9
ASME SFA 5.9

CLASSIFCATIONS
AWS ER308/308H
UNS S30880

DESCRIPTION / APPLICATION
Oxford Alloy ER308H is used for welding of unstabilized stainless steels such as Types 301, 302, 304, 304H, 305, 308, and 308H. This filler metal is also used for general-purpose applications where corrosion conditions are moderate. The classification is the same as the Oxford Alloy ER308, except that the allowable carbon content has been restricted to the higher portion of the 308 range. Carbon content in the range of .04 - .08 provides higher strength at elevated temperatures.

AWS Chemical Composition						
C	**Mn**	**Si**	**Cr**	**Ni**	**S**	**P**
0.04-0.08	1.0-2.5	0.30-0.65	19.5-22.0	9.0-11.0	0.03 max	0.03 max
Mo	**Cu**					
0.50 max	0.75 max					

TYPICAL MECHANICAL PROPERTIES
Tensile strength: 87,000 psi 600 MPa
Yield strength: 59,450 psi 410 MPa
Elongation: 41%

Oxford Alloy® 308/308L

SPECIFICATIONS
AWS 5.9
ASME SFA 5.9

CLASSIFICATIONS
AWS ER308/308L
UNS S30883

DESCRIPTION / APPLICATION
Oxford Alloy ER308L is ideal for welding Types 304L, 321, and 347. This classification is the same as Oxford Alloy ER308, except for the carbon content. The carbon content is held to a maximum of .03% to reduce the possibility of intergranular carbide precipitation. This increases the resistance to intergranular corrosion without the use of stabilizers such as columbium (niobium) or titanium. Strength of this low-carbon alloy, however, is less than that of the columbium (niobium)-stabilized alloys or Type 308H at elevated temperatures.

AWS Chemical Composition						
C	**Mn**	**Si**	**Cr**	**Ni**	**S**	**P**
0.03 max	1.0-2.5	0.30-0.65	19.5-22.0	9.0-11.0	0.03 max	0.03 max
Mo	**Cu**					
0.75 max	0.75 max					

TYPICAL MECHANICAL PROPERTIES
Tensile strength: 84,100 psi 580 MPa
Yield strength: 58,000 psi 400 MPa
Elongation: 42%

Oxford Alloy® 308LSi

SPECIFICATIONS
AWS 5.9
ASME SFA 5.9

CLASSIFICATIONS
AWS ER309LSI
UNS S30888

DESCRIPTION / APPLICATION
Oxford Alloy ER308LSi is used to weld base metal of similar composition such as AISI 301, 302, 304, 304L, 305, 308, 308L and 347. This classification is the same as Oxford Alloy ER308L, except for the higher silicon. This improves the usability of the filler metal in the gas metal arc welding process. If the dilution by the base metal produces a low ferrite or fully austenitic weld, the crack sensitivity of the weld is somewhat higher than that of a lower silicon content weld metal.

AWS Chemical Composition						
C	**Cr**	**Ni**	**Mo**	**Mn**	**Si**	**P**
0.03 max	19.5-22.0	9.0-11.0	075 max	1.0-2.5	0.65-1.00	0.03 max
S	**Cu**					
0.03 max	0.75 max					

TYPICAL MECHANICAL PROPERTIES
Tensile strength: 84,100 psi 580 MPa
Yield strength: 58,000 psi 400 MPa
Elongation: 41%

Oxford® ALLOYS, Inc.
Supplier of Welding Alloys

Stainless Steel TIG, MIG and SUB-ARC Wire

Oxford Alloy® 309/309L

SPECIFICATIONS
AWS 5.9
ASME SFA 5.9

CLASSIFICATIONS
AWS ER309/309L
UNS S30983

DESCRIPTION / APPLICATION
Oxford Alloy ER309L is of similar composition as Oxford Alloy ER309 except for the carbon content being lower than .03%. This lower carbon content reduces the possibility of intergranular carbide precipitation. This increases the resistance of intergranular corrosion without the use of stabilizers such as columbium (niobium) or titanium. Strength of this low-carbon alloy; however, may not be as great at elevated temperatures as that of the columbium (niobium)-stabilized alloys or ER309. Oxford Alloy ER309L is preferred over Oxford Alloy ER309 for cladding over carbon or low alloy steels, as well as for dissimilar joints that undergo heat treatment.

AWS Chemical Composition						
C	**Cr**	**Ni**	**Mo**	**Mn**	**Si**	**P**
0.03 max	23.0-25.0	12.0-14.0	0.75 max	1.0-2.5	0.30-0.65	0.03 max
S	**Cu**					
0.03 max	0.75 max					

TYPICAL MECHANICAL PROPERTIES
Tensile strength: 85,550 psi 590 MPa
Yield strength: 58,000 psi 400 MPa
Elongation: 40%

Oxford Alloy® 309LSi

SPECIFICATIONS
AWS 5.9
ASME SFA 5.9

CLASSIFICATIONS
AWS ER309LSi
UNS S30988

DESCRIPTION / APPLICATION
Oxford Alloy ER309LSi is of the same chemical composition as ER309L, with higher silicon content to improve the bead appearance and increase welding ease. This filler metal is used for welding of similar alloys in wrought or cast form. Oxford Alloy ER309L-HiSil is mostly used for welding dissimilar materials such as mild steel to stainless steel, as well as for a barrier layer in stainless overlays. The weld beads are exceptionally smooth due to good wetting.

AWS Chemical Composition						
C	**Mn**	**Si**	**Cr**	**Ni**	**S**	**P**
0.03 max	1.0-2.5	0.65-1.00	23.0-25.0	12.0-14.0	0.03 max	0.03 max
Mo	**Cu**					
0.75 max	0.75 max					

TYPICAL MECHANICAL PROPERTIES
Tensile strength: 82,650 psi 570 MPa
Yield strength: 59,450 psi 410 MPa
Elongation: 38%

Oxford Alloy® 309LMo

SPECIFICATIONS
AWS 5.9
ASME SFA 5.9

CLASSIFICATIONS
AWS ER309LMo
UNS S30986

DESCRIPTION / APPLICATION
Oxford Alloy ER309LMO is used for the welding of dissimilar materials between stainless and low alloy steels, as well as for overlay cladding. This alloy is well suited for austenitic ferritic joints with a maximum application temperature of 300°C. It is al so suited for stainless with wet corrosion up to 350°C. Oxford A lloy 309LMO is also used for depositing buffer layers when welding clad products. Oxford Alloy ER309LMO can be used for joining unalloyed/low-alloy steels/cast steel grades or stainless/heat-resistance chromium steels/cast steel grades to austenitic steels/cast steel grades.

AWS Chemical Composition						
C	**Si**	**Cr**	**Ni**	**Mo**	**Mn**	**S**
0.03 max	0.30-0.65	23.0-25.0	12.0-14.0	2.0-3.0	1.0-2.5	0.03 max
P	**Cu**					
0.03 max	0.75 max					

TYPICAL MECHANICAL PROPERTIES
Tensile strength: 89,900 psi 620 MPa
Yield strength: 63,800 psi 440 MPa
Elongation: 42%

Oxford® ALLOYS, Inc.
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Stainless Steel TIG, MIG and SUB-ARC Wire

Oxford Alloy® 310

SPECIFICATIONS
AWS 5.9
ASME SFA 5.9

CLASSIFICATIONS
AWS ER310
UNS S31080

DESCRIPTION / APPLICATION
Oxford Alloy ER 310 is used for the welding of stainless steels of similar composition in wrought or cast form. The weld deposit is fully austenitic and calls for low heat during welding. This filler metal can also be used for dissimilar welding.

AWS Chemical Composition						
C	**Mn**	**Si**	**Cr**	**Ni**	**S**	**P**
0.08-0.15	1.0-2.5	0.30-0.65	25.0-28.0	20.0-22.5	0.03 max	0.03 max
Mo	**Cu**					
0.75 max	0.75 max					

TYPICAL MECHANICAL PROPERTIES
Tensile strength: 88,450 psi 610 MPa
Yield strength: 69,600 psi 480 MPa
Elongation: 41%

Oxford Alloy® 312

SPECIFICATIONS
AWS 5.9
ASME SFA 5.9

CLASSIFICATIONS
AWS ER312
UNS S31380

DESCRIPTION / APPLICATION
Oxford Alloy ER312 was originally designed to weld cast alloys of similar composition. This filler metal has also been found to be valuable in welding dissimilar metals such as carbon steel to stainless steel, particularly those grades high in nickel. Oxford Alloy ER312 gives a two-phase weld deposit with substantial percentages of ferrite in an austenite matrix. Even with considerable dilution by austenite-forming elements such as nickel, the microstructure remains two-phase and thus highly resistant to weld metal cracks and fissures.

AWS Chemical Composition						
C	**Mn**	**Si**	**Cr**	**Ni**	**Mo**	**S**
0.15 max	1.0-2.5	0.30-0.65	28.0-32.0	8.0-10.5	0.75 max	0.03 max
P	**Cu**					
0.03 max	0.75 max					

TYPICAL MECHANICAL PROPERTIES
Tensile strength: 102,950 psi 710 MPa
Yield strength: 85,550 psi 590 MPa
Elongation: 40%

Oxford Alloy® 316/316H

SPECIFICATIONS
AWS 5.9
ASME SFA 5.9

CLASSIFICATIONS
AWS ER316/316H
UNS S31680

DESCRIPTION / APPLICATION
Oxford Alloy 316H is used for welding 316H base metal. This filler metal is the same as Oxford Alloy ER316, except that the allowable carbon content has been restricted to the higher portion of the 316 range. Carbon content in the range of 0.04 to 0.08 wt.% provides higher strength at elevated temperatures.

AWS Chemical Composition						
C	**Mn**	**Si**	**Cr**	**Ni**	**Mo**	**S**
0.04-0.08	1.0-2.5	0.30-0.65	18.0-20.0	11.0-14.0	2.0-3.0	0.03 max
P	**Cu**					
0.03 max	0.75 max					

TYPICAL MECHANICAL PROPERTIES
Tensile strength: 84,100 psi 580 MPa
Yield strength: 58,000 psi 400 MPa
Elongation: 38%

Stainless Steel TIG, MIG and SUB-ARC Wire

Oxford Alloy® 316/316L

SPECIFICATIONS
AWS 5.9
ASME SFA 5.9

CLASSIFICATIONS
AWS ER316/316L
UNS S31683

DESCRIPTION / APPLICATION
Oxford Alloy ER316L is primarily used for welding low carbon molybdenum-bearing austenitic alloys. This filler metal has the same analysis as Oxford Alloy ER316, except that the carbon content is limited to a maximum of 0.03% in order to reduce the possibility of formation of intergranular carbide precipitation. This low carbon alloy is not as strong at elevated temperatures as ER316H.

AWS Chemical Composition

C	Mn	Si	Cr	Ni	Mo	S
0.03 max	1.0-2.5	0.30-0.65	18.0-20.0	11.0-14.0	2.0-3.0	0.03 max
P	**Cu**					
0.30 max	0.75 max					

TYPICAL MECHANICAL PROPERTIES
Tensile strength: 79,750 psi 550 MPa
Yield strength: 55,100 psi 380 MPa
Elongation: 40%

Oxford Alloy® 316LSi

SPECIFICATIONS
AWS 5.9
ASME SFA 5.9

CLASSIFICATIONS
AWS ER316LSi
UNS S31688

DESCRIPTION / APPLICATION
Oxford Alloy ER316LSi is used for welding low carbon molybdenum-bearing austenitic alloys. This filler metal is similar to Oxford Alloy ER316L, with higher silicon content for optimum ease in welding and smooth bead appearance. Higher productivity could be realized in the MIG welding process.

AWS Chemical Composition

C	Mn	Si	Cr	Ni	Mo	S
0.03 max	1.0-2.5	0.65-1.00	18.0-20.0	11.0-14.0	2.0-3.0	0.03 max
P	**Cu**					
0.03 max	0.75 max					

TYPICAL MECHANICAL PROPERTIES
Tensile strength: 79,750 psi 550 MPa
Yield strength: 55,100 psi 380 MPa
Elongation: 39%

Oxford Alloy® 317L

SPECIFICATIONS
AWS 5.9
ASME SFA 5.9

CLASSIFICATIONS
AWS ER317L
UNS S31783

DESCRIPTION / APPLICATION
Oxford Alloy ER317L is used for welding stainless steels with similar composition. This alloy offers high resistance to pitting and crevice corrosion because of its high molybdenum content. The lower carbon content of the Oxford Alloy ER317L makes the weld metal less susceptible to intergranular corrosion.

AWS Chemical Composition

C	Mn	Si	Cr	Ni	S	P
0.03 max	1.0-2.5	0.30-0.65	18.5-20.5	13.0-15.0	0.03 max	0.03 max
Cu	**Mo**					
0.75 max	3.0-4.0					

TYPICAL MECHANICAL PROPERTIES
Tensile strength: 82,650 psi 570 MPa
Yield strength: 59,450 psi 410 MPa
Elongation: 42%

Oxford® ALLOYS, Inc.
Supplier of Welding Alloys

Stainless Steel TIG, MIG and SUB-ARC Wire

Oxford Alloy® 320LR

SPECIFICATIONS
AWS 5.9
ASME SFA 5.9

CLASSIFICATIONS
AWS ER320LR
UNS NO8022

DESCRIPTION / APPLICATION
Oxford Alloy ER320LR has a composition similar to Oxford Alloy ER320, except that carbon, silicon, phosphorus, and sulfur levels are kept at lower levels as well as the columbium and manganese being specified at a narrower range. The low melting residuals are limited in this alloy to reduce the possibility of micro fissuring. It is for this reason that the Oxford Alloy ER320LR is often used for welding Type 320 stainless steels.

AWS Chemical Composition						
C	Mn	Si	Cr	Ni	Mo	Cb+Ta
0.025 max	1.5-2.0	0.15 max	19.0-21.0	32.0-36.0	2.0-3.0	8 x C min/0.40 max
S	P	Cu				
0.02 max	0.015 max	3.0-4.0				

TYPICAL MECHANICAL PROPERTIES

Tensile strength:	86,000 psi	590 MPa
Yield strength:	57,500 psi	400 MPa
Elongation:	35%	

Oxford Alloy® 330

SPECIFICATIONS
AWS 5.9
ASME SFA 5.9

CLASSIFICATIONS
AWS ER330
UNS N08331

DESCRIPTION / APPLICATION
Oxford Alloy ER330 is used to weld cast and wrought material of similar chemical composition. The weld metal provides excellent heat and scale resistance up to 1800° F. However, high sulfur environments may adversely affect elevated temperature performance.

AWS Chemical Composition						
C	Mn	Si	Cr	Ni	Mo	S
0.18-0.25	1.0-2.5	0.30-0.65	15.0-17.0	34.0-37.0	0.75 max	0.03 max
P	Cu					
0.03 max	0.75 max					

TYPICAL MECHANICAL PROPERTIES

Tensile strength:	84,000 psi	580 MPa
Yield strength:	56,500 psi	390 MPa
Elongation:	29%	

Oxford Alloy® 347

SPECIFICATIONS
AWS 5.9
ASME SFA 5.9

CLASSIFICATIONS
AWS ER347
UNS S34780

DESCRIPTION / APPLICATION
Oxford Alloy ER347 is a columbium-stabilized stainless steel welding wire used to weld Types 321 and 347. Addition of columbium reduces the possibility of chromium carbide precipitation and consequent intergranular corrosion .

AWS Chemical Composition						
C	Mn	Si	Cr	Ni	Mo	S
0.08 max	1.0-2.5	0.30-0.65	19.0-21.5	9.0-11.0	0.75 max	0.03 max
P	Cu	Cb+Ta				
0.03 max	0.75 max	10 X C min/1.0 max				

TYPICAL MECHANICAL PROPERTIES

Tensile strength:	89,900 psi	620 MPa
Yield strength:	65,250 psi	450 MPa
Elongation:	41%	

Stainless Steel TIG, MIG and SUB-ARC Wire

Oxford Alloy® 385 (904L)

SPECIFICATIONS
AWS 5.9
ASME SFA 5.9

CLASSIFICATIONS
AWS ER385
UNS NO8904

DESCRIPTION / APPLICATION
Oxford Alloy ER385 (904L) is used for welding materials of similar chemical composition, which are used for fabrication of equipment and vessels for handling of sulfuric acid and many chloride containing media. This filler metal may also find applications for joining Type 317L material where improved corrosion resistance in specific media is needed. In order to reduce the propensity for fissuring and hot cracking, the low melting constituents such as carbon, silicon, and phosphorus are controlled to lower levels in this alloy.

AWS Chemical Composition

C	Mn	Si	Cr	Ni	Cu	Mo
0.025 max	1.0-2.5	0.50 max	19.5-21.5	24.0-26.0	1.2-2.0	4.2-5.2
S	**P**					
0.03 max	0.02 max					

TYPICAL MECHANICAL PROPERTIES
Tensile strength: 87,000 psi 600 MPa
Yield strength: 59,450 psi 410 MPa
Elongation: 36%

Oxford Alloy® 410

SPECIFICATIONS
AWS 5.9
ASME SFA 5.9

CLASSIFICATIONS
AWS ER410
UNS S41080

DESCRIPTION / APPLICATION
Oxford Alloy ER410 is used to weld Types 403, 405, 410, and 416. It is also used for welding overlay on carbon steels to resist corrosion, erosion, or abrasion. Oxford Alloy ER410 is an air hardening type filler metal that calls for preheating of the joint to 350°F before welding.

AWS Chemical Composition

C	Mn	Si	Cr	Mo	S	P
0.12 max	0.6 max	0.5 max	11.5-13.5	0.75 max	0.03 max	0.03 max
Ni	**Cu**					
0.6 max	0.75 max					

TYPICAL MECHANICAL PROPERTIES
Tensile strength: 78,300 psi 540 MPa
Yield strength: 49,300 psi 340 MPa
Elongation: 25%

Note: Mechanical properties listed above reflect utilization of a post-weld heat treatment between 1350°F and 1400°F for one hour.

Oxford Alloy® 410NiMo

SPECIFICATIONS
AWS 5.9
ASME SFA 5.9

CLASSIFICATIONS
AWS ER410NiMo
UNS S41086

DESCRIPTION / APPLICATION
Oxford Alloy ER410NiMo is used primarily to weld cast and wrought material of similar chemical composition. Preheating and interpass temperature of not less than 300°F is required. Post-weld heat treatment should not exceed 1150°F, as higher temperatures may result in hardening.

AWS Chemical Composition

C	Mn	Si	Cr	Ni	Mo	S
0.06 max	0.6 max	0.5 max	11.0-12.5	4.0-5.0	0.4-0.7	0.03 max
P	**Cu**					
0.03 max	0.75 max					

TYPICAL MECHANICAL PROPERTIES
Tensile strength: 118,900 psi 820 MPa
Yield strength: 91,350 psi 630 MPa
Elongation: 20%

Note: Mechanical properties listed above reflect utilization of a post-weld heat treatment between 1100°F and 1150°F for one hour.

Oxford® ALLOYS, Inc.
Supplier of Welding Alloys

Stainless Steel TIG, MIG and SUB-ARC Wire

Oxford Alloy® 420

SPECIFICATIONS
AWS 5.9
ASME SFA 5.9

CLASSIFICATIONS
AWS ER420
UNS S42080

DESCRIPTION / APPLICATION
Oxford Alloy ER420 is often used for surfacing applications that call for superior resistance to abrasion. This filler metal is similar to the Oxford Alloy ER410, except for the higher carbon content. It requires preheat and interpass temperatures of not less than 400℉, followed by slow cooling.

Note: Mechanical properties are greatly influenced by changes in welding parameters such as preheat and interpass temperatures.

AWS Chemical Composition						
C	**Mn**	**Si**	**Cr**	**Mo**	**S**	**P**
0.25-0.40	0.6 max	0.5 max	12.0-14.0	0.75 max	0.03 max	0.03 max
Ni	**Cu**					
0.6 max	0.75 max					

TYPICAL MECHANICAL PROPERTIES

Tensile strength:	145,000 psi	1,000 MPa
Yield strength:	120,350 psi	830 MPa
Elongation:	45%	

Oxford Alloy® 630 (17-4PH)

SPECIFICATIONS
AWS 5.9
ASME SFA 5.9

CLASSIFICATIONS
AWS ER630
UNS S17480

DESCRIPTION / APPLICATION
Oxford Alloy ER630 (17-4PH) is a precipitation hardening stainless steel used for welding of materials of similar chemical composition. Mechanical properties of this alloy are greatly influenced by the heat treatment.

NOTE: Mechanical properties listed above reflect utilization of a post-weld heat treatment between 1875℉ and 1925℉ for one hour, f ollowed by precipitation hardening between 1135℉ and 1165℉ for four hours.

AWS Chemical Composition						
C	**Mn**	**Si**	**Cr**	**Ni**	**Mo**	**Cu**
0.05 max	0.25-0.75	0.75 max	16.0-16.75	4.5-5.0	0.75 max	3.25-4.00
Cb+Ta	**S**	**P**				
0.15-0.30	0.03 max	0.03 max				

TYPICAL MECHANICAL PROPERTIES

Tensile strength:	143,550 psi	990 MPa
Yield strength:	123,250 psi	850 MPa
Elongation:	10%	

Oxford Alloy® 2209

SPECIFICATIONS
AWS 5.9
ASME SFA 5.9

CLASSIFICATIONS
AWS ER2209
UNS S39209

DESCRIPTION / APPLICATION
Oxford Alloy 2209 is designed to weld duplex stainless steels such as 2205 (UNS Number N31803). High tensile strength and improved resistance to stress corrosion cracking and pitting characterize the welds of this wire. This wire is lower in ferrite compared to that of base metal in order to obtain improved weldability.

AWS Chemical Composition						
C	**Mn**	**Si**	**Cr**	**Ni**	**Mo**	**S**
0.03 max	0.50-2.0	0.90 max	21.5-23.5	7.5-9.5	2.5-3.5	0.03 max
P	**Cu**	**N**				
0.03 max	0.75 max	0.08-0.20				

TYPICAL MECHANICAL PROPERTIES

Tensile strength:	104,400 psi	720 MPa
Yield strength:	81,200 psi	560 MPa
Elongation:	26%	

Stainless Steel TIG, MIG and SUB-ARC Wire

Oxford Alloy® 2594

SPECIFICATIONS
AWS 5.9
ASME SFA 5.9

CLASSIFICATIONS
AWS ER2594
UNS S32750

DESCRIPTION / APPLICATION

Oxford Alloy ER2594 is a superduplex welding wire. The Pitting Resistance Equivalent Number (PREN) is at least 40, thereby allowing the weld metal to be called a superduplex stainless steel. This welding wire provides matching chemistry and mechanical property characteristics to wrought superduplex alloys such as 2507 and Zeron 100 as well as superduplex casting alloys (ASTM A890). This welding wire is overalloyed 2 – 3 percent in Nickel to provide optimum ferrite/austenite ratio in the finished weld. This structure results in high tensile and yield strength along with superior resistance to SCC and pitting corrosion.

Set the parameters to obtain a heat input of 10,000 – 30,000 Joules/inch. Pre-heat is not required. The interpass temperature should be maintained at 300°F max. If post weld annealing is required this weld metal will require a higher annealing temperature than that required by the duplex base metal.

AWS Chemical Composition

C	Cr	Ni	Mo	Mn	Si	P
0.03 max	24.0-27.0	8.0-10.5	2.5-4.5	2.5 max	1.0 max	0.03 max
S	**N**	**Cu**	**W**			
0.02 max	0.20-0.30	1.5 max	1.0 max			

TYPICAL MECHANICAL PROPERTIES

Tensile strength:	123,250 psi	850 MPa
Yield strength:	94,250 psi	650 MPa
Elongation:	28%	

Oxford® ALLOYS, Inc.
Supplier of Welding Alloys

Stainless Steel Flux Cored Wire

Oxford Alloy® 308HT-1

SPECIFICATIONS
AWS 5.22
ASME SFA 5.22

CLASSIFICATIONS
AWS E308HT1-1/T1-4
UNS W30831

DESCRIPTION / APPLICATION
Oxford Alloy E308HT1-1/T1-4 is used for welding types 304H and 347H stainless when high temperature service is required. Minimum carbon content allowed is 0.04%. Oxford Alloy E308HT1-1/T1-4 was developed for out-of-position welding. This flux cored wire will deposit out-of-position welds at substantially higher welding currents than other stainless steel flux cored wires, resulting in a higher deposition rate. The slag is self-peeling and minimizes cleanup. Oxford Alloy E308HT1-1/T1-4 was formulated for use with 75% Argon/25% CO^2 shielding gas; however, straight CO^2 may also be used. The 75/25 mixture will produce a smooth arc with virtually no spatter and slightly higher yield and tensile strengths than CO^2. The mechanical properties and deposit analysis will meet AWS 5.22 specifications with either gas.

AWS Chemical Composition						
C	**Mn**	**Si**	**Cr**	**Ni**	**Mo**	**P**
0.04-0.08	0.5-2.5	1.0 max	18.0-21.0	9.0-11.0	0.5 max	0.04 max
S	**Cu**					
0.03 max	0.5 max					

TYPICAL MECHANICAL PROPERTIES
Tensile strength: 88,450 psi 610 MPa
Yield strength: 66,700 psi 460 MPa
Elongation: 40%

Oxford Alloy® 308LT-1

SPECIFICATIONS
AWS 5.22
ASME SFA 5.22

CLASSIFICATIONS
AWS E308LT1-1/T1-4
UNS W30835

DESCRIPTION / APPLICATION
Oxford Alloy E308LT1-1/T1-4 is a flux cored wire used for welding types 301, 302, 304, 304L, 308, and 308L. This flux cored wire may also be used for welding types 321 and 347 if service temperature does not exceed 500℉ (260℃). Maximum carbon content allowed is 0.04%. The carbon content is a 0.04% maximum. This low carbon content minimizes carbide precipitation. Ferrite values will lower as impact toughness increases. Oxford Alloy E308LT1-1/T1-4 was developed for out-of-position welding. This flux cored wire will deposit out-of-position welds at substantially higher welding currents than other stainless steel flux cored wires, resulting in a higher deposition rate. The slag is self-peeling and minimizes cleanup. Oxford Alloy E308LT1-1/T1-4 was formulated for use with 75% Argon/25% CO^2 shielding gas; however, straight CO^2 may also be used. The 75/25 mixture will produce a smooth arc with virtually no spatter and slightly higher yield and tensile strengths than CO^2. The mechanical properties and deposit analysis will meet AWS 5.22 specifications with either gas.

AWS Chemical Composition						
C	**Mn**	**Si**	**Cr**	**Ni**	**Mo**	**P**
0.04 max	0.5-2.5	1.0 max	18.0-21.0	9.0-11.0	0.5 max	0.04 max
S	**Cu**					
0.03 max	0.5 max					

TYPICAL MECHANICAL PROPERTIES
Tensile strength: 84,100 psi 580 MPa
Yield strength: 66,700 psi 460 MPa
Elongation: 38%

Stainless Steel Flux Cored Wire

Oxford Alloy® 309LT-1

SPECIFICATIONS
AWS 5.22
ASME SFA 5.22

CLASSIFICATIONS
AWS E309LT1-1/T1-4
UNS W30935

DESCRIPTION / APPLICATION
Oxford Alloy E309LT1-1/T1-4 is designed for welding type 309 wrought, or cast forms, but used extensively for welding type 304 to mild or carbon steel. This flux cored wire is also for welding 304 clad sheets and for applying stainless steel sheet linings to carbon steel. Maximum carbon content allowed is 0.04%. Oxford Alloy E309LT1-1/T1-4 was developed for out-of-position welding. This flux cored wire will deposit out-of-position welds at substantially higher welding currents than other stainless steel flux cored wires, resulting in a higher deposition rate. The slag is self-peeling and minimizes cleanup. Oxford Alloy E309LT1-1/T1-4 was formulated for use with 75% Argon/25% CO^2 shielding gas; however, straight CO^2 may also be used. The 75/25 mixture will produce a smooth arc with virtually no spatter and slightly higher yield and tensile strengths than CO^2. The mechanical properties and deposit analysis will meet AWS 5.22 specifications with either gas.

AWS Chemical Composition						
C	**Mn**	**Si**	**Cr**	**Ni**	**Mo**	**P**
0.04 max	0.5-2.5	1.0 max	22.0-25.0	12.0-14.0	0.5 max	0.04 max
S	**Cu**					
0.03 max	0.5 max					

TYPICAL MECHANICAL PROPERTIES

Tensile strength:	84,100 psi	580 MPa
Yield strength:	65,250 psi	450 MPa
Elongation:	37%	

Oxford Alloy® 316LT-1

SPECIFICATIONS
AWS 5.22
ASME SFA 5.22

CLASSIFICATIONS
AWS E316LT1-1/T1-4
UNS W31635

DESCRIPTION / APPLICATION
Oxford Alloy E316LT1-1/T1-4 is used for welding type 316 and 316L stainless. This flux cored wire contains molybdenum, which resists pitting corrosion induced by sulphuric and sulphurous acids, chlorides and cellulose solutions. Oxford Alloy E316LT1-1/T1-4 is used widely in the rayon, dye and paper making industries. Maximum carbon content allowed is 0.04%. Oxford Alloy E316LT1-1/T1-4 was developed for out-of-position welding. This flux cored wire will deposit out-of-position welds at substantially higher welding currents than other stainless steel flux cored wires, resulting in a higher deposition rate. The slag is self-peeling and minimizes cleanup. Oxford Alloy E316LT1-1/T1-4 was formulated for use with 75% Argon/25% CO^2 shielding gas; however, straight CO^2 may also be used. The 75/25 mixture will produce a smooth arc with virtually no spatter and slightly higher yield and tensile strengths than CO^2. The mechanical properties and deposit analysis will meet AWS 5.22 specifications with either gas.

AWS Chemical Composition						
C	**Mn**	**Si**	**Cr**	**Ni**	**Mo**	**P**
0.04 max	0.5-2.5	1.0 max	17.0-20.0	11.0-14.0	2.0-3.0	0.04 max
S	**Cu**					
0.03 max	0.5 max					

TYPICAL MECHANICAL PROPERTIES

Tensile strength:	84,100 psi	560 MPa
Yield strength:	66,700 psi	460 MPa
Elongation:	38%	

Oxford® ALLOYS, Inc.
Supplier of Welding Alloys

Stainless Steel Flux Cored Wire

Oxford Alloy® 317LT-1

SPECIFICATIONS
AWS 5.22
ASME SFA 5.22

CLASSIFICATIONS
AWS E317LT1-1/T1-4
UNS W31735

DESCRIPTION / APPLICATION
Oxford Alloy E317LT1-1/T1-4 is recommended for welding type 317 and 317L stainless steel to give a maximum of 0.04% Carbon in the weld deposit. The higher molybdenum content, as compared to type 316L, further reduces susceptibility to pitting corrosion. This flux cored wire is used in the pulp and paper industry and in other severe corrosion applications involving sulfuric and sulfurous acids and their salts. Oxford Alloy E317LT1-1/T1-4 was developed for out-of-position welding. This flux cored wire will deposit out-of-position welds at substantially higher welding currents than other stainless steel flux cored wires, resulting in a higher deposition rate. The slag is self-peeling and minimizes cleanup. Oxford Alloy 317LT1-1/T1-4 was formulated for use with 75% Argon/25% CO^2 shielding gas; however, straight CO^2 may also be used. The 75/25 mixture will produce a smooth arc with virtually no spatter and slightly higher yield and tensile strengths than CO^2. The mechanical properties and deposit analysis will meet AWS 5.22 specifications with either gas.

AWS Chemical Composition						
C	**Mn**	**Si**	**Cr**	**Ni**	**Mo**	**P**
0.04 max	0.5-2.5	1.0 max	18.0-21.0	12.0-14.0	3.0-4.0	0.04 max
S	**Cu**					
0.03 max	0.5 max					

TYPICAL MECHANICAL PROPERTIES

Tensile strength:	91,350 psi	630 MPa
Yield strength:	68,150 psi	470 MPa
Elongation:	33%	

Oxford Alloy® 347T-1

SPECIFICATIONS
AWS 5.22
ASME SFA 5.22

CLASSIFICATIONS
AWS E347T1-1/T1-4
UNS W34731

DESCRIPTION / APPLICATION
Oxford Alloy E347T1-1/T1-4 was developed to weld types 347, 304, 304L and 321 stainless, where service temperatures are below 600℉ (316℃). The addition o f columbium helps minimize chromium carbide precipitation while providing improved corrosion resistance. Oxford Alloy E347T1-1/T1-4 was developed for out-of-position welding. This flux cored wire will deposit out-of-position welds at substantially higher welding currents than other stainless steel flux cored wires, resulting in a higher deposition rate. The slag is self-peeling and minimizes cleanup. Oxford Alloy E347T1-1/T1-4 was formulated for use with 75% Argon/25% CO^2 shielding gas; however, straight CO^2 may also be used. The 75/25 mixture will produce a smooth arc with virtually no spatter and slightly higher yield and tensile strengths than CO^2. The mechanical properties and deposit analysis will meet AWS 5.22 specifications with either gas.

AWS Chemical Composition						
C	**Mn**	**Si**	**Cr**	**Ni**	**Cb+Ta**	**Mo**
0.08 max	0.5-2.5	1.0 max	18.0-21.0	9.0-11.0	8 x C min/1.0 max	0.5 max
P	**S**	**Cu**				
0.04 max	0.03 max	0.5 max				

TYPICAL MECHANICAL PROPERTIES

Tensile strength:	94,250 psi	650 MPa
Yield strength:	69,600 psi	480 MPa
Elongation:	34%	

Stainless Steel Flux Cored Wire

Oxford Alloy® 2209T-1

SPECIFICATIONS
AWS 5.22
ASME SFA 5.22

CLASSIFICATIONS
AWS E2209T1-1/T1-4

DESCRIPTION / APPLICATION

Oxford Alloy E2209T1-1/T1-4 is an all position duplex stainless steel flux cored wire. This flux cored wire is used for welding ferritic-austenitic (duplex) steels, especially those with high resistance to stress corrosion cracking. It is designed for the welding of 22Cr-5Ni-2Mo-0.15N duplex stainless steel (UNS S31803), commonly known as 2205. This flux cored wire is also used for welding on stainless structures where a particularly high strength is required. Oxford Alloy E2209T1-1/T1-4 was developed for all position welding. This flux cored wire will deposit welds at substantially higher welding currents than other stainless steel flux cored wires, resulting in a higher deposition rate. The slag is self-peeling and minimizes cleanup. Oxford Alloy E2209T1-1/T1-4 was formulated for use with 75% Argon/25% CO_2 shielding gas; however, straight CO_2 may also be used. The 75/25 mixture will produce a smooth arc with virtually no spatter and slightly higher yield and tensile strengths than CO_2. The mechanical properties and deposit analysis will meet AWS 5.22 specifications with either gas.

AWS Chemical Composition						
C	**Mn**	**Si**	**Cr**	**Ni**	**Mo**	**P**
0.04 max	0.5-2.0	1.0 max	21.0-24.0	7.5-10.0	2.5-4.0	0.04 max
S	**Cu**	**N**				
0.03 max	0.5 max	0.08-2.0				

TYPICAL MECHANICAL PROPERTIES

Tensile strength:	118,900 psi	820 MPa
Yield strength:	99,325 psi	685 MPa
Elongation:	27%	

Oxford® ALLOYS, Inc.
Supplier of Welding Alloys

Nickel Alloy Coated Electrodes

Oxford Alloy® A

SPECIFICATIONS
AWS 5.11
ASME SFA 5.11

CLASSIFICATIONS
AWS ENiCrFe-2
UNS W86133

DESCRIPTION / APPLICATION
Oxford Alloy A electrodes are used for shielded-metal-arc welding of Incoloy® alloys 800 and 800HT, Inconel® alloys 600 and 601, and nickel steels. The weld metal of this electrode has excellent strength and oxidation resistance at high temperatures and retains impact resistance at cryogenic temperatures. Oxford Alloy A is an exceptional versatile product. This electrode can be used on a variety of austenitic and ferritic steels and nickel alloys. Some examples are combinations of stainless steels, carbon steels, Inconel® alloys, Incoloy® alloys, Monel® alloys, and copper-nickel alloys. Oxford Alloy A is especially useful for general maintenance welding of equipment exposed to strenuous service conditions. This electrode can be operated in all welding positions. The power supply is direct current, electrode positive.

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AWS Chemical Composition						
Ni	**C**	**Mn**	**Fe**	**S**	**Si**	**Cu**
62.0 min	0.10 max	1.0-3.5	12.0 max	0.02 max	0.75 max	0.50 max
Cr	**Cb+Ta**	**Mo**	**P**	**OET**		
13.0-17.0	0.5-3.0	0.5-2.5	0.03 max	0.50 max		

TYPICAL MECHANICAL PROPERTIES

Tensile strength:	89,000 psi	610 MPa
Yield strength:	72,000 psi	500 MPa
Elongation:	36%	

Oxford Alloy® C-276

SPECIFICATIONS
AWS 5.11
ASME SFA 5.11

CLASSIFICATIONS
AWS ENiCrMo-4
UNS W80276

DESCRIPTION / APPLICATION
Oxford Alloy C-276 is a solid solution, nickel-molybdenum-chromium, corrosion-resistant alloy. This electrode is used for dissimilar welding between nickel base alloys and stainless steels, as well as for surfacing and cladding. Oxford Alloy C-276 is also used as a matching composition filler material for welding alloy C-276 wrought and cast products. Due to the high molybdenum content that this alloy offers excellent resistance to stress corrosion, cracking and pitting and crevice corrosion.

AWS Chemical Composition						
C	**Mn**	**Si**	**Fe**	**Mo**	**W**	**S**
0.02 max	1.0 max	0.2 max	4.0-7.0	15.0-17.0	3.0-4.5	0.03 max
P	**Cr**	**Ni**	**Cu**	**V**	**Co**	**OET**
0.04 max	14.5-16.5	Bal	0.50 max	0.35 max	2.5 max	0.50 max

TYPICAL MECHANICAL PROPERTIES

Tensile strength:	106,000 psi	730 Mpa
Yield strength:	78,500 psi	540 MPa
Elongation:	39%	

Oxford Alloy® X

SPECIFICATIONS
AWS 5.11
ASME SFA 5.11

CLASSIFICATIONS
AWS ENiCrMo-2
UNS W86002

DESCRIPTION / APPLICATION
Oxford Alloy X is a solid-solution-strengthened super alloy that combines very good high-temperature strength with very good resistance to oxidizing environments up to about 2000°F (1095° C), and good carburization resistance. This electrode is used for the welding of alloy X and similar nickel-chromium-molybdenum alloys. It is also used for surfacing of steel. This alloy is one of the most widely used materials for fabricated or forged parts in gas turbine engines, and is also used in chemical and petrochemical plant, power plant and industrial heating applications. Alloy X may be cold-formed or hot-formed by various techniques, and is readily weldable by most standard methods.

AWS Chemical Composition						
Ni	**C**	**Mn**	**Fe**	**P**	**S**	**Si**
Bal	0.05-0.15	1.0 max	17.0-20.0	0.04 max	0.03 max	1.0 max
Cu	**Co**	**Cr**	**Mo**	**W**	**OET**	
0.50 max	0.50-2.50	20.5-23.0	8.0-10.0	0.2-1.0	0.50 max	

TYPICAL MECHANICAL PROPERTIES

Tensile strength:	109,765 psi	757 MPa
Yield strength:	56,695 psi	391 MPa
Elongation:	26%	

Nickel Alloy Coated Electrodes

Oxford Alloy® 112

SPECIFICATIONS
AWS 5.11
ASME SFA 5.11

CLASSIFICATIONS
AWS ENiCrMo-3
UNS W86112

DESCRIPTION / APPLICATION
Oxford Alloy 112 is used for shielded-metal-arc welding of Inconel® alloy 625, Incoloy® alloy 825, Inco® alloy 25-6MO, and other molybdenum-containing stainless steels. This electrode is also used for surfacing of steel and for welding various corrosion-resistant alloys such as alloy 20. The weld metal has high strength at room and elevated temperatures and has exceptional corrosion resistance, including resistance to pitting, crevice corrosion, and polyphonic acid stress-corrosion cracking. Oxford Alloy 112 is useful for many dissimilar joints involving Inconel® alloys, Incoloy® alloys, stainless steels, low-alloy steels, and carbon steels. This electrode can be operated in all welding positions. The power supply is direct current, electrode positive.

AWS Chemical Composition

Ni	C	Mn	Fe	S	Cu	Si
55.0 min	0.10 max	1.0 max	7.0 max	0.02 max	0.50 max	0.75 max
Cr	**Cb+Ta**	**Mo**	**P**	**OET**		
20.0-23.0	3.15-4.15	8.0-10.0	0.03 max	0.50 max		

TYPICAL MECHANICAL PROPERTIES
Tensile strength: 114,500 psi 790 MPa
Yield strength: 89,500 psi 620 MPa
Elongation: 34%

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Oxford Alloy® 117

SPECIFICATIONS
AWS 5.11
ASME SFA 5.11

CLASSIFICATIONS
AWS ENiCrCoMo-1
UNS W86117

DESCRIPTION / APPLICATION
Oxford Alloy 117 is used for shielded-metal-arc welding of Inconel® alloy 617. The weld metal of this electrode has high strength, good metallurgical stability, and excellent resistance to corrosion and high-temperature oxidation. Oxford Alloy 117 also is used for welding many dissimilar materials, especially for high temperature applications. Some examples are Inconel® alloys 600 and 601, Incoloy® alloys 880HT and 802, and cast alloys such as HK-40, HP, and HP-45 Modified. This electrode can be operated in all welding positions. The power supply is direct current, electrode positive.

AWS Chemical Composition

Ni	Cr	Co	Mo	C	Fe	Mn
Bal	21.0-26.0	9.0-15.0	8.0-10.0	0.05-0.15	5.0 max	0.3-2.5
Cb+Ta	**S**	**Si**	**Cu**	**P**	**OET**	
1.0 max	0.015 max	0.75 max	0.50 max	0.03 max	0.50 max	

TYPICAL MECHANICAL PROPERTIES
Tensile strength: 110,000 psi 760 MPa
Yield strength: 87,000 psi 600 MPa
Elongation: 26%

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Oxford Alloy® 122

SPECIFICATIONS
AWS 5.11
ASME SFA 5.11

CLASSIFICATIONS
AWS ENiCrMo-10
UNS W86022

DESCRIPTION / APPLICATION
Oxford Alloy 122 is a solid solution, nickel-chromium-molybdenum, corrosion resistant alloy that has exceptional versatility. This electrode is used for welding of nickel-chromium-molybdenum alloys as well as for overlay cladding on carbon, low-alloy, or stainless steels. These electrodes are also used for dissimilar joints between nickel-chromium-molybdenum alloys and stainless, carbon, or low alloy steels. Typical specifications for the nickel-chromium-molybdenum base metals are ASTM, F574, B619, B622, and B626 all of which have UNS Number N06022. Oxford Alloy 122 offers excellent corrosion resistance in oxidizing as well as reducing media in a wide variety of chemical process environments. This electrode also offers an outstanding resistance to stress corrosion cracking, pitting, and crevice corrosion.

AWS Chemical Composition

C	Mn	Si	Cr	Mo	W	S
0.02 max	1.0 max	0.2 max	20.0-22.5	12.5-14.5	2.5-3.5	0.015 max
P	**Ni**	**Fe**	**Cu**	**Co**	**V**	**OET**
0.03 max	Bal	2.0-6.0	0.50 max	2.5 max	0.35 max	0.50 max

TYPICAL MECHANICAL PROPERTIES
Tensile strength: 114,000 psi 790 Mpa
Yield strength: 78,500 psi 540 MPa
Elongation: 36%

Oxford® ALLOYS, Inc.
Supplier of Welding Alloys

Nickel Alloy Coated Electrodes

Oxford Alloy® 141

SPECIFICATIONS
AWS 5.11 / ASME SFA 5.11
ASME SFA 5.11

CLASSIFICATIONS
AWS ENi-1
UNS W82141

DESCRIPTION / APPLICATION
Oxford Alloy 141 is used for shielded-metal-arc welding of Nickel 200 and Nickel 201, welding the clad side of nickel-clad-steel, and surfacing of steel. The reaction of titanium with carbon in the weld metal holds free carbon to a low level so that the electrode can be used with low-carbon nickel (Nickel 201). The weld metal of this electrode has good corrosion resistance, especially in alkalis. Oxford Alloy 141 is also used for dissimilar welding, including joints between Nickel 200 or 201 and various iron-base and nickel-base alloys. This electrode can be operated in all welding positions. The power supply is direct current, electrode positive.

AWS Chemical Composition

Ni	C	Mn	Fe	S	Si	Cu
92.0 min	0.10 max	0.75 max	0.75 max	0.02 max	1.25 max	0.25 max
Al	**Ti**	**P**	**OET**			
1.0 max	1.0-4.0	0.03 max	0.50 max			

TYPICAL MECHANICAL PROPERTIES

Tensile strength:	64,500 psi	500 MPa
Yield strength:	58,500 psi	400 MPa
Elongation:	26%	

Oxford Alloy® 182

SPECIFICATIONS
AWS 5.11
ASME SFA 5.11

CLASSIFICATIONS
AWS ENiCrFe-3
UNS W86182

DESCRIPTION / APPLICATION
Oxford Alloy 182 is used for shielded-metal-arc welding of Inconel® alloys 600, 601, and 690. The weld metal of this electrode has excellent high-temperature strength and oxidation resistance and can meet stringent radiographic requirements. Oxford Alloy 182 is also used in dissimilar welds such as Inconel® alloys and Incoloy® alloys joined to carbon steels, stainless steels, nickel and Monel® alloys; Monel® alloys joined to carbon steels; nickel joined to stainless steels; and stainless steels joined to carbon steels. This electrode can be operated in all welding positions. The power supply is direct current, electrode positive.

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AWS Chemical Composition

Ni	C	Mn	Fe	S	Si	Cu
59.0 min	0.10 max	5.0-9.5	10.0 max	0.015 max	1.0 max	0.50 max
Cr	**Ti**	**Cb+Ta**	**P**	**OET**		
13.0-17.0	1.0 max	1.0-2.5	0.03 max	0.50 max		

TYPICAL MECHANICAL PROPERTIES

Tensile strength:	84,500 psi	580 MPa
Yield strength:	53,500 psi	370 MPa
Elongation:	36%	

Oxford Alloy® 187

SPECIFICATIONS
AWS 5.6
ASME SFA 5.6

CLASSIFICATIONS
AWS ECuNi
UNS W60715

DESCRIPTION / APPLICATION
Oxford Alloy 187 is used for shielded-metal-arc welding of wrought or cast 70/30, 80/20, and 90/10 copper-nickel alloys. The weld metal of this electrode resists fouling and corrosion in seawater and is useful for many marine and desalination applications. Dissimilar joints welded with the Oxford Alloy 187 include those between copper-nickel alloys and Monel® alloy 400 or Nickel® 200. This electrode can be operated in all welding positions. The power supply is direct current, electrode positive.

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AWS Chemical Composition

Ni	Pb	Mn	Fe	Si	Cu+Ag	Ti
29.0-33.0	0.02 max	1.0-2.5	0.40-0.75	0.50 max	Bal	0.50 max
P	**OET**					
0.020 max	0.50 max					

TYPICAL MECHANICAL PROPERTIES

Tensile strength:	54,500 psi	380 MPa
Yield strength:	37,500 psi	260 MPa
Elongation:	28%	

Nickel Alloy Coated Electrodes

Oxford Alloy® 190

SPECIFICATIONS
AWS 5.11
ASME SFA 5.11

CLASSIFICATIONS
AWS ENiCu-7
UNS W84190

DESCRIPTION / APPLICATION
Oxford Alloy 190 is used for shielded-metal-arc welding of Monel® alloys 400, R-405, and K-500. This electrode is also used for surfacing of steel. The weld metal of the Oxford Alloy 190 is resistant to corrosion by seawater, salts, and reducing acids. The electrode is capable of producing weld deposits that meet stringent radiographic requirements. Dissimilar-welding applications for welding Oxford Alloy 190 include joints between Monel®, nickel-copper alloys and carbon steel, low-alloy steel, copper, and copper-nickel alloys. Oxford Alloy 190 produces sound joints in Monel® alloy K-500, the weld metal has lower strength since, unlike the base metal, it is not age hardenable. This electrode can be operated in all welding positions.

AWS Chemical Composition						
Ni	**C**	**Mn**	**Fe**	**S**	**Si**	**Cu**
62.0-69.0	0.15 max	4.0 max	2.5 max	0.015 max	1.5 max	Bal
Al	**Ti**	**P**	**OET**			
0.75 max	1.0 max	0.02 max	0.50 max			

TYPICAL MECHANICAL PROPERTIES

Tensile strength:	75,500 psi	520 MPa
Yield strength:	52,000 psi	360 MPa
Elongation:	39%	

Oxford Alloy® 55

SPECIFICATIONS
AWS 5.15
ASME SFA 5.15

CLASSIFICATIONS
AWS ENiFe-Cl
UNS W82002

DESCRIPTION / APPLICATION
Oxford Alloy Nickel 55 is used for shielded-metal-arc welding of gray, ductile, malleable, and Ni-Resist cast irons. This electrode is also used for welding cast irons to various wrought materials, including carbon steels, low-alloy steels, and nickel alloys. Oxford Alloy Nickel 55 is especially useful for welding heavy sections and high-phosphorus irons. The welds are moderately hard and require carbide tipped tools for machining. This electrode can be operated in all welding positions. The power supply is direct current; electrode positive is preferred although alternating current can be used.

AWS Chemical Composition						
Ni	**C**	**Mn**	**Fe**	**S**	**Si**	**Cu**
45.0-60.0	2.0 max	2.5 max	Bal	0.03 max	4.0 max	2.5 max
Al	**OET**					
1.0 max	1.0 max					

TYPICAL MECHANICAL PROPERTIES

Tensile strength:	71,050 psi	490 MPa
Yield strength:	52,925 psi	365 MPa
Elongation :	12%	

Oxford Alloy® 99

SPECIFICATIONS
AWS 5.15
ASME SFA 5.15

CLASSIFICATIONS
AWS ENi-Cl
UNS W82001

DESCRIPTION / APPLICATION
Oxford Alloy Nickel 99 is used for shielded-metal-arc welding of gray, ductile, and malleable cast irons. This electrode is also used for joints between cast irons and carbon steel or low-alloy steel. Oxford Alloy Nickel 99 is useful for thin sections and for joints to be machined. The welds are quite machinable. This electrode can be operated in all welding positions. The power supply is direct current; electrode positive is preferred although alternating current can be used.

AWS Chemical Composition						
Ni	**C**	**Mn**	**Fe**	**S**	**Si**	**Cu**
85.0 min	2.0 max	2.5 max	8.0 max	0.03 max	4.0 max	2.5 max
Al	**OET**					
1.0 max	1.0 max					

TYPICAL MECHANICAL PROPERTIES

Tensile strength :	52,490 psi	362 MPa
Yield strength:	49,010 psi	338 MPa
Elongation:	5%	

Oxford® ALLOYS, Inc.
Supplier of Welding Alloys

Nickel Alloy TIG, MIG and SUB-ARC Wire

Oxford Alloy® C-276

SPECIFICATIONS
AWS 5.14
ASME SFA 5.14

CLASSIFICATIONS
AWS ERNiCrMo-4
UNS N10276

DESCRIPTION / APPLICATION
Oxford Alloy C-276 is used for welding of materials of similar chemical composition (UNS Number N10276), as well as dissimilar materials of nickel base alloys, steels and stainless steels. This wire also can be used for cladding steel with nickel-chromium-molybdenum weld metal. Oxford Alloy C-276, due to its high molybdenum content, offers excellent resistance to stress corrosion cracking, pitting, and crevice corrosion.

AWS Chemical Composition

C	Mn	Si	Cr	Mo	W	S
0.02 max	1.0 max	0.08 max	14.5-16.5	15.0-17.0	3.0-4.5	0.03 max
P	**V**	**Ni**	**Fe**	**Cu**	**Co**	**OET**
0.04 max	0.35 max	Bal	4.0-7.0	0.50 max	2.5 max	0.50 max

TYPICAL MECHANICAL PROPERTIES

Tensile strength:	106,000 psi	730 MPa
Yield strength:	78,500 psi	540 MPa
Elongation:	39%	

Oxford Alloy® X

SPECIFICATIONS
AWS 5.14
ASME SFA 5.14

CLASSIFICATIONS
AWS ERNiCrMo-2
UNS N06002

DESCRIPTION / APPLICATION
Oxford Alloy X is a solid –solution-strengthened superalloy that combines very good high-temperature strength with very good resistance to oxidizing environments up to about 2000℉ (1095℃), and good carburization resistance. This alloy is one of the most widely used materials for fabrication of forged parts in gas turbine engines, and is also used in chemical and petrochemical plant, power plant and industrial heating applications. Oxford Alloy X may be cold-formed or hot-formed by various techniques, and is readily weldable by most standard methods.

AWS Chemical Composition

Ni	Co	Fe	Cr	Mo	W	Mn
Bal	0.5-2.5	17.0-20.0	20.5-23.0	8.0-10.0	0.2-1.0	1.0 max
Si	**C**	**P**	**S**	**Cu**	**OET**	
1.0 max	0.05-0.15	0.04 max	0.03 max	0.50 max	0.50 max	

TYPICAL MECHANICAL PROPERTIES

Tensile strength:	107,010 psi	738 MPa
Yield strength:	52,925 psi	365 MPa
Elongation:	25%	

Oxford Alloy® 60

SPECIFICATIONS
AWS 5.14
ASME SFA 5.14

CLASSIFICATIONS
AWS ERNiCu-7
UNS N04060

DESCRIPTION / APPLICATION
Oxford Alloy 60 is used for the welding of Monel® alloys 400, R-405, and K-500. This filler metal is also used for surfacing of steel. The weld metal deposited by the Oxford Alloy 60 has properties similar to those of Monel® alloy 400. This filler metal has good strength and resists corrosion in many media, including seawater, salts, and reducing acids. The weld metal of the Oxford Alloy 60 is not age hardenable and when used to join Monel® alloy K-500 it has lower strength than the base metal.

AWS Chemical Composition

Ni	C	Mn	Fe	Si	Cu	Al
62.0-69.0	0.15 max	4.0 max	2.5 max	1.25 max	Bal	1.25 max
Ti	**P**	**S**	**OET**			
1.5-3.0	0.02 max	0.015 max	0.50 max			

TYPICAL MECHANICAL PROPERTIES

Tensile strength:	76,500 psi	530 MPa
Yield strength:	52,500 psi	360 MPa
Elongation:	34%	

Oxford® ALLOYS, Inc.
Supplier of Welding Alloys

Nickel Alloy TIG, MIG and SUB-ARC Wire

Oxford Alloy® 61

SPECIFICATIONS
AWS 5.14
ASME SFA 5.14

CLASSIFICATIONS
AWS ERNi-1
UNS N02061

DESCRIPTION / APPLICATION
Oxford Alloy 61 is used for the welding of Nickel 200 and 201. The reaction of titanium with carbon maintains a low level of free carbon and enables the filler metal to be used with Nickel 201. The weld metal of Oxford Alloy 61 has good corrosion resistance, particularly in alkalis. Dissimilar-welding applications for Oxford Alloy 61 include joining Nickel 200 and 201 to stainless steels, carbon steels, Inconel® alloys, Incoloy® alloys, copper-nickel alloys, and Monel® alloys. This filler metal is also used for joining Monel® alloys and copper-nickel alloys to carbon steels, and for joining copper-nickel alloys to Inconel® and Incoloy® alloys.

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AWS Chemical Composition

Ni	C	Mn	Fe	S	Si	Cu
93.0 min	0.15 max	1.0 max	1.0 max	0.015 max	0.75 max	0.25 max
Al	**Ti**	**P**	**OET**			
1.5 max	2.0-3.5	0.03 max	0.50 max			

TYPICAL MECHANICAL PROPERTIES

Tensile strength:	66,500 psi	460 MPa
Yield strength:	38,000 psi	260 MPa
Elongation:	28%	

Oxford Alloy® 67

SPECIFICATIONS
AWS 5.7
ASME SFA 5.7

CLASSIFICATIONS
AWS ERCuNi
UNS C71581

DESCRIPTION / APPLICATION
Oxford Alloy 67 is used for oxyacetylene and gas-tungsten-arc welding of Monel® alloy 450. This alloy is also used for welding on 70/30, 80/20, and 90/10 copper-nickel alloys. The weld metal of this filler metal has excellent resistance to corrosion in sea water, and is widely used for marine and desalination applications. Dissimilar welding applications for Oxford Alloy 67 are joints between Monel® alloys or Nickel 200 and copper-nickel alloys.

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AWS Chemical Composition

Ni+Co	Mn	Fe	Si	Cu+Ag	Ti	P
29.0-32.0	1.0 max	0.40-0.75	0.25 max	Bal	0.20-0.50	0.02 max
Pb	**OET**					
0.02 max	0.50 max					

TYPICAL MECHANICAL PROPERTIES

Tensile strength:	53,000 psi	360 MPa
Yield strength:	21,000 psi	140 MPa
Elongation:	32%	

Oxford Alloy® 82

SPECIFICATIONS
AWS 5.14
ASME SFA 5.14

CLASSIFICATIONS
AWS ERNiCr-3
UNS N06082

DESCRIPTION / APPLICATION
Oxford Alloy 82 is used for the welding of Inconel® alloys 600, 601, and 690, Incoloy® alloys 800 and 800HT, and Inco® alloy 330. This filler metal is also used for surfacing of steel. Weld metal deposited by Oxford Alloy 82 has high strength and good corrosion resistance, including oxidation resistance and creep-rupture strength at elevated temperatures. Oxford Alloy 82 is used in dissimilar-welding such as joining Inconel® alloys, Incoloy® alloys, and Inco® alloy 330 to nickel, Monel® alloys, stainless steels, and carbon steels. This filler metal is also used to join stainless steels to nickel alloys and carbon steels.

AWS Chemical Composition

Ni	C	Mn	Fe	S	Si	Cr
67.0 min	0.10 max	2.5-3.5	3.0 max	0.015 max	0.50 max	18.0-22.0
Ti	**P**	**Cb+Ta**	**Cu**	**OET**		
0.75 max	0.03 max	2.0-3.0	0.50 max	0.50 max		

TYPICAL MECHANICAL PROPERTIES

Tensile strength:	86,000 psi	590 MPa
Yield strength:	52,000 psi	360 MPa
Elongation:	38%	

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Oxford® ALLOYS, Inc.
Supplier of Welding Alloys

Nickel Alloy TIG, MIG and SUB-ARC Wire

Oxford Alloy® 601

SPECIFICATIONS
AWS 5.14
ASME SFA 5.14

CLASSIFICATIONS
AWS ERNiCrFe-11
UNS N06601

DESCRIPTION / APPLICATION
Oxford Alloy 601 is used for the welding of Inconel® alloy 601. The GTAW process with Oxford Alloy 601 is the only recommended joining method for applications involving temperature over 2100℉ (1150℃) or for appli cations at lower temperatures involving exposure to hydrogen sulfide or sulfur dioxide. The weld metal of this filler metal is comparable to the base metal in resistance to corrosion and oxidation.

AWS Chemical Composition						
Ni	**Cr**	**Fe**	**Al**	**C**	**Mn**	**S**
58.0-63.0	21.0-25.0	Bal	1.0-1.7	0.10 max	1.0 max	0.015 max
Si	**Cu**	**P**	**OET**			
0.50 max	1.0 max	0.03 max	0.50 max			

TYPICAL MECHANICAL PROPERTIES
Tensile strength: 94,000 psi 648 MPa
Elongation: 42%

Oxford Alloy® 617

SPECIFICATIONS
AWS 5.14
ASME SFA 5.14

CLASSIFICATIONS
AWS ERNiCrCoMo-1
UNS N06617

DESCRIPTION / APPLICATION
Oxford Alloy 617 is used for the welding of Inconel® alloy 617. This filler metal is also used for joining various dissimilar high-temperature alloys because of it's high temperature strength, oxidation resistance, and metallurgical stability. Some examples are Incoloy® alloys 800HT and 802 and cast alloys such as HK-40, HP, and HP-45 Modified.

AWS Chemical Composition						
Ni	**Cr**	**Co**	**Mo**	**Al**	**C**	**Fe**
Bal	20.0-24.0	10.0-15.0	8.0-10.0	0.8-1.5	0.05-0.15	3.0 max
Mn	**Si**	**S**	**Ti**	**Cu**	**P**	**OET**
1.0 max	1.0 max	0.015 max	0.60 max	0.50 max	0.03 max	0.50 max

TYPICAL MECHANICAL PROPERTIES
Tensile strength: 112,000 psi 770 MPa
Yield strength: 88,500 psi 610 MPa
Elongation: 28%

Oxford Alloy® 622

SPECIFICATIONS
AWS 5.14
ASME SFA 5.14

CLASSIFICATIONS
AWS ERNiCrMo-10
UNS N06022

DESCRIPTION / APPLICATION
Oxford Alloy 622 is an alloy of nickel with chromium molybdenum and tungsten as principle alloying elements. This wire is used to weld alloys of similar composition as well as dissimilar joints between nickel-chromium-molybdenum alloys and stainless or carbon or low alloy steels. It can also be used for cladded overlay as well as spraying applications. Oxford Alloy 622 offers excellent corrosion resistance in oxidizing as well as reducing media in a wide variety of chemical process environments. This alloy offers an outstanding resistance to stress corrosion cracking, pitting, and crevice corrosion.

AWS Chemical Composition						
C	**Mn**	**Si**	**Fe**	**S**	**P**	**Cr**
0.015 max	0.50 max	0.08 max	2.0-6.0	0.010 max	0.02 max	20.0-22.5
Mo	**W**	**Ni**	**Cu**	**Co**	**V**	**OET**
12.5-14.5	2.5-3.5	Bal	0.50 max	2.5 max	0.35 max	0.50 max

TYPICAL MECHANICAL PROPERTIES
Tensile strength: 115,000 psi 790 MPa
Yield strength: 82,000 psi 570 MPa
Elongation: 38%

Oxford® ALLOYS, Inc.
Supplier of Welding Alloys

Nickel Alloy TIG, MIG and SUB-ARC Wire

Oxford Alloy® 625

SPECIFICATIONS
AWS 5.14
ASME SFA 5.14

CLASSIFICATIONS
AWS ERNiCrMo-3
UNS N06625

DESCRIPTION / APPLICATION
Oxford Alloy 625 is used for the welding of Inconel® alloy 625, Incoloy® alloy 825, Inco® alloy 25-6MO, and other molybdenum-containing stainless steels. This filler metal is also used for surfacing of steel, for welding nickel steels, and for welding various corrosion-resistant alloys such as alloy 20. The weld metal of Oxford Alloy 625 has high strength over a broad temperature range and has exceptional corrosion resistance, including resistance to localized attack such as pitting and crevice corrosion. Oxford Alloy 625 is useful for many dissimilar joints involving Inconel® and Incoloy® alloys, carbon steels, low-alloy steels, and stainless steels.

AWS Chemical Composition						
Ni	**C**	**Mn**	**Fe**	**S**	**Si**	**P**
58.0 min	0.10 max	0.50 max	5.0 max	0.015 max	0.50 max	0.02 max
Cr	**Al**	**Cb+Ta**	**Mo**	**Ti**	**Cu**	**OET**
20.0-23.0	0.40 max	3.15-4.15	8.0-10.0	0.40 max	0.50 max	0.50 max

TYPICAL MECHANICAL PROPERTIES

Tensile strength:	114,500 psi	790 MPa
Yield strength:	85,000 psi	590 MPa
Elongation:	35%	

Oxford Alloy® 718

SPECIFICATIONS
AWS 5.14
ASME SFA 5.14

CLASSIFICATIONS
AWS ERNiFeCr-2
UNS N07718

DESCRIPTION / APPLICATION
Oxford Alloy 718 is used for welding of Inconel® alloys 718, 706, and X-750. This filler metal is mainly used for welding high-strength aircraft components, and liquid rocket components involving cryogenic temperatures. The weld metal of the Oxford Alloy 718 is age hardenable and has mechanical properties comparable to those of the base metals.

AWS Chemical Composition						
Ni	**C**	**Mn**	**Fe**	**S**	**Si**	**Cu**
50.0-55.0	0.08 max	0.35 max	Bal	0.015 max	0.35 max	0.30 max
Cr	**Al**	**Ti**	**Cb+Ta**	**Mo**	**P**	**OET**
17.0-21.0	0.20-0.80	0.65-1.15	4.75-5.50	2.80-3.30	0.015 max	0.50 max

TYPICAL MECHANICAL PROPERTIES

Tensile strength:	125,000 psi	860 MPa
Yield strength:	91,000 psi	630 MPa
Elongation:	27%	

Oxford Alloy® 55

SPECIFICATIONS
N/A

CLASSIFICATIONS
N/A

DESCRIPTION / APPLICATION
Oxford Alloy Nickel 55 is used for the welding of cast iron. This filler metal is extensively employed to overlay cast iron rolls. It is also used to repair castings. The weld metal of Oxford Alloy Nickel 55 is harder than that of Oxford Alloy Nickel 99. However, the machining can be accomplished by using carbide tipped tools. A preheat and interpass temperature of 350°(175°C) minimum is recommended during welding, without which the weld and heat affected zones could develop cracks.

Typical Chemical Composition						
C	**Mn**	**Si**	**Fe**	**Ni**		
0.05	0.25	0.15	43.6	55.9		

TYPICAL MECHANICAL PROPERTIES

Tensile strength:	89,500 psi	620 MPa
Yield strength:	62,000 psi	430 MPa
Elongation:	35%	

Oxford® ALLOYS, Inc.
Supplier of Welding Alloys

Nickel Alloy TIG, MIG and SUB-ARC Wire

Oxford Alloy® 59

SPECIFICATIONS
AWS 5.14
ASME SFA 5.14

CLASSIFICATIONS
AWS ERNiCrMo-13
UNS N06059

DESCRIPTION / APPLICATION
Oxford Alloy 59 is a nickel-chromium-molybdenum alloy with an extra low carbon and silicon content. This wire has excellent corrosion resistance and high mechanical strength. This alloy is used to weld low-carbon-nickel-chromium-molybdenum alloys, for welding the clad side of joints in steel clad with low-carbon-nickel-chromium-molybdenum alloys, and for welding low-carbon-nickel-chromium-molybdenum alloys to steel and to other nickel-base alloys, such as alloys C-276, 22, 625 and other high alloys such as 6Mo stainless, 825 and even common grades of stainless steels. Some typical base metals that this alloy is used on are ASTM and ASME B and SB 574, 575, 619, 622 and 626.

AWS Chemical Composition						
C	**Mn**	**Fe**	**P**	**S**	**Si**	**Ni**
0.01 max	0.5 max	1.5 max	0.015 min	0.01 max	0.10 max	Bal
Co	**Al**	**Cr**	**Mo**	**OET**	**Cu**	
0.3 max	0.1-0.4	22.0-24.0	15.0-16.5	0.50 max	0.5 max	

TYPICAL MECHANICAL PROPERTIES

Tensile strength:	101,500 psi	700 MPa
Yield strength:	58,000 psi	400 MPa
Elongation:	30%	

Oxford Alloy® 99

SPECIFICATIONS
AWS 5.15
ASME SFA 5.15

CLASSIFICATIONS
AWS ERNiCl
UNS N02215

DESCRIPTION / APPLICATION
Oxford Alloy Nickel 99 is used for the welding of cast irons. This filler metal is extensively employed to repair cast irons. It can also be used for overlay and buildup. However, dilution from the castings influences the mechanical properties of the metal. The welds of the Oxford Alloy Nickel 99 are easily machinable. A preheat and interpass temperature of 350°F (175°C) minimum is recommended during welding.

AWS Chemical Composition						
C	**Mn**	**Si**	**Ni**	**S**	**Fe**	**Cu**
1.0 max	2.5 max	0.75 max	90.0 min	0.03 max	4.0 max	4.0 max
OET						
1.0 max						

TYPICAL MECHANICAL PROPERTIES

Tensile strength:	66,500 psi	460 MPa
Yield strength:	36,000 psi	250 MPa
Elongation:	40%	

Nickel Alloy Flux Cored Wire

Oxford Alloy® 82T-1

SPECIFICATIONS
AWS 5.34
ASME SFA 5.34

CLASSIFICATIONS
AWS ENiCr3T1-1/T1-4
UNS W86082

DESCRIPTION / APPLICATION
Oxford Alloy 82T-1 is a gas shielded all position flux cored wire that results in a deposit that is within the chemical composition requirements of AWS 5.34. Some typical applications include joining nickel-chromium-iron alloys, surfacing steel with nickel-chromium-iron weld metal, joining alloys 600, 601 and alloy 800 to themselves or to stainless and carbon steels. This flux cored wire is also used to clad the side of joints in steels that have been clad with nickel-chromium-iron weld metal.

AWS Chemical Composition						
C	**Mn**	**Si**	**Cr**	**Fe**	**Cb**	**S**
0.1 max	2.5-3.5	0.5 max	18.0-22.0	3.0 max	2.0-3.0	0.015 max
Ti	**P**	**Ni**	**Cu**			
0.75 max	0.03 max	67.0 min	0.5 max			

TYPICAL MECHANICAL PROPERTIES

Tensile strength:	89,030 psi	614 MPa
Yield strength:	58,000 psi	400 MPa
Elongation:	26%	

Oxford Alloy® 625T-1

SPECIFICATIONS
AWS 5.34
ASME SFA 5.34

CLASSIFICATIONS
AWS ENiCrMo3T1-1/T1-4
UNS W86625

DESCRIPTION / APPLICATION
Oxford Alloy 625T-1 is a gas shielded all position flux cored wire that results in a deposit that is within the chemical composition requirements of AWS 5.34. Some typical applications include joining nickel-chromium-molybdenum alloys, surfacing steel with nickel-chromium-molybdenum weld metal, joining steels to nickel based alloys. This flux cored wire is also used to clad the side of joints in steels that have been clad with nickel-chromium-molybdenum.

AWS Chemical Composition						
C	**Mn**	**Si**	**Cr**	**Mo**	**Fe**	**Cb**
0.1 max	0.5 max	0.5 max	20.0-23.0	8.0-10.0	5.0 max	3.15-4.15
Ti	**S**	**P**	**Ni**	**Cu**		
0.4 max	0.015 max	0.02 max	58.0 min	0.5 max		

TYPICAL MECHANICAL PROPERTIES

Tensile strength:	112,085 psi	773 MPa
Yield strength:	72,065 psi	497 MPa
Elongation:	38%	

Oxford® ALLOYS, Inc.
Supplier of Welding Alloys

Mild and Low Alloy Steel Coated Electrodes

Oxford Alloy® 7018

SPECIFICATIONS
AWS 5.1
ASME SFA 5.1

CLASSIFICATIONS
AWS E7018
UNS W07018

DESCRIPTION / APPLICATION
Oxford Alloy E7018 is an all position iron powdered low hydrogen electrode which exhibits excellent mechanical properties, crack resistance and X-ray quality. This electrode can be used with either ac or dc ep. The fillet welds of the Oxford Alloy E7018 made in the horizontal and flat welding positions have a slightly convex weld face, with a smooth and finely rippled surface. These electrodes are characterized by a smooth, quiet arc, very low spatter and medium arc penetration. The coated electrodes can also be used at high travel levels. The Oxford Alloy E7018 is used in high tensile strength steels like ship hull constructions, pressure vessels and other heavy duty equipments.

AWS Chemical Composition

C	Mn	Si	P	S	Ni	Cr
0.15 max	1.60 max	0.75 max	0.035 max	0.035 max	0.30 max	0.20 max
Mo	**V**	**Combined Limit for Mn+Ni+Cr+Mo+V**				
0.30 max	0.08 max	1.75 max				

TYPICAL MECHANICAL PROPERTIES
Tensile strength: 84,850 psi 585 MPa
Yield strength: 74,400 psi 513 MPa
Elongation: 29%

Oxford Alloy® 7018-A1

SPECIFICATIONS
AWS 5.5
ASME SFA 5.5

CLASSIFICATIONS
AWS E7018-A1
UNS W17018

DESCRIPTION / APPLICATION
Oxford Alloy E7018-A1 is recommended for welding low-alloy, high tensile steels of 50 ksi (345 MPa) minimum yield strength, and also the 0.50% Molybdenum steels. These electrodes are commonly used in the fabrication and erection of boilers, pressure piping and tubing, and other pressure vessel applications.

AWS Chemical Composition

C	Mn	Si	P	S	Mo	
0.12 max	0.90 max	0.80 max	0.03 max	0.03 max	0.40-0.65	

TYPICAL MECHANICAL PROPERTIES
Tensile strength: 98,600 psi 680 MPa
Yield strength: 85,550 psi 590 MPa
Elongation: 28%

Oxford Alloy® 8018-B2

SPECIFICATIONS
AWS 5.5
ASME SFA 5.5

CLASSIFICATIONS
AWS E8018-B2
UNS W52018

DESCRIPTION / APPLICATION
Oxford Alloy E8018-B2 are used for welding of ½% Cr-½% Mo, 1% Cr - ½% Mo, and 1-¼% Cr - ½% Mo. These electrodes are used primarily in power piping and boiler work for the fabrication of plates, pipes, tubes, castings, and forgings.

AWS Chemical Composition

C	Mn	Si	P	S	Cr	Mo
0.05-0.12	0.90 max	0.80 max	0.03 max	0.03 max	1.00-1.50	0.40-0.65

TYPICAL MECHANICAL PROPERTIES
Tensile strength: 97,150 psi 670 MPa
Yield strength: 85,550 psi 590 MPa
Elongation: 25%

Mild and Low Alloy Steel Coated Electrodes

Oxford Alloy® 8018-B6 (502-16)

SPECIFICATIONS
AWS 5.5
ASME SFA 5.5

CLASSIFICATIONS
AWS E8018-B6
UNS W50218

DESCRIPTION / APPLICATION
Oxford Alloy E8018-B6 coated electrodes are designed to weld 5% Chrome –1/2% Molybdenum creep resisting steels such as ASTM A387 Grade 5, A213-T5 and A335-P5. These types of steels are normally used in pressure vessels and piping for high temperature service. This alloy was formally

AWS Chemical Composition						
C	Mn	Si	P	S	Cr	Ni
0.05-0.10	1.0 max	0.90 max	0.03 max	0.03 max	4.0-6.0	0.40 max
Mo						
0.45-0.65						

TYPICAL MECHANICAL PROPERTIES

Tensile strength:	79,750 psi	550 MPa
Yield strength:	66,700 psi	460 MPa
Elongation:	19%	

Oxford Alloy® 8018-B8 (505-16)

SPECIFICATIONS
AWS 5.5
ASME SFA 5.5

CLASSIFICATIONS
AWS E8018-B8
UNS W50418

DESCRIPTION / APPLICATION
Oxford Alloy E8018-B8 coated electrodes are designed to weld 9% Chrome –1% Molybdenum creep resisting steels such as ASTM A213-T9 and A335-P9. These types of steels are normally used in pressure vessels and piping for high temperature service. This alloy was formally called 505.

AWS Chemical Composition						
C	Mn	Si	P	S	Ni	Cr
0.05-0.10	1.0 max	0.90 max	0.03 max	0.03 max	0.40 max	8.0-10.5
Mo						
0.85-1.20						

TYPICAL MECHANICAL PROPERTIES

Tensile strength:	79,750 psi	550 MPa
Yield strength :	66,700 psi	460 MPa
Elongation:	19%	

Oxford Alloy® 9015-B9

SPECIFICATIONS
AWS 5.5
ASME SFA 5.5

CLASSIFICATIONS
AWS E9015-B9
UNS W50425

DESCRIPTION / APPLICATION
Oxford Alloy E9015-B9 is a low hydrogen sodium coated electrode designed for out of position welding. This electrode is recommended for direct current, reversed polarity only. This electrode is used to weld the modified 9% Chromium – 1% Molybdenum steels such as P91, T91 and F91. This electrode is used in heavy wall components such as main steam piping and turbine rotors in fossil fuelled power generating plants.

AWS Chemical Composition						
C	Mn	Si	P	S	Ni	Cr
0.08-0.13	1.20 max	0.30 max	0.01 max	0.01 max	0.8 max	8.0-10.5
Mo	V	Cu	Al	Nb	N	
0.85-1.20	0.15-0.30	0.25 max	0.04 max	0.02-0.10	0.02-0.07	

TYPICAL MECHANICAL PROPERTIES

Tensile strength:	89,900 psi	620 MPa
Yield strength:	76,850 psi	530 MPa
Elongation:	17%	

Oxford® ALLOYS, Inc.
Supplier of Welding Alloys

Mild and Low Alloy Steel Coated Electrodes

Oxford Alloy® 9018-B3

SPECIFICATIONS
AWS 5.5
ASME SFA 5.5

CLASSIFICATIONS
AWS E9018-B3
UNS W53018

DESCRIPTION / APPLICATION
Oxford Alloy E9018-B3 is used for welding 2-1/4% Cr – 1% Mo steels. This electrode is commonly used on pressure vessels, heat exchangers, and other related components.

AWS Chemical Composition						
C	**Mn**	**Si**	**P**	**S**	**Cr**	**Mo**
0.05-0.12	0.90 max	0.80 max	0.03 max	0.03 max	2.00-2.50	0.90-1.20

TYPICAL MECHANICAL PROPERTIES

Tensile strength:	108,750 psi	750 MPa
Yield strength:	98,600 psi	680 MPa
Elongation:	21%	

Oxford Alloy® 9018-B9

SPECIFICATIONS
AWS 5.5
ASME SFA 5.5

CLASSIFICATIONS
AWS E9018-B9
UNS W50428

DESCRIPTION / APPLICATION
Oxford Alloy E9018-B9 is an iron powder low hydrogen coated electrode designed to weld the modified 9% Chromium – 1% Molybdenum steels known by the designations T91, P91 or Grade 91. These steels are designed to provide improved creep strength, toughness fatigue and oxidation, and corrosion resistance at elevated temperatures.

AWS Chemical Composition						
C	**Mn**	**Si**	**P**	**S**	**Cr**	**Ni**
0.80-0.13	1.20 max	0.30 max	0.01 max	0.01 max	8.0-10.5	0.8 max
Mo	**V**	**Nb**	**Cu**	**Al**	**N**	
0.85-1.20	0.15-0.30	0.02-0.10	0.25 max	0.04 max	0.02-0.07	

TYPICAL MECHANICAL PROPERTIES

Tensile strength:	89,900 psi	620 MPa
Yield strength:	76,850 psi	530 MPa
Elongation:	17%	

Mild and Low Alloy Steel TIG, MIG & SUB-ARC Wire

Oxford Alloy® 70S-2

SPECIFICATIONS
AWS 5.18
ASME SFA 5.18

CLASSIFICATIONS
AWS ER70S-2
UNS K10726

DESCRIPTION / APPLICATION
Oxford Alloy ER70S-2 is a triple deoxidized (aluminum, titanium, zirconium) welding wire designed for welding over rust and mill scale. The less fluid weld puddle of Oxford Alloy ER70S-2 makes it easier to control when used out of position. This wire is preferred for all position welding of small diameter pipe.

AWS Chemical Composition

C	Mn	Si	P	S	Ni	Cr
0.07 max	0.90-1.40	0.40-0.70	0.025 max	0.035 max	0.15 max	0.15 max
Mo	**V**	**Al**	**Zr**	**Ti**	**Cu**	
0.15 max	0.03 max	0.05-0.15	0.02-0.12	0.05-0.15	0.50 max	

TYPICAL MECHANICAL PROPERTIES

Tensile strength:	79,750 psi	550 MPa
Yield strength:	71,050 psi	490 MPa
Elongation:	29%	

Oxford Alloy® 70S-3

SPECIFICATIONS
AWS 5.18
ASME SFA 5.18

CLASSIFICATIONS
AWS ER70S-3
UNS K11022

DESCRIPTION / APPLICATION
Oxford Alloy ER70S-3 is a silicon and manganese deoxidized wire used for mild and low alloy steel general purpose fabrication. A well balanced silicon and manganese content permits its use with CO_2, Argon-Oxygen mixtures, or mixtures of the two. The Oxford Alloy ER70S-3 produces quality welds with rimmed steels, better welds on semi-deoxidized steels and excellent welds on fully deoxidized steels. This wire also yields an almost slag-free deposit, which does not require cleaning for many applications thereby providing low plate preparation costs, good bead appearance and welder satisfaction. Some typical applications include earthmoving and farm equipment, automobile frames, sheet metal, ships and barges, railcars, trailers, storage bins and general fabrication.

AWS Chemical Composition

C	Mn	Si	P	S	Ni	Cr
0.06-0.15	0.90-1.40	0.45-0.75	0.025 max	0.035 max	0.15 max	0.15 max
Mo	**V**	**Cu**				
0.15 max	0.03 max	0.50 max				

TYPICAL MECHANICAL PROPERTIES

Tensile strength:	75,400 psi	520 MPa
Yield strength:	62,350 psi	430 MPa
Elongation:	33%	

Oxford Alloy® 70S-6

SPECIFICATIONS
AWS 5.18
ASME SFA 5.18

CLASSIFICATIONS
AWS ER70S-6
UNS K11140

DESCRIPTION / APPLICATION
Oxford Alloy ER70S-6 contains high levels of manganese and silicon for stronger deoxidizing power where stringent cleaning procedures are not possible. The high silicon content increases the fluidity of the weld pool, creating a smoother bead appearance and resulting in minimal post-weld grinding. The Oxford Alloy ER70S-6 has been designed to provide X-ray quality porosity-free welds and the highest tensile strength (as welded) of the plain carbon steel wires. This wire is excellent where poor fit-ups or rusty and oily plates may be used. Some typical applications are truck bodies, farm implements, steel castings or forgings, shaft build-ups and general shop fabrications.

AWS Chemical Composition

C	Mn	Si	P	S	Ni	Cr
0.06-0.15	1.40-1.85	0.80-1.15	0.025 max	0.035 max	0.15 max	0.15 max
Mo	**V**	**Cu**				
0.15 max	0.03 max	0.50 max				

TYPICAL MECHANICAL PROPERTIES

Tensile strength:	79,750 psi	550 MPa
Yield strength:	65,250 psi	450 MPa
Elongation:	30%	

Oxford® ALLOYS, Inc.
Supplier of Welding Alloys

Mild and Low Alloy Steel TIG, MIG & SUB-ARC Wire

Oxford Alloy® 80S-B2

SPECIFICATIONS
AWS 5.28
ASME SFA 5.28

CLASSIFICATIONS
AWS ER80S-B2
UNS K20900

DESCRIPTION / APPLICATION
Oxford Alloy ER80S-B2 is designed for welding on 1-1/4 Cr / ½ Mo steels, which are used for high temperature service. Preheating and interpass temperatures of not less than 300℉ must be used during welding.

*Note: Mechanical properties listed above reflect utilization of a post-weld heat treatment

AWS Chemical Composition						
C	**Mn**	**Si**	**Cr**	**Mo**	**P**	**S**
0.07-0.12	0.40-0.70	0.40-0.70	1.20-1.50	0.40-0.65	0.025 max	0.025 max
Cu	**Ni**	**OET**				
0.35 max	0.20 max	0.50 max				

TYPICAL MECHANICAL PROPERTIES
Tensile strength: 85,550 psi 590 MPa
Yield strength: 72,500 psi 500 MPa
Elongation: 26%

Oxford Alloy® 80S-B6 (502)

SPECIFICATIONS
AWS 5.28
ASME SFA 5.28

CLASSIFICATIONS
AWS ER80S-B6
UNS S50280

DESCRIPTION / APPLICATION
Oxford Alloy ER80S-B6 is designed for welding of materials of similar composition, for high temperature service conditions. This alloy is an air-hardening material and as such calls for preheat and interpass temperatures of 350℉ minimum during welding. Formerly known as Oxford Alloy ER502 AWS / ASME SFA 5.9.

*Note: Mechanical properties listed above reflect utilization of a post-weld heat treatment between 1550℉ and 1600℉ for two hours.

AWS Chemical Composition						
C	**Mn**	**Si**	**Cr**	**Mo**	**S**	**P**
0.10 max	0.40-0.70	0.50 max	4.50-6.00	0.45-0.65	0.025 max	0.025 max
Ni	**Cu**	**OET**				
0.6 max	0.35 max	0.50 max				

TYPICAL MECHANICAL PROPERTIES
Tensile strength: 91,350 psi 630 MPa
Yield strength: 69,600 psi 480 MPa
Elongation: 25%

Oxford Alloy® 80S-B8 (505)

SPECIFICATIONS
AWS 5.28
ASME SFA 5.28

CLASSIFICATIONS
AWS ER80S-B8
UNS S50480

DESCRIPTION / APPLICATION
Oxford Alloy ER80S-B8 is designed for welding materials of similar composition. This alloy is an air hardening type that calls for preheat and interpass temperatures of not less than 350℉ during welding. Formerly known as Oxford Alloy ER505 AWS / ASME SFA 5.9.

*Note: Mechanical properties listed above reflect utilization of a post-weld heat treatment between 1550℉ and 1600℉ for two hours.

AWS Chemical Composition						
C	**Mn**	**Si**	**Cr**	**Mo**	**S**	**P**
0.10 max	0.40-0.70	0.50 max	8.00-10.5	0.8-1.2	0.025 max	0.025 max
Ni	**Cu**	**OET**				
0.5 max	0.35 max	0.50 max				

TYPICAL MECHANICAL PROPERTIES
Tensile strength: 92,800 psi 640 MPa
Yield strength: 71,050 psi 490 MPa
Elongation: 30%

Mild and Low Alloy Steel TIG, MIG & SUB-ARC Wire

Oxford Alloy® 80S-D2

SPECIFICATIONS
AWS 5.28
ASME SFA 5.28

CLASSIFICATIONS
AWS ER80S-D2
UNS K10945

DESCRIPTION / APPLICATION
Oxford Alloy ER80S-D2 is a low alloy steel wire with 2% manganese and 0.5% molybdenum as alloying elements. The weld deposits of this wire have moderately high strength with adequate low temperature toughness. A pre-heat and interpass temperature of not less than 300℉ is required during welding.

*Note: Mechanical properties listed above are greatly influenced by the preheat, inter-pass temperature, the heat input, and the post weld heat treatment.

AWS Chemical Composition						
C	**Mn**	**Si**	**Mo**	**P**	**S**	**Cu**
0.07-0.12	1.60-2.10	0.50-0.80	0.40-0.60	0.025 max	0.025 max	0.50 max
Ni	**OET**					
0.15 max	0.50 max					

TYPICAL MECHANICAL PROPERTIES

Tensile strength:	92,800 psi	640 MPa
Yield strength:	85,550 psi	590 MPa
Elongation:	22%	

Oxford Alloy® 80S-Ni1

SPECIFICATIONS
AWS 5.28
ASME SFA 5.28

CLASSIFICATIONS
AWS ER80S-Ni1
UNS K11260

DESCRIPTION / APPLICATION
Oxford Alloy ER80S-Ni1 is used for welding low alloy high strength steels requiring good toughness at temperatures as low as -40℉ (-40℃). The weld deposits of this filler metal are similar to Oxford Alloy E8018-C3 electrodes.

AWS Chemical Composition						
C	**Mn**	**Si**	**P**	**S**	**Ni**	**Cr**
0.12 max	1.25 max	0.40-0.80	0.025 max	0.025 max	0.80-1.10	0.15 max
Mo	**V**	**Cu**	**OET**			
0.35 max	0.05 max	0.35 max	0.50 max			

TYPICAL MECHANICAL PROPERTIES

Tensile strength:	87,000 psi	600 MPa
Yield strength:	76,850 psi	530 MPa
Elongation:	26%	

Oxford Alloy® 80S-Ni2

SPECIFICATIONS
AWS 5.28
ASME SFA 5.28

CLASSIFICATIONS
AWS ER80S-Ni2
UNS K21240

DESCRIPTION / APPLICATION
Oxford Alloy ER80S-Ni2 are used for welding 2-1/2 percent nickel steels and other materials requiring a tensile strength of 80 ksi (550 MPa) and good toughness at temperatures as low as -80℉ (-62℃). The weld deposits of this filler metal are similar to Oxford Alloy E8018-C1 electrodes.

AWS Chemical Composition						
C	**Mn**	**Si**	**P**	**S**	**Ni**	**Cu**
0.12 max	1.25 max	0.40-0.80	0.025 max	0.025 max	2.00-2.75	0.35 max
OET						
0.50 max						

TYPICAL MECHANICAL PROPERTIES

Tensile strength:	89,900 psi	620 MPa
Yield strength:	76,850 psi	530 MPa
Elongation:	26%	

Oxford® ALLOYS, Inc.
Supplier of Welding Alloys

Mild and Low Alloy Steel TIG, MIG & SUB-ARC Wire

Oxford Alloy® 90S-B3

SPECIFICATIONS
AWS 5.28
ASME SFA 5.28

CLASSIFICATIONS
AWS ER90S-B3
UNS K30960

DESCRIPTION / APPLICATION
Oxford Alloy ER90S-B3 is designed for welding 2-1/4 Cr / 1 Mo steels, which are used for high temperature applications. A preheat and interpass temperature of not less than 350℉ should be maintained during welding.

Note: Mechanical properties listed above reflect utilization of a post-weld heat treatment between 1250℉ and 1300℉ for one hour.

AWS Chemical Composition						
C	**Mn**	**Si**	**Cr**	**Mo**	**P**	**S**
0.07-0.12	0.40-0.70	0.40-0.70	2.30-2.70	0.90-1.20	0.025 max	0.025 max
Cu	**Ni**	**OET**				
0.35 max	0.20 max	0.50 max				

TYPICAL MECHANICAL PROPERTIES

Tensile strength:	97,150 psi	670 MPa
Yield strength:	79,750 psi	550 MPa
Elongation:	26%	

Oxford Alloy® 90S-B9

SPECIFICATIONS
AWS 5.28
ASME SFA 5.28

CLASSIFICATIONS
AWS ER90S-B9
UNS S50482

DESCRIPTION / APPLICATION
Oxford Alloy ER90S-B9 is designed to weld high temperature steels for hot hydrogen service. This wire is suitable for 9% Chromium steels such as P91, T91 and F91. Applications include steam generation and petrochemical equipment. Preheat and interpass is required.

AWS Chemical Composition						
C	**Mn**	**Si**	**Cr**	**Ni**	**Mo**	**Cu**
0.07-0.13	1.25 max	0.15-0.30	8.00-9.50	1.00 max	0.80-1.10	0.20 max
V	**P**	**S**	**Al**	**OET**		
0.15-0.25	0.010 max	0.010 max	0.04 max	0.50 max		

TYPICAL MECHANICAL PROPERTIES

Tensile strength:	108,750 psi	750 MPa
Yield strength:	94,250 psi	650 MPa
Elongation:	18%	

Mild and Low Alloy Steel Flux Cored Wire

Oxford Alloy® 71T-1M

SPECIFICATIONS
AWS 5.20
ASME SFA 5.20

CLASSIFICATIONS
AWS E71T-1/1M
UNS W07601

DESCRIPTION / APPLICATION
Oxford Alloy E71T-1/T-1M is an all position flux cored wire that combines excellent performance features with the ability to produce high quality welds. This wire produces fillet welds with little spatter. Cleaning time is reduced because the slag cover is complete and can be easily removed. Oxford Alloy E71T-1/T-1M is designed for welding mild and medium-carbon steels. It can also be used over normal rust and mill scale. This wire can be used with either 100% CO_2 or 75% Argon / 25% CO_2 shielding gas. The 75/25 gas mixture improves arc characteristics in out-of-position work. It also provides increased wetting action and easier arc control.

AWS Chemical Composition

C	Mn	Si	P	S	Cr	Ni
0.18 max	1.75 max	0.90 max	0.03 max	0.03 max	0.20 max	0.50 max
Mo	**V**	**Al**	**Cu**			
0.30 max	0.08 max	-	0.35 max			

TYPICAL MECHANICAL PROPERTIES

Tensile strength:	75,400 psi	520 MPa
Yield strength:	72,500 psi	500 MPa
Elongation:	28%	

Oxford Alloy® 81T1-B2

SPECIFICATIONS
AWS 5.29
ASME SFA 5.29

CLASSIFICATIONS
AWS E81T1-B2
UNS W52031

DESCRIPTION / APPLICATION
Oxford Alloy E81T1-B2 is an all position flux cored wire recommended for welding 1-14 % Cr 1/2% Mo steels. The weld metal analysis is similar to an E8018-B2 electrode. The recommended shielding gas is CO^2 or argon mixtures up to 75% Argon.

AWS Chemical Composition

C	Mn	Si	P	S	Cr	Mo
0.05-0.12	1.25 max	0.80 max	0.03 max	0.03 max	1.00-1.50	0.40-0.65

TYPICAL MECHANICAL PROPERTIES

Tensile strength:	87,000 psi	600 MPa
Yield strength:	76,850 psi	530 MPa
Elongation:	25%	

Stress relieved 1 hr. @ 1175°F (635°C) with CO^2

Oxford Alloy® 91T1-B3

SPECIFICATIONS
AWS 5.29
ASME SFA 5.29

CLASSIFICATIONS
AWS E91T1-B3
UNS W53031

DESCRIPTION / APPLICATION
Oxford Alloy E91T1-B3 is an all position flux cored wire recommended for welding 2-1/4 % Cr 1% Mo steels. The weld metal analysis is similar to an E9018-B3 electrode. The recommended shielding gas is CO^2 or argon mixtures up to 75% Argon. Oxford Alloy E91T1-B3 is designed for single or multiple pass welding.

AWS Chemical Composition

C	Mn	Si	P	S	Cr	Mo
0.05-0.12	1.25 max	0.80 max	0.03 max	0.03 max	2.00-2.50	0.90-1.20

TYPICAL MECHANICAL PROPERTIES

Tensile strength:	98,600 psi	680 MPa
Yield strength:	91,350 psi	630 MPa
Elongation:	24%	

Stress relieved 1 hr. @ 1275°F (691°C) with CO^2

Oxford® ALLOYS, Inc.
Supplier of Welding Alloys

Cobalt Flux Coated Electrodes

Oxford Alloy® #1

SPECIFICATIONS
AWS 5.13
ASME SFA 5.13

CLASSIFICATIONS
AWS ECoCr-C
UNS W73001

DESCRIPTION / APPLICATION
Oxford Alloy #1 Coated is a non-ferrous, cobalt-chromium-tungsten alloy. This electrode is recommended for applications involving severe abrasion accompanied by heat and/or corrosion with moderate impact. The Oxford Alloy #1 Coated has a carbon content of 2.5 percent, which gives it a relatively high volume of carbides within its structure. Oxford Alloy #1 Coated weld deposits are smooth. It acquires a mirror-like finish in use and retains wear resistance at high temperatures. This alloy is nonmagnetic and is not forgeable. It can be machined with difficulty using carbide tools. Oxford Alloy #1 Coated bonds well with weldable alloy steels, including stainless.

AWS Chemical Composition

C	Co	Cr	W	Mn	Si	Ni
1.7-3.0	Bal	25-33	11-14	2.0 max	2.0 max	3.0 max
Mo	**Fe**	**OET**				
1.0 max	5.0 max	1.0 max				

TYPICAL MECHANICAL PROPERTIES
Hardness: 43-58 HRC

Note: The typical hardness values listed above are for multilayer welds. Hardness values for single deposits will be lower because of dilution from the base metal.

Oxford Alloy® #6

SPECIFICATIONS
AWS 5.13
ASME SFA 5.13

CLASSIFICATIONS
AWS ECoCr-A
UNS W73006

DESCRIPTION / APPLICATION
Oxford Alloy #6 Coated is a non-ferrous, cobalt-chromium-tungsten alloy. This electrode is recommended for metal-to-metal abrasion and high impact applications involving high temperatures and/or corrosive media. Some typical applications are valves of all kinds, shear blades, hot punches and saw guides. Oxford Alloy #6 Coated is the most generally useful cobalt alloy; it has excellent resistance to many forms of mechanical and chemical degradation over a wide temperature range. This alloy has outstanding self-mated anti-galling properties, high temperature hardness, and a high resistance to cavitation erosion, which result in its wide use as a valve seat material. It is ideally suited for a variety of hardfacing processes. The weld deposits of the Oxford Alloy #6 Coated are smooth and normally acquire mirror-like finish in use. The deposits retain wear resistance at high temperatures. This alloy is nonmagnetic and is not forgeable. It can be machined with carbide tools. Oxford Alloy #6 Coated bonds well with weldable alloy steels, including stainless.

AWS Chemical Composition

C	Co	Cr	W	Mn	Si	Ni
0.7-1.4	Bal	25-32	3.0-6.0	2.0 max	2.0 max	3.0 max
Mo	**Fe**	**OET**				
1.0 max	5.0 max	1.0 max				

TYPICAL MECHANICAL PROPERTIES
Hardness: 23-47 HRC

Note: The typical hardness values listed above are for multilayer welds. Hardness values for single deposits will be lower because of dilution from the base metal.

Oxford Alloy® #12

SPECIFICATIONS
AWS 5.13
ASME SFA 5.13

CLASSIFICATIONS
AWS ECoCr-B
UNS W73012

DESCRIPTION / APPLICATION
Oxford Alloy #12 Coated is a non-ferrous, cobalt-chromium-tungsten alloy. This electrode is recommended for metal–to-metal abrasion involving high temperature and/or corrosive media with moderate impact. Oxford Alloy #12 Coated weld deposits are smooth and it acquires a high polish in use. This alloy is nonmagnetic and is not forgeable. It can be machined with difficulty using carbide tools. Oxford Alloy #12 Coated bonds well with weldable alloy steels, including stainless.

AWS Chemical Composition

C	Co	Cr	W	Mn	Si	Ni
1.0-1.7	Bal	25-32	7.0-9.5	2.0 max	2.0 max	3.0 max
Mo	**Fe**	**OET**				
1.0 max	5.0 max	1.0 max				

TYPICAL MECHANICAL PROPERTIES
Hardness: 34-47 HRC

Note: The typical hardness values listed above are for multilayer welds. Hardness values for single deposits will be lower because of dilution from the base metal.

Cobalt Flux Coated Electrodes

Oxford Alloy® #21

SPECIFICATIONS
AWS 5.13
ASME SFA 5.13

CLASSIFICATIONS
AWS ECoCr-E
UNS W73021

DESCRIPTION / APPLICATION
Oxford Alloy #21 Coated is a low carbon, molybdenum strengthened, cobalt-chromium alloy. This electrode is recommended for metal-to-metal abrasion and high impact applications involving high temperatures and/or corrosive media. Some typical applications are valves of all kinds, shear blades, hot punches and saw guides. Oxford Alloy #21 Coated is also used as hot die material because of its high temperature strength and stability. Its inherent resistance to galling (under self-mated conditions), cavitation erosion, and corrosion resistance have made it a popular fluid valve seat-facing alloy. The weld deposits of the Oxford Alloy #21 Coated are smooth and normally acquire mirror-like finish in use. The deposits retain wear resistance at high temperatures. This alloy is nonmagnetic and is not forgeable. It can be machined with carbide tools. Oxford Alloy #21 Coated bonds well with weldable alloy steels, including stainless.

AWS Chemical Composition

C	Co	Cr	Mo	Ni	Mn	Si
0.15-0.40	Bal	24-29	4.5-6.5	2.0-4.0	1.5 max	2.0 max
W	**Fe**	**OET**				
0.50 max	5.0 max	1.0 max				

TYPICAL MECHANICAL PROPERTIES
Hardness: 20-32 HRC

Note: The typical hardness values listed above are for multilayer welds. Hardness values for single deposits will be lower because of dilution from the base metal.

Oxford® ALLOYS, Inc.
Supplier of Welding Alloys

Cobalt Bare Electrodes

Oxford Alloy® #1 BARE

SPECIFICATIONS
AWS 5.21
ASME SFA 5.21

CLASSIFICATIONS
AWS ERCoCr-C
UNS R30001

DESCRIPTION / APPLICATION
Oxford Alloy #1 Bare is a non-ferrous, cobalt-chromium-tungsten alloy. This filler metal is recommended for applications involving severe abrasion accompanied by heat and/or corrosion with moderate impact. The Oxford Alloy #1 Bare has a carbon content of 2.5 percent, which gives it a relatively high volume of carbides within its structure. Oxford Alloy #1 Bare weld deposits are smooth. It acquires a mirror-like finish in use and retains wear resistance at high temperatures. This alloy is nonmagnetic and is not forgeable. It can be machined with difficulty using carbide tools. Oxford Alloy #1 Bare bonds well with weldable alloy steels, including stainless.

AWS Chemical Composition

C	Co	Cr	W	Mn	Si	Ni
2.0-3.0	Bal	26-33	11.0-14.0	1.0 max	2.0 max	3.0 max
Mo	**Fe**	**OET**				
1.0 max	3.0 max	0.50 max				

TYPICAL MECHANICAL PROPERTIES
Hardness: 43-58 HRC

Note: The typical hardness values listed above are for multilayer welds. Hardness values for single deposits will be lower because of dilution from the base metal.

Oxford Alloy® #6 BARE

SPECIFICATIONS
AWS 5.21
ASME SFA 5.21

CLASSIFICATIONS
AWS ERCoCr-A
UNS R30006

DESCRIPTION / APPLICATION
Oxford Alloy #6 Bare is a non-ferrous, cobalt-chromium-tungsten alloy. This filler metal is recommended for metal-to-metal abrasion and high impact applications involving high temperatures and/or corrosive media. Some typical applications are valves of all kinds, shear blades, hot punches and saw guides. Oxford Alloy #6 Bare is the most generally useful cobalt alloy; it has excellent resistance to many forms of mechanical and chemical degradation over a wide temperature range. This alloy has outstanding self-mated anti-galling properties, high temperature hardness, and a high resistance to cavitation erosion, which result in its wide use as a valve seat material. It is ideally suited for a variety of hardfacing processes. The weld deposits of the Oxford Alloy #6 Bare are smooth and normally acquire mirror-like finish in use. The deposits retain wear resistance at high temperatures. This alloy is nonmagnetic and is not forgeable. It can be machined with carbide tools. Oxford Alloy #6 Bare bonds well with weldable alloy steels, including stainless.

AWS Chemical Composition

C	Co	Cr	W	Mn	Si	Mo
0.9-1.4	Bal	26-32	3.0-6.0	1.0 max	2.0 max	1.0 max
Ni	**Fe**	**OET**				
3.0 max	3.0 max	0.50 max				

TYPICAL MECHANICAL PROPERTIES
Hardness: 23-47 HRC

Note: The typical hardness values listed above are for multilayer welds. Hardness values for single deposits will be lower because of dilution from the base metal.

Oxford Alloy® #12 BARE

SPECIFICATIONS
AWS 5.21
ASME SFA 5.21

CLASSIFICATIONS
AWS ERCoCr-B
UNS R30012

DESCRIPTION / APPLICATION
Oxford Alloy #12 Bare is a non-ferrous, cobalt-chromium-tungsten alloy. This filler metal is recommended for metal–to-metal abrasion involving high temperature and/or corrosive media with moderate impact. Oxford Alloy #12 Bare weld deposits are smooth and it acquires a high polish in use. This alloy is nonmagnetic and is not forgeable. It can be machined with difficulty using carbide tools. Oxford Alloy #12 Bare bonds well with weldable alloy steels, including stainless.

AWS Chemical Composition

C	Co	Cr	W	Mn	Si	Ni
1.2-1.7	Bal	26-32	7.0-9.5	1.0 max	2.0 max	3.0 max
Mo	**Fe**	**OET**				
1.0 max	3.0 max	0.50 max				

TYPICAL MECHANICAL PROPERTIES
Hardness: 34-47 HRC

Note: The typical hardness values listed above are for multilayer welds. Hardness values for single deposits will be lower because of dilution from the base metal.

Oxford® ALLOYS, Inc.
Supplier of Welding Alloys

Cobalt Bare Electrodes

Oxford Alloy® #21 BARE

SPECIFICATIONS
AWS 5.21
ASME SFA 5.21

CLASSIFICATIONS
AWS ERCoCr-E
UNS R30021

DESCRIPTION / APPLICATION
Oxford Alloy #21 Bare is a low carbon, molybdenum strengthened, cobalt-chromium alloy. This filler metal is recommended for metal-to-metal abrasion and high impact applications involving high temperatures and/or corrosive media. Some typical applications are valves of all kinds, shear blades, hot punches and saw guides. Oxford Alloy #21 Bare is also used as hot die material because of its high temperature strength and stability. Its inherent resistance to galling (under self-mated conditions), cavitation erosion, and corrosion resistance have made it a popular fluid valve seat-facing alloy. The weld deposits of the Oxford Alloy #21 Bare are smooth and normally acquire mirror-like finish in use. The deposits retain wear resistance at high temperatures. This alloy is nonmagnetic and is not forgeable. It can be machined with carbide tools. Oxford Alloy #21 Bare bonds well with weldable alloy steels, including stainless.

AWS Chemical Composition

C	Co	Cr	Mo	Ni	Mn	Si
0.15-0.45	Bal	25-30	4.5-7.0	1.5-4.0	1.5 max	1.5 max
W	**Fe**	**OET**				
0.50 max	3.0 max	0.50 max				

TYPICAL MECHANICAL PROPERTIES
Hardness: 20-35 HRC

Note: The typical hardness values listed above are for multilayer welds. Hardness values for single deposits will be lower because of dilution from the base metal.

Oxford® ALLOYS, Inc.
Supplier of Welding Alloys

Cobalt Metal Cored Wire

Oxford Alloy® #6M

SPECIFICATIONS
AWS 5.21
ASME SFA 5.21

CLASSIFICATIONS
AWS ERCCoCr-A
UNS W73036

DESCRIPTION / APPLICATION
Oxford Alloy #6M is an alloy-cored wire for GMAW applications. This is the most widely used cobalt alloy having excellent resistance to many forms of mechanical and chemical degradation over a wide temperature range. Some attributes of the Oxford Alloy #6M are its outstanding self mated anti-galling properties, high temperature hardness and high resistance to cavitation erosion. Oxford Alloy #6M should be welded with direct current reverse polarity requiring proper preheat, controlled interpass temperatures and cooling rates. Some power supplies are used to reduce penetration and base metal dilution. Crack free deposits up to two layers. Some applications that the Oxford Alloy #6M is used for are flights of extrusion screws, sinker roll bushings in steel mills, soaking pit tong bits, and shafts.

AWS Chemical Composition

C	Mn	Si	Cr	W	Fe	Ni
0.7-1.4	2.0 max	2.0 max	25-32	3.0-6.0	5.0 max	3.0 max
Co	**Mo**	**OET**				
Bal	1.0 max	1.0 max				

TYPICAL MECHANICAL PROPERTIES
Rockwell Hardness: 23-47 HRC

Note: The typical hardness values listed above are for multilayer welds. Hardness values for single deposits will be lower because of dilution from the base metal.

Oxford Alloy® #21M

SPECIFICATIONS
AWS 5.21
ASME SFA 5.21

CLASSIFICATIONS
AWS ERCCoCr-E
UNS W73041

DESCRIPTION / APPLICATION
Oxford Alloy #21M is an alloy-cored wire for GMAW applications with excellent high temperature strength making it suitable for use on hot dies. The deposits of this alloy are inherently resistant to galling, cavitation erosion, and corrosion. Abrasion resistance of the Oxford Alloy #21M is lower than other wires but its impact strength at high temperatures; anti-galling properties and corrosion resistance are outstanding. Oxford Alloy #21M should be welded with direct current reverse polarity requiring proper preheat, interpass temperatures and controlled cooling to minimize or produce a crack free deposit. Some applications that the Oxford Alloy #21M is used for are fluid valve seats, tube mill piercing plugs, hot shears, erosion shields, and forging dies.

AWS Chemical Composition

C	Mn	Si	Cr	Mo	Fe	Ni
0.15-0.40	2.0 max	1.5 max	25-30	4.5-7.0	5.0 max	1.5-4.0
Co	**W**	**OET**				
Bal	0.50 max	1.0 max				

TYPICAL MECHANICAL PROPERTIES
Rockwell Hardness: 20-35 HRC

Note: The typical hardness values listed above are for multilayer welds. Hardness values for single deposits will be lower because of dilution from the base metal.

Titanium and Zirconium TIG Wire

Oxford Alloy® Ti-1

SPECIFICATIONS
AWS 5.16
ASME SFA 5.16

CLASSIFICATIONS
AWS ERTi-1
UNS R50100

DESCRIPTION / APPLICATION
Oxford Alloy ERTi-1 can be welded by the gas tungsten arc, plasma arc, and gas metal arc processes. The procedures and equipment are generally similar to those used for welding stainless steel or aluminum. Titanium and titanium alloys are extremely reactive above 1000 ℉. Additional precautions, exceeding those required during the welding of austenitic stainless steel or aluminum alloys, must be taken to shield the weld and hot root side of the joint from air. In welding titanium or titanium alloys, only argon and helium, and occasionally a mixture of these two gases, are used for shielding. The filler metal composition is usually matched to the grade of titanium being welded. The filler metal and the base metal should be meticulously cleaned at the time of welding. Grease and oil accumulated during forming and machining must also be removed before welding to avoid weld contamination.

AWS Chemical Composition

C	O	H	N	Fe	Ti	
0.03 max	0.03-0.10	0.005 max	0.012 max	0.08 max	Bal	

TYPICAL MECHANICAL PROPERTIES

Tensile strength:	34,800 psi	240 MPa
Yield strength:	24,650 psi	170 MPa
Elongation:	24%	

Oxford Alloy® Ti-2

SPECIFICATIONS
AWS 5.16
ASME SFA 5.16

CLASSIFICATIONS
AWS ERTi-2
UNS R50120

DESCRIPTION / APPLICATION
Oxford Alloy ERTi-2 can be welded by the gas tungsten arc, plasma arc, and gas metal arc processes. The procedures and equipment are generally similar to those used for welding stainless steel or aluminum. Titanium and titanium alloys are extremely reactive above 1000 ℉, however, additional precautions, exceeding those required during the welding of austenitic stainless steel or aluminum alloys, must be taken to shield the weld and hot root side of the joint from air. In welding titanium or titanium alloys, only argon and helium, and occasionally a mixture of these two gases, are used for shielding. The filler metal composition is usually matched to the grade of titanium being welded. The filler metal and the base metal should be meticulously cleaned at the time of welding. Grease and oil accumulated during forming and machining must also be removed before welding to avoid weld contamination.

AWS Chemical Composition

C	O	H	N	Fe	Ti	
0.03 max	0.08-0.16	0.008 max	0.015 max	0.12 max	Bal	

TYPICAL MECHANICAL PROPERTIES

Tensile strength:	50,025 psi	345 MPa
Yield strength:	39,875 psi	275 MPa
Elongation:	20%	

Oxford Alloy® Ti-5 (6Al-4V)

SPECIFICATIONS
AWS 5.16
ASME SFA 5.16

CLASSIFICATIONS
AWS ERTi-5
UNS R56400

DESCRIPTION / APPLICATION
Oxford Alloy ERTi-5 can be welded by the gas tungsten arc, plasma arc, and gas metal arc processes. The procedures and equipment are generally similar to those used for welding stainless steel or aluminum. Titanium and titanium alloys are extremely reactive above 1000 ℉, however, additional precautions, exceeding those required during the welding of austenitic stainless steel or aluminum alloys, must be taken to shield the weld and hot root side of the joint from air. In welding titanium or titanium alloys, only argon and helium, and occasionally a mixture of these two gases, are used for shielding. The filler metal composition is usually matched to the grade of titanium being welded. The filler metal and the base metal should be meticulously cleaned at the time of welding. Grease and oil accumulated during forming and machining must also be removed before welding to avoid weld contamination.

AWS Chemical Composition

C	O	H	N	Al	V	Fe
0.05 max	0.12-0.20	0.015 max	0.030 max	5.5-6.7	3.5-4.5	0.22 max
Ti						
Bal						

TYPICAL MECHANICAL PROPERTIES

Tensile strength:	129,775 psi	895 MPa
Yield strength:	120,350 psi	830 MPa
Elongation:	10%	

Oxford® ALLOYS, Inc.
Supplier of Welding Alloys

Titanium and Zirconium TIG Wire

Oxford Alloy® Ti-7

SPECIFICATIONS
AWS 5.16
ASME SFA 5.16

CLASSIFICATIONS
AWS ERTi-7
UNS R52401

DESCRIPTION / APPLICATION
Oxford Alloy ERTi-7 can be welded by the gas tungsten arc, plasma arc, and gas metal arc processes. The procedures and equipment are generally similar to those used for welding stainless steel or aluminum. Titanium and titanium alloys are extremely reactive above 1000 ℉, however, additional precautions, exceeding those required during the welding of austenitic stainless steel or aluminum alloys, must be taken to shield the weld and hot root side of the joint from air. In welding titanium or titanium alloys, only argon and helium, and occasionally a mixture of these two gases, are used for shielding. The filler metal composition is usually matched to the grade of titanium being welded. The filler metal and the base metal should be meticulously cleaned at the time of welding. Grease and oil accumulated during forming and machining must also be removed before welding to avoid weld contamination.

AWS Chemical Composition						
C	**O**	**H**	**N**	**Fe**	**Pd**	**Ti**
0.03 max	0.08-0.16	0.008 max	0.015 max	0.12 max	0.12-0.25	Bal

TYPICAL MECHANICAL PROPERTIES

Tensile strength:	50,025 psi	345 MPa
Yield strength:	39,875 psi	275 MPa
Elongation:	20%	

Oxford Alloy® ZR 702 (Zirconium)

SPECIFICATIONS
AWS 5.24
ASME SFA 5.24

CLASSIFICATIONS
AWS ERZr2
UNS R60702

DESCRIPTION / APPLICATION
Oxford Alloy ERZR-2 is most widely used in the chemical processing industry. It is used in chemical processes that require alternate contact with strong acids and alkalis. Some of the major areas that Oxford Alloy ERZR-2 is used include heat exchangers, stripper columns, reactor vessels, pumps, valves, and corrosive media piping. This alloy has excellent corrosion resistance to many chemical solutions. It also has excellent resistance to corrosive attack in most organic and mineral acids, strong alkalis, and some molten salts. Oxford Alloy ERZR-2 can be machined, welded and fabricated using the same equipment and processes used in fabrication of stainless steel, nickel-based alloys and titanium. This alloy is most commonly welded by the gas tungsten arc welding (GTAW) technique. Other welding methods include metal arc gas welding (MAGW), plasma arc welding, electron beam welding and resistance welding. Oxford Alloy ERZR-2 cannot be welded directly to most other structural metals; the exceptions are titanium, vanadium and niobium.

AWS Chemical Composition						
Zr+Hf	**Hf**	**Fe+Cr**	**H**	**N**	**C**	**O**
99.01 min	4.5 max	0.20 max	0.005 max	0.025 max	0.05 max	0.16 max

TYPICAL MECHANICAL PROPERTIES

Tensile strength:	54,955 psi	379 MPa
Yield strength:	30,015 psi	207 MPa
Elongation:	16%	

Mechanical properties listed above are at room temperature (cold worked and annealed). *Bend test are not applicable to material over 0.187 in. (4.75mm) in thickness.

Bronze and Copper TIG & MIG Wire

Oxford Alloy® Aluminum Bronze A-2

SPECIFICATIONS
AWS 5.7
ASME SFA 5.7

CLASSIFICATIONS
AWS ERCuAl-A2
UNS C61800

DESCRIPTION / APPLICATION
Oxford Alloy ERCuAl-A2 is used to weld and join many ferrous and nonferrous metals and combinations of dissimilar metals. These metals include the more weldable grades of cast iron, high and low carbon steels, copper, bronzes and copper-nickel alloys. This alloy contains an additive to inhibit inter-granular stress corrosion cracking. This is particularly important when welding on C61300 and C61400 base metal. Some applications include building up bearing surfaces, joining and fabricating copper alloys, overlaying for resistance to corrosion and erosion and general maintenance and repair welding.

AWS Chemical Composition						
Cu+Ag	**Al**	**Fe**	**Si**	**Zn**	**Pb**	**OET**
Bal	8.5-11.0	1.5 max	0.10 max	0.02 max	0.02 max	0.50 max

TYPICAL MECHANICAL PROPERTIES

Tensile strength:	79,025 psi	545 MPa
Yield strength:	34,945 psi	241 MPa
Elongation:	28%	

Oxford Alloy® Deoxidized Copper

SPECIFICATIONS
AWS 5.7
ASME SFA 5.7

CLASSIFICATIONS
AWS ERCu
UNS C18980

DESCRIPTION / APPLICATION
Oxford Alloy Deoxidized Copper was an alloy developed to provide dense, high quality deposits with relatively high electrical conductivity for use in joining and overlay with the inert-gas processes. This alloy is primarily used to fabricate deoxidized copper and to weld repair copper castings with the gas metal-arc and gas tungsten-arc processes. It may also be used to weld galvanized steel and deoxidized copper to mild steel where high strength joints are not required. Proper shielding gas selection is one of the most important single factors to consider when welding with copper-base alloys. In most cases, 100% argon or 100% helium will provide best results.

AWS Chemical Composition						
Cu+Ag	**P**	**Sn**	**Pb**	**Mn**	**Si**	**Al**
98.0 min	0.15 max	1.0 max	0.02 max	0.50 max	0.50 max	0.01 max
OET						
0.50 max						

TYPICAL MECHANICAL PROPERTIES

Tensile strength:	29,000 psi	200 MPa
Yield strength:	7,975 psi	55 MPa
Elongation:	29%	

Oxford Alloy® Low Fuming Bronze

SPECIFICATIONS
AWS 5.8
ASME SFA 5.8

CLASSIFICATIONS
AWS RBCuZn-C
UNS C68100

DESCRIPTION / APPLICATION
Oxford Alloy Low Fuming Bronze is a general purpose oxya-cetylene brazing rod used for steel, copper alloys, cast iron, nickel alloys and stainless steel. The balanced chemical analysis of copper and zinc as well as alloying elements of tin, iron, manganese and silicon produce weld deposits with excellent mechanical properties. High strength, ductile and sound weld deposits are easy attained simply by applying a neutral or slightly oxidizing flame. Oxford Alloy Low Fuming bronze has a low silicon content, which keep fumes to a minimum.
This alloy also is available in a flux coated tig.

AWS Chemical Composition						
Cu	**Mn**	**Sn**	**Pb**	**Fe**	**Si**	**Zn**
56.0-60.0	0.01-0.50	0.80-1.10	0.05 max	0.25-1.20	0.04-0.15	Bal
Al	**OET**					
0.01 max	0.50 max					

TYPICAL MECHANICAL PROPERTIES

Tensile strength:	56,115 psi	387 MPa

Oxford® ALLOYS, Inc.
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Bronze & Copper TIG & MIG Wire

Oxford Alloy® Silicon Bronze

SPECIFICATIONS
AWS 5.7
ASME SFA 5.7

CLASSIFICATIONS
AWS ERCuSi-A
UNS C65600

DESCRIPTION / APPLICATION
Oxford Alloy Silicon Bronze is used for the welding of copper, copper-silicon, and copper-zinc base metals to themselves, and also to steel. This filler metal is also used to weld on coated steels. Oxford Alloy Silicon Bronze can be used to surface areas subject to corrosion.

AWS Chemical Composition

Cu+Ag	Zn	Sn	Mn	Fe	Si	Al
Bal	1.0 max	1.0 max	1.5 max	0.50 max	2.8-4.0	0.01 max
Pb	**OET**					
0.02 max	0.50 max					

TYPICAL MECHANICAL PROPERTIES
Tensile strength: 50,750 psi 350 MPa

Aluminum TIG & MIG Wire

Oxford Alloy® 4043

SPECIFICATIONS
AWS A5.10
ASME SFA 5.10

CLASSIFICATIONS
AWS ER4043
UNS A94043

DESCRIPTION / APPLICATION
Oxford Alloy ER4043 is a 5% silicon aluminum. This alloy is recommended for welding 3003, 3004, 5052, 6061, 6063 and casting alloys 43, 355, 356 and 214. Oxford Alloy 4043 has a melting range of 1065 - 1170℉ and a density of .097 lbs./cu. in. The post-anodizing color tint of the weld area is gray.

AWS Chemical Composition

Si	Fe	Cu	Mn	Mg	Zn	Ti
4.5-6.0	0.8 max	0.30 max	0.05 max	0.05 max	0.10 max	0.20 max
Al	**OEE**	**OET**				
Bal	0.05 max	0.15 max				

TYPICAL MECHANICAL PROPERTIES

Tensile strength:	27,115 psi	187 MPa
Yield strength:	18,125 psi	125 MPa
Elongation:	8%	

Oxford Alloy® 5356

SPECIFICATIONS
AWS A5.10
ASME SFA 5.10

CLASSIFICATIONS
AWS ER5356
UNS A95356

DESCRIPTION / APPLICATION
Oxford Alloy 5356 is a 5% magnesium aluminum filler metal. The weld deposit of this filler metal offers good corrosion resistance when exposed to salt water. This alloy is commonly used on base metals 5050, 5052, 5083, 5356, 5454 and 5456. The post-anodizing color tint of the weld area is white.

AWS Chemical Composition

Si	Fe	Cu	Mn	Mg	Cr	Zn
0.25 max	0.40 max	0.10 max	0.05-0.20	4.5-5.5	0.05-0.20	0.10 max
Ti	**Al**	**OEE**	**OET**			
0.06-0.20	Bal	0.05 max	0.15 max			

TYPICAL MECHANICAL PROPERTIES

Tensile strength:	39,005 psi	269 MPa
Yield strength:	19,140 psi	132 MPa
Elongation:	17%	

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Stainless Steel Welding Parameters

Typical Welding Parameters for Stainless Steel SMAW (Electrodes)				
Diameter of Rod		Voltage (V)	Amperage (A)	
Inches	Millimeters		Flat	Vertical & Overhead
3/32	2.4	24-28	70-85	65-75
1/8	3.2	26-30	85-110	80-90
5/32	4.0	28-32	110-140	100-120
3/16	4.8	28-32	120-160	110-130

Typical Welding Parameters of Stainless Steel TIG, MIG and SAW					
Process	Diameter of Wire		Voltage (V)	Amperage (A)	Shielding Gas
	Inches	Millimeters			
TIG (GTAW)	.035	0.9	12 - 15	60 - 90	100% Argon
	.045	1.14	13 - 16	80 - 110	
	1/16	1.6	14 - 18	90 - 130	
	3/32	2.4	15 - 20	120 - 175	
	1/8	3.2	15 - 20	150 - 220	
MIG (GMAW)	.035	0.9	26 - 29	150 - 180	99% Argon / 1% Oxygen or 97% Argon / 3% CO_2
	.045	1.14	28 - 32	180 - 220	
	1/16	1.6	29 - 33	200 - 250	
Sub-Arc (SAW)	3/32	2.4	28 - 30	275 - 350	Suitable Flux
	1/8	3.2	29 - 32	350 - 450	
	5/32	4.0	30 - 33	400 - 550	

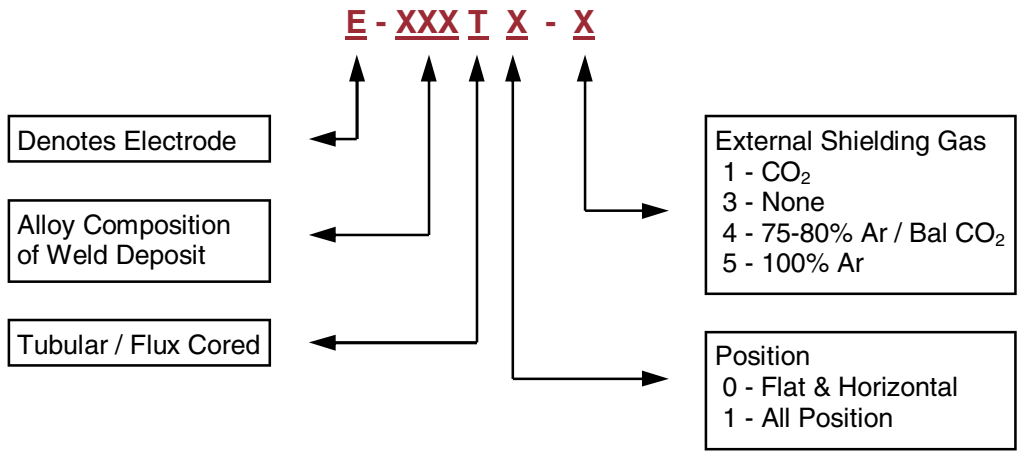
Stainless Steel Flux Cored Wire Welding Parameters

TYPICAL WELDING PARAMETERS FOR STAINLESS STEEL FLUX CORED												
Diameter	.035" 0.9mm				.045" 1.14mm				1/16" 1.6mm			
Amperage	100	120	140	170	130	165	190	220	170	210	250	300
Voltage	23	23	25	26	25	26	28	30	25	27	28	29
Wire Feed Speed in/min	265	315	405	530	227	341	445	567	154	193	243	321
Deposition Rate lbs/hr	2.9	3.4	4.6	5.7	4.25	6.14	8.08	10.24	5.34	6.89	8.57	11.43
% Efficiency	83.9	81.4	82.6	81.8	84.0	83.0	84.0	84.0	83.0	82.5	83.0	83.0

The ESO (Electrical Stick Out) is 1/2" - 1". DCEP (Electrode Positive) is specified. When using 75% Argon / 25% CO_2 mixture, decrease voltage by as much as 2 volts.

AWS CLASSIFICATION OF FLUX CORED WIRE

AWS A5.22



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Nickel Alloy Welding Parameters

Typical Welding Parameters for Nickel Alloy SMAW (Electrodes)				
Diameter of Rod		Voltage (V)	Amperage (A)	
Inches	Millimeters		Flat	Vertical & Overhead
3/32	2.4	24-28	70-85	65-75
1/8	3.2	26-30	85-110	80-90
5/32	4.0	28-32	110-140	100-120
3/16	4.8	28-32	120-160	110-130

Typical Welding Parameters of Nickel Alloy Bare Wire					
Process	Diameter of Wire		Voltage (V)	Amperage (A)	Shielding Gas
	Inches	Millimeters			
GTAW (TIG)	.035	0.9	12 - 15	60 - 90	100% Argon
	.045	1.14	13 - 16	80 - 110	
	1/16	1.6	14 -18	90 - 130	
	3/32	2.4	15 - 20	120 - 175	
	1/8	3.2	15 - 20	150 - 220	
GMAW (MIG)	.035	0.9	26 - 29	150 - 190	75 % Argon/ 25% Helium Or 100% Argon
	.045	1.14	28 - 32	180 - 220	
	1/16	1.6	29 - 33	200 - 250	
SAW (Sub-Arc)	3/32	2.4	28 - 30	275 - 350	Suitable Flux
	1/8	3.2	29 - 32	350 - 450	
	5/32	4.0	30 - 33	400 - 550	

Typical Welding Parameters for Nickel Alloy FCAW						
Diameter of Wire		Voltage (V)	Amperage (A)	Wire Feed Speed (ipm)	Wire Extension in (mm)	Shielding Gas
Inches	Millimeters					
.045	1.14	25-26	150-200	290-400	1/2 (12)	75% Ar -25% Co_2 or 100% Co_2
1/16	1.6	26-27	200-250	190-275	1/2 (12)	

Mild & Low Alloy Steel Welding Parameters

Typical Welding Parameters of Mild Steel & Low Alloy SMAW (Electrodes)				
Diameter of Rod		Voltage (V)	Amperage (A)	
Inches	Millimeters		Flat	Vertical & Overhead
3/32	2.4	21 – 25	65 – 80	65 – 75
1/8	3.2	21 – 25	90 – 110	80 – 95
5/32	4.0	21 – 26	135 – 160	120 – 140
3/16	4.8	22 – 26	160 – 210	140 – 160

Typical Welding Parameters of Mild & Low Alloy TIG, MIG and SAW					
Process	Diameter of Wire		Voltage (V)	Amperage (A)	Shielding Gas
	Inches	Millimeters			
TIG (GTAW)	.035	0.9	10 – 12	50 – 70	100% Argon
	.045	1.14	10 – 12	70 – 100	
	1/16	1.6	12 – 15	100 – 125	
	3/32	2.4	15 – 20	125 – 175	
	1/8	3.2	15 – 20	175 – 250	
MIG (GMAW) Spray Transfer	.035	0.9	28 – 32	165 – 200	98% Argon + 2% Oxygen or 75% Argon + 25% CO^2
	.045	1.14	30 – 34	180 – 220	
	1/16	1.6	30 – 34	230 – 260	
MIG (GMAW) Short Circuiting Transfer	.035	0.9	22 – 25	100 – 140	100% CO^2
	.045	1.14	23 – 26	120 – 150	75% Argon + 25% CO^2

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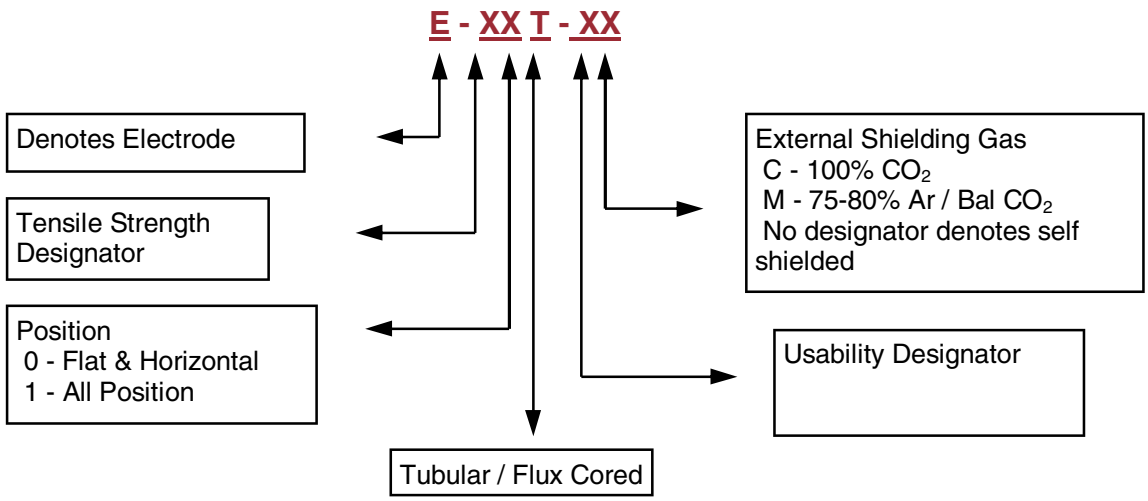
Mild & Low Alloy Steel Flux Cored Welding Parameters

Typical Welding Parameters of Mild & Low Alloy Steel FCAW (FLUX CORED)							
Diameter of Wire		FLAT		VERTICAL-UP		OVERHEAD	
Inches	Millimeters	Voltage (V)	Amperage (A)	Voltage (V)	Amperage (A)	Voltage (V)	Amperage (A)
.035	0.9	20-30	130-250	16-23	90-180	20-28	130-240
.045	1.14	23-30	150-280	22-26	150-250	24-29	150-250
1/16	1.6	25-34	180-400	21-27	180-300	24-30	180-310

AWS CLASSIFICATION OF FLUX CORED WIRE

AWS A5.20



Cobalt Welding Parameters

Typical Welding Parameters of Cobalt SMAW (Electrodes)		
Diameter of Rod		Amperage (A)
Inches	Millimeters	Flat
1/8	3.2	80 - 110
5/32	4.0	120 - 150
3/16	4.8	150 - 180
1/4	6.4	190 - 250

Typical Welding Parameters of Cobalt OAW				
Diameter of Wire		Tip Size	Flame	Position
Inches	Millimeters			
1/8	3.2	4	3X –4X	Flat
5/32	4.0	4	3X –4X	
3/16	4.8	5	3X –4X	
1/4	6.4	6	3X –4X	

Typical Welding Parameters of Cobalt GTAW & GMAW					
Process	Diameter of Wire		Voltage (V)	Amperage (A)	Shielding Gas
	Inches	Millimeters			
TIG (GTAW)	1/8	3.2	20 - 40	90 - 120	100% Argon
	5/32	4.0	20 - 40	120 - 140	
	3/16	4.8	20 - 40	140 - 160	
	1/4	6.4	20 - 40	160 - 180	
GMAW	.045	1.14	25 - 27	180 - 200	100% Argon
	1/16	1.6	26 - 28	280 –300	

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Titanium Welding Parameters

Typical Welding Parameters for Titanium Manual GTA Welding						
Diameter of Wire		Amperage (A)	Voltage (V)	Travel Speed (in./min.)	Deposition Rate (lb./h)	Shielding Gas
Inches	Millimeters					
1/16”	1.6	180	16	5 to 15	0.50 to 0.70	100% Argon
3/32”	2.4	190	17	5 to 15	0.80 to .90	100% Argon
1/8”	3.2	205	19	5 to 15	1.20 to 1.36	100% Argon

TITANIUM WELDING INFORMATION

Welding with titanium requires extreme cleanliness. Grind or file off mill scale. Clean surface oxides with a 35% nitric – 5 % hydrofluoric acid solution at room temperature, then rinse with water and air dry. Grease or oils should be cleaned with a nonchlorinated degreasing solvent, acetone or methanol. Light Oil can be washed away with a normal household detergent, then air-dried.

Titanium is a reactive metal and as such it is sensitive to embrittlement by oxygen, nitrogen, and hydrogen, within the weld zone area, at temperatures above 500℉. Consequently the weld metal must be protected against atmospheric contamination that may be caused by these elements. This can be most easily attained by holding the shielding gas over the weld area until it cools to approximately 600℉.

Argon is the recommended shielding gas, however an argon-helium mixture will give greater penetration although at the expense of arc stability.

Aluminum Welding Parameters

Typical Welding Parameters of Aluminum TIG & MIG Wire					
Process	Diameter of Wire		Voltage (V)	Amperage (A)	Shielding Gas
	Inches	Millimeters			
TIG (GTAW)	1/16	1.6		60-100	100% Argon
	3/32	2.4		125-160	
	1/8	3.2		180-240	
MIG (GMAW) Short Circuiting Transfer	.030	0.8	15-18	45-120	100% Argon
	.035	0.9	17-19	50-150	
	3/64	1.2	16-20	60-175	
MIG (GMAW) Spray Transfer	.030	0.8	22-28	90-150	100% Argon
	.035	0.9	22-28	100-175	
	3/64	1.2	22-28	120-210	
	1/16	1.6	24-30	160-300	

Table A2
Guide to the Choice of Filler Metal for General Purpose Welding

Base Metal	201.0 206.0 224.0	319.0, 333.0, 354.0, 355.0, C355.0	356.0, A356.0 357.0, A357.0 413.0, 443.0, A444.0	511.0, 512.0, 513.0, 514.0, 535.0	7004, 7005, 7039, 710.0, 712.0	6009 6010 6070	6005, 6061, 6063, 6101, 6151, 6201, 6351, 6951	5456	5454
1060, 1070, 1080, 1350	ER4145	ER4145	ER4043[a,b]	ER5356[c,d]	ER5356[c,d]	ER4043[a,b]	ER4043[b]	ER5356[d]	ER4043[b,d]
1100, 3003, Alc 3003	ER4145	ER4145	ER4043[a,b]	ER5356[c,d]	ER5356[c,d]	ER4043[a,b]	ER4043[b]	ER5356[d]	ER4043[b,d]
2014, 2036	ER4145[e]	ER4145[e]	ER4145	—	—	ER4145	ER4145	—	—
2219	ER2319[a]	ER4145[e]	ER4145[b,c]	ER4043	ER4043	ER4043[a,b]	ER4043[a,b]	—	ER4043[b]
3004, Alc 3004	—	ER4043[b]	ER4043[b]	ER5356[f]	ER5356[f]	ER4043[b]	ER4043[b,f]	ER5356[d]	ER5356[f]
5005, 5050	—	ER4043[b]	ER4043[b]	ER5356[f]	ER5356[f]	ER4043[b]	ER4043[b,f]	ER5356[d]	ER5356[f]
5052, 5652[i]	—	ER4043[b]	ER4043[f]	ER5356[f]	ER5356[f]	ER4043[b]	ER5356[c,f]	ER5356[f]	ER5356[f]
5083	—	—	ER5356[c,d]	ER5356[d]	ER5183[d]	—	ER5356[d]	ER5183[d]	ER5356[d]
5086	—	—	ER5356[c,d]	ER5356[d]	ER5356[d]	—	ER5356[d]	ER5356[d]	ER5356[d]
5154, 5254[i]	—	—	ER4043[f]	ER5356[f]	ER5356[f]	—	ER5356[f]	ER5356[f]	ER5356[f]
5454	—	ER4043[b]	ER4043[f]	ER5356[f]	ER5356[f]	ER4043[b]	ER5356[c,f]	ER5356[f]	ER5554[c,f]
5456	—	—	ER5356[c,d]	ER5356[d]	ER5556[d]	—	ER5356[d]	ER5556[d]	
6005, 6061, 6063 6101, 6151, 6201 6351, 6951	ER4145	ER4145[b,c]	ER4043[b, f, g]	ER5356[f]	ER5356[c,f]	ER4043[a,b,g]	ER4043[b,f,g]		
6009, 6010, 6070	ER4145	ER4145[b,c]	ER4043[a,b,g]	ER4043	ER4043	ER4043[a,b,g]			
7004, 7005, 7039 710.0, 712.0	—	ER4043[b]	ER4043[b,f]	ER5356[f]	ER5356[d]				
511.0, 512.0, 513.0 514.0, 535.0	—	—	ER4043[f]	ER5356[f]					
356.0, A356.0, 357.0 A357.0, 413.0 443.0, A444.0	ER4145	ER4145[b,c]	ER4043[b,h]						
319.0, 333.0 354.0, 355.0 C355.0	ER4145[c]	ER4145[b,c,h]							
201.0, 206.0, 224.0	ER2319[a,h]								

(continued)

Table A2 (Continued)

Base Metal	5154 5254[i]	5086	5083	5052 5652[i]	5005 5050	3004 Alc. 3004	2219	2014 2036	1100 3003 Alc. 3003	1060 1070 1080 1350
1060, 1070, 1080, 1350	ER5356[c,d]	ER5356[d]	ER5356[d]	ER4043[b,d]	ER1100[b,c]	ER4043[b,d]	ER4145[b,c]	ER4145	ER1100 [b,c]	ER1188[b,c,h,j]
1100, 3003, Alc 3003	ER5356[c,d]	ER5356[d]	ER5356[d]	ER4043[b,d]	ER1100[b,c]	ER4043[b,d]	ER4145[b,c]	ER4145	ER1100 [b,c]	
2014, 2036	—	—	—	—	ER4145	ER4145	ER4145[e]	ER4145[e]		
2219	ER4043	—	—	ER4043[b]	ER4043[a,b]	ER4043[a,b]	ER2319[a]			
3004, Alc 3004	ER5356[f]	ER5356[d]	ER5356[d]	ER5356[c,f]	ER5356[c,f]	ER5356[c,f]				
5005, 5050	ER5356[f]	ER5356[d]	ER5356[d]	ER5356[c,d]	ER5356[c,f]					
5052, 5652[i]	ER5356[f]	ER5356[d]	ER5356[d]	ER5654[c,f,i]						
5083	ER5356[d]	ER5356[d]	ER5183[d]							
5086	ER5356[d]	ER5356[d]								
5154, 5254[i]	ER5356[f,i]									

General Notes:

1. Service conditions such as immersion in fresh or salt water, exposure to specific chemicals, or a sustained high temperature (over 150°F [66°C]) may limit the choice of filler metals, Filler metals ER5183, ER5356, ER5556 are not recommended for sustained elevated temperature service.
2. Recommendations in this table apply to gas shielded arc welding processes. For oxyfuel gas welding, only ER1188, ER1100, ER4043, ER4047, and ER4145 filler metals are ordinarily used.
3. Where no filler metal is listed, the base metal combination is not recommended for welding.

Notes:

a. ER4145 may be used for some applications.
b. ER4047 may be used for some applications.
c. ER4043 may be used for some applications.
d. ER5183, ER5356, or ER5556 may be used.
e. ER2319 may be used for some applications. It can supply high strength when the weldment is postweld solution heat treated and aged.
f. ER5183, ER5356, ER5554, ER5556, and ER5654 may be used. In some cases, they provide: (1) improved color match after anodizing treatment, (2) highest weld ductility, and (3) higher weld strength. ER5554 is suitable for sustained elevated temperature service.
g. ER4643 will provide higher strength in 1/2 in. [12 mm] and thicker groove welds in 6XXX base alloys when postweld solution heat treated and aged.
h. Filler metal with the same analysis as the base metal is sometimes used. The following wrought filler metals possess the same chemical composition limits as cast filler alloys: ER4009 and R4009 as R-C355.0; ER4010 and R4010 as R-A356.0; and R4011 as R-A357.0.
i. Base metal alloys 5254 and 5652 are used for hydrogen peroxide service. ER5654 filler metal is used for welding both alloys for service temperatures below 150°F [66°C].
j. ER1100 may be used for some applications.

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AMS SPECIFICATION GUIDE

AMS NO.	GRADE	AMS NO.	GRADE
4182	5056 ALUMINUM	5778	ALLOY 69
4184	4145 ALUMINUM	5780	AM355
4185	4047 ALUMINUM	5782	19-9W MO (349)
4190	4043 ALUMINUM	5784	29CR-9NI (312)
4191	2319 ALUMINUM	5786	ALLOY W
4395	AZ92A MAGNESIUM	5787	ALLOY W COATED
4396	EZ33A MAGNESIUM	5789	COBALT 31
4701	COPPER ANNEALED	5794	N-155
4730	ALLOY 400	5796	L-605
4951	COMMERCIAL PURE TITANIUM	5798	ALLOY X
4953	5AL2.5 SN TITANIUM	5799	ALLOY X COATED
5954	6AL4V TITANIUM STANDARD	5800	ALLOY 41
4955	8AL-1MO-1V TITANIUM	5801	ALLOY 188
4956	6AL4V TITANIUM ELI	5804	A-286 STANDARD
5555	ALLOY 205	5813	WHP 15-7 STANDARD
5621	420	5817	GREEK ASCOLOY
5660	ALLOY 901	5821	410 STAINLESS STEEL MOD
5675	ALLOY 92	5823	JETHETE
5676	NICHROME V	5824	17-7PH
5679	ALLOY 62	5825	17-4PH
5680	347 STAINLESS STEEL	5827	630-15,16
5683	ALLOY 42	5828	WASPALOY®
5684	132	5832	ALLOY 718
5685	305 SAFETY WIRE	5836	ALLOY 82
5687	ALLOY 600	5837	ALLOY 625
5689	321 STAINLESS STEEL	5840	PH 1308 MO
5690	316 STAINLESS STEEL	6350	4130
5694	310 STAINLESS STEEL	6458	17-22-AS
5698	ALLOY X-750	6451	6130 PREMIUM
5774	AM350	6462	6130 STANDARD
5776	410 STAINLESS STEEL	6466	502

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DECIMAL AND MILLIMETER EQUIVALENTS

FRACTION	DECIMAL	MM	FRACTION	DECIMAL	MM
1/64	.0156	0.397	33/64	.5156	13.097
1/32	.0312	0.794	17/32	.5312	13.494
3/64	.0468	1.191	35/64	.5469	13.890
1/16	.0625	1.587	9/16	.5625	14.287
5/64	.0781	1.984	37/64	.5781	14.684
3/32	0.937	2.381	19/32	.5937	15.081
7/64	.1094	2.778	39/64	.6094	15.478
1/8	.1250	3.175	5/8	.6250	15.875
9/64	.1406	3.572	41/64	.6406	16.272
5/32	.1562	3.969	21/32	.6562	16.669
11/64	.1719	4.366	43/64	.6719	17.065
3/16	.1875	4.762	11/16	.6875	17.462
13/64	.2031	5.159	45/64	.7031	17.859
7/32	.2187	5.556	23/32	.7187	18.256
15/64	.2344	5.953	47/64	.7344	18.653
1 / 4	.2500	6.350	3 / 4	.7500	19.050
17/64	.2656	6.747	49/64	.7656	19.447
9/32	.2812	7.144	25/32	.7812	19.844
19/64	.2969	7.541	51/64	.7969	20.240
5/16	.3125	7.937	13/16	.8125	20.637
21/64	.3281	8.334	53/64	.8281	21.034
11/32	.3437	8.731	27/32	.8437	21.431
23/64	.3594	9.128	55/64	.8594	21.828
3/8	.3750	9.525	7/8	.8750	22.225
25/64	.3906	9.922	57/64	.8906	22.622
13/32	.4062	10.3190	29/32	.9062	23.019
27/64	.4219	10.7160	59/64	.9219	23.415
7/16	.4375	11.1130	15/16	.9375	23.812
29/64	.4531	11.5090	61/64	.9531	24.209
15/32	.4687	11.9060	31/32	.9687	24.604
31/64	.4844	12.3030	63/64	.9843	25.003
1 / 2	.5000	12.7000	1	1.00000	25.40

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GENERAL CONVERSION FACTORS FOR COMMON WELDING TERMS

PROPERTY	TO COVERT FROM	TO	MULTIPLY BY
area dimensions (mm^2)	$in.^2$	mm^2	$6.451\ 600 \times 10^{2}$
	mm^2	$in.^2$	$1.550\ 003 \times 10^{-3}$
current density	$A/in.^2$	A/mm^2	$1.550\ 003 \times 10^{-3}$
	A/mm^2	$A/in.^2$	$6.451\ 600 \times 10^{2}$
deposition rate (approximate conversion)	lb/h	kg/h	0.45
electrode force	pound-force	N	4.448 222
	kilogram-force	N	9.806 650
	N	lbf	$2.248\ 089 \times 10^{-1}$
flow rate (L/min)	ft^3/h	L/min	$4.719\ 475 \times 10^{-1}$
	gallon per hour	L/min	$6.309\ 020 \times 10^{-2}$
	gallon per minute	L/min	3.785 412
	L/min	ft^3/h	2.118 880
heat input	J/in.	J/m	$3.937\ 008 \times 10$
	J/m	J/in.	$2.540\ 000 \times 10^{-2}$
impact energy	foot pound force	J	1.355 818
linear measurements	in.	mm	$2.540\ 000 \times 10$
	ft	mm	$3.048\ 000 \times 10^{2}$
	mm	in.	$3.937\ 008 \times 10^{-2}$
	mm	ft	$3.280\ 840 \times 10^{-3}$
power density	$W/in.^2$	W/m^2	$1.550\ 003 \times 10^{3}$
pressure (gas and liquid)	W/mm^2	W/m^2	$6.451\ 600 \times 10^{-4}$
	psi	Pa	$6.894\ 757 \times 10^{-3}$
	lb/ft^2	Pa	$4.788\ 026 \times 10$
	N/mm^2	Pa	$1.000\ 000 \times 10^{6}$
	kPa	psi	$1.450\ 377 \times 10^{-1}$
	kPa	lb/ft^2	$2.088\ 543 \times 10$
	kPa	N/mm^2	$1.000\ 000 \times 10^{-3}$
	torr (mm Hg at 0°C)	kPa	$1.333\ 22 \times 10^{-1}$
	Micron (µm Hg at 0°C)	kPa	$1.333\ 22 \times 10^{-4}$
	kPa	torr	$7.500\ 64 \times 10$
	kPa	micron	$7.500\ 64 \times 10^{3}$
tensile strength (MPa)	psi	kPa	6.894 757
	lb/ft^2	kPa	$4.788\ 026 \times 10^{-2}$
	N/mm^2	MPa	1.000 000
	MPa	psi	$1.450\ 377 \times 10^{2}$
	MPa	lb/ft^2	$2.088\ 543 \times 10^{4}$
	MPa	N/mm^2	1.000 000
thermal conductivity (W/(m · K)	Cal/(cm · s · °C)	W/(m · K)	$4.184\ 000 \times 10^{2}$
travel speed, wire feed speed (mm/s)	in./mm	mm/s	$4.233\ 333 \times 10^{-1}$
	mm/s	in./min	2.362 205

GENERAL CONVERSION FACTORS FOR COMMON ENGINEERING TERMS

PROPERTY	TO COVERT FROM	TO	MULTIPLY BY
acceleration (angular)	revolution per minute squared	rad/s^2	$1.745\ 329 \times 10^{-3}$
acceleration (linear)	in./min.2	m/s^2	$7.055\ 556 \times 10^{-6}$
	ft/min^2	m/s^2	$8.466\ 667 \times 10^{-5}$
	ft/s^2	m/s^2	$3.048\ 000 \times 10^{-1}$
area	$in.^2$	m^2	$6.451\ 6000 \times 10^{-4}$
	ft^2	m^2	$9.290\ 304 \times 10^{-2}$
	yd^2	m^2	$8.361\ 274 \times 10^{-1}$
	acre (U.S. Survey)	m^2	$4.046\ 873 \times 10^{3}$
density	pound mass per cubic inch	kg/m^3	$2.767\ 990 \times 10^{4}$
energy, work, heat, and impact energy	foot pound force	J	1.355 818
	Btu	J	$1.054\ 350 \times 10^{3}$
	calorie	J	4.187 000
	watt hour	J	$3.600\ 000 \times 10^{3}$
force	kilogram-force	N	9.806 650
	pound-force	N	4.448 222
length	in.	m	$2.540\ 000 \times 10^{-2}$
	ft	m	$3.048\ 000 \times 10^{-1}$
	yd	m	$9.144\ 000 \times 10^{-1}$
	mile (U.S. Survey)	km	1.609 347
mass	pound mass (avdp)	kg	$4.535\ 924 \times 10^{-1}$
	metric ton	kg	$1.000\ 000 \times 10^{3}$
	ton (short 2000 lbm)	kg	$9.071\ 847 \times 10^{2}$
power	horsepower (550 ft lbf/s)	W	$7.456\ 999 \times 10^{2}$
	horsepower (electric)	W	$7.460\ 000 \times 10^{2}$
	Btu/min	W	$1.757\ 250 \times 10$
	calorie per minute	W	$6.973\ 333 \times 10^{-2}$
	foot pound-force per minute	W	$2.259\ 697 \times 10^{-2}$
pressure	pound force per square inch	kPa	6.894 757
	bar	kPa	$1.000\ 000 \times 10^{2}$
	atmosphere	kPa	$1.013\ 250 \times 10^{2}$
tensile strength (stress)	ksi	MPa	6.894 757
torque	inch pound force	$N \cdot m$	$1.129\ 848 \times 10^{-1}$
	foot pound force	$N \cdot m$	1.355 818
velocity (angular)	revolution per minute	rad/s	$1.047\ 198 \times 10^{-1}$
	degree per minute	rad/s	$2.908\ 882 \times 10^{-4}$
	revolution per minute	deg/min	$3.600\ 000 \times 10^{2}$
velocity (linear)	in./min	m/s	$4.233\ 333 \times 10^{-4}$
	ft/min	m/s	$5.080\ 000 \times 10^{-3}$
	mile/hour	km/h	1.609 344
volume	$in.^3$	m^3	$1.638\ 706 \times 10^{-5}$
	ft^3	m^3	$2.831\ 685 \times 10^{-2}$
	yd^3	m^3	$7.645\ 549 \times 10^{-1}$
	in^3	L	$1.638\ 706 \times 10\_^{2}$
	ft^3	L	$2.831\ 685 \times 10$
	gallon	L	3.785 412

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NOTES