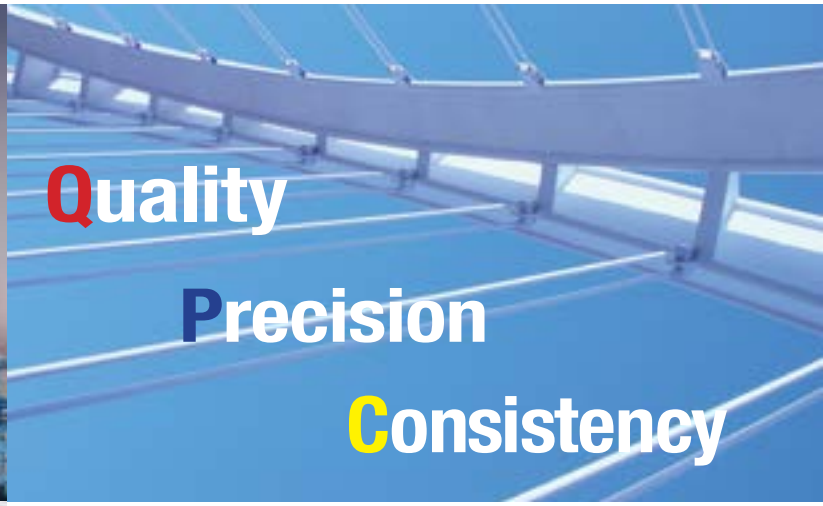
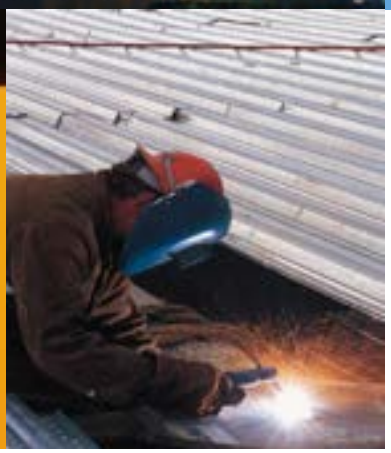
AMERICAN FILLER METALS





Stainless Steel Wire

Flux Cored Wire

Nickel

QUALITY WELDING ALLOYS

6015 Murphy Street, Houston, TX 77033, USA (T) 1.713.649.8785 (F) 1.713.644.9628

AMERICAN FILLER METALS

• Real People • Real Service • Real Fast

Get Your Quality Filler Metal

American Filler Metals' manufacturing capabilities allow us to provide a wider variety of options with regards to cut lengths, spool sizes and diameter of wires than many of our competitors.

E71T-1 **E71T-GS** **Nickel**

STS FCW **STS Wires**

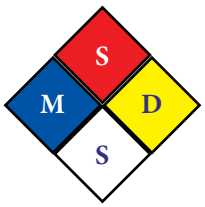
Made In USA Products

Call us today!

Toll Free: 1.800.394.4550

Telephone: 1.713.649.8785

Fax: 1.713.644.9628



Material
Safety
Data
Sheet

Important Notice for All Users of This Book

The information contained herein is intended for ***general information only*** and ***not for specification purposes***. ***American Filler Metals Company*** presents all the technical information, data and applications to permit you to make your own evaluations and decisions, and is not to be mistaken as expressed or implied warranties for these or other applications.

American Filler Metals Company assumes no liability for results or damages incurred from the use of any information contained herein, in whole or in part.

Click to Download

AFM ERTi-1

AWS/SFA A5.16

Description:

AFM ERTi-1 (Grade 1) is the lowest strength unalloyed (or Commercially Pure-CP) grade.

Applications:

AFM ERTi-1 (Grade 1) is used in applications where ductility is paramount, such as explosive cladding, loose linings, expanded metal, and deep drawing applications.
It is also used in electrolytic applications like coated anode substrates for production of chlorine and sodium chlorate.
** ERTi-1 is no longer recommended for Grade 2 in structural applications.*

Chemical Composition Requirements (%):

C	O	N	H	Fe
0.03	0.03 ~ 0.10	0.012	0.005	0.08
Al	V	Pd	Ru	Ni
-	-	-	-	-

* All values are considered maximum, unless otherwise noted.

Standard Sizes:

0.030”	0.035”	0.045”	1/16”	3/32”	1/8”	5/32”
0.8 mm	0.9 mm	1.2 mm	1.6 mm	2.4 mm	3.2 mm	4.0 mm

AFM ERTi-2

AWS/SFA A5.16

Description:

AFM ERTi-2 (Grade 2) is the "workhorse" of the industrial corrosion market and most common unalloyed (or Commercially Pure-CP) grade.
It is generally the most readily available in all product forms and has the lowest cost.

Applications:

AFM ERTi-2 (Grade 2) is used for process equipment like pressure vessels, columns, tanks, heat exchangers, shafts, blowers and fans, condenser tubing, valves. fittings. and pipe.chlorate.

** ERTi-2 is no longer recommended for Grade 3 in structural applications.*

Chemical Composition Requirements (%):

C	O	N	H	Fe
0.03	0.08 ~ 0.16	0.015	0.008	0.12
Al	V	Pd	Ru	Ni
-	-	-	-	-

* All values are considered maximum, unless otherwise noted.

Standard Sizes:

0.030"	0.035"	0.045"	1/16"	3/32"	1/8"	5/32"
0.8 mm	0.9 mm	1.2 mm	1.6 mm	2.4 mm	3.2 mm	4.0 mm

AFM ERTi-5

AWS/SFA A5.16

Description:

AFM ERTi-5 (Grade 5, Ti 6Al-4V), commonly called "6-4," is the most common and widely used alloy grade due to its relatively low cost and good availability.
It has a UTS of 130,000 psi [895 MPa] minimum, good weldability, and can be heat treated to a higher strength or toughness.

Applications:

AFM ERTi-5 (Grade 5) is used in aircraft components such as landing gear, wing spars, and compressor blades.
Its corrosion resistance is generally comparable to Grade 2 and it is often used in corrosion service where higher strength is required, particularly in shafts, high strength bolting, and keys.
Also its high strength, ability to be heat treated, weldability, excellent fatigue strength, and hardness make this alloy excellent for industrial fans, pressure vessels, aircraft components, compressor blades, and automotive and jet engine parts.

Chemical Composition Requirements (%):

C	O	N	H	Fe
0.05	0.12 ~ 0.20	0.03	0.015	0.22
Al	V	Pd	Ru	Ni
5.5 ~ 6.75	3.5 ~ 4.5	-	-	-

* All values are considered maximum, unless otherwise noted.

Standard Sizes:

0.030"	0.035"	0.045"	1/16"	3/32"	1/8"	5/32"
0.8 mm	0.9 mm	1.2 mm	1.6 mm	2.4 mm	3.2 mm	4.0 mm

AFM ERTi-7

AWS/SFA A5.16

Description:

AFM ERTi-7 (Grade 7) has the same mechanical properties as **ERTi-2** (Grade 2).
The 0.12 wt % palladium addition improves corrosion performance under mildly reducing conditions or where crevice or under-deposit corrosion is a problem.

Applications:

AFM ERTi-7 (Grade 7) can be considered for welding **ERTi-2** (Grade 2) or 16 where improved corrosion performance is desired.
This alloy extends the use of titanium into mildly reducing media, to much higher chloride levels, or where the environment fluctuates between oxidizing and reducing.

Chemical Composition Requirements (%):

C	O	N	H	Fe
0.03	0.08 ~ 0.16	0.015	0.008	0.12
Al	V	Pd	Ru	Ni
-	-	0.12 ~ 0.25	-	-

* All values are considered maximum, unless otherwise noted.

Standard Sizes:

0.030”	0.035”	0.045”	1/16”	3/32”	1/8”	5/32”
0.8 mm	0.9 mm	1.2 mm	1.6 mm	2.4 mm	3.2 mm	4.0 mm

AFM ERTi-23

AWS/SFA A5.16

Description:

AFM ERTi-23 (Grade 23, Ti 6Al-4V) is comparable in chemical composition to Grade 5, but slightly lower aluminum and lower levels of oxygen and other interstitial elements improve fabricability, weldability, and toughness.

Applications:

AFM ERTi-23 (Grade 23) is used in many high strength industrial applications such as shafts where very high strength, but better toughness and fabricability than Grade 5 is desired.
This grade is often specified for marine and offshore energy production components that are exposed to low temperature seawater due to higher fracture toughness values than Grade 5.
With special processing, this alloy can develop high fracture toughness.
Primary uses are in surgical implants, cryogenic vessels, and airframe components.
** ERTi-23 (Grade 23) was classified "ERTi-5ELI" formerly.*
ELI = Extra Low Interstitial

Chemical Composition Requirements (%):

C	O	N	H	Fe
0.03	0.03 ~ 0.11	0.012	0.005	0.20
Al	V	Pd	Ru	Ni
5.5 ~ 6.5	3.5 ~ 4.5	-	-	-

* All values are considered maximum, unless otherwise noted.

Standard Sizes:

0.030"	0.035"	0.045"	1/16"	3/32"	1/8"	5/32"
0.8 mm	0.9 mm	1.2 mm	1.6 mm	2.4 mm	3.2 mm	4.0 mm

Welding Considerations

Titanium and ***Titanium Alloys*** can be welded by gas tungsten arc. gas metal arc. plasma arc. and electron beam welding processes.
Titanium is a reactive metal and is sensitive to emhrittlement by oxygen, nitrogen, and hydrogen, at elevated temperatures.
Consequently, the metal must be protected from atmospheric contamination.
This can be provided by shielding the metal with welding grade inert gas as specified in A WS A5.32/A5.32M, *Specification for Welding Shielding Gases*, for classes SG-A or SG-He or by having mixtures of these single shielding gas classes surrounding the arc as molten or solidified hot weld metal.
Welding can also be done remotely in a chamber or in a glove hag.
These chambers can be purged of air and back filled with inert gas, or, if they are rigid gas tight walls, can, be evacuated to at least 10^{-4} torr [0.01 3 Pa] to remove any air contaminants.

During arc welding, the titanium should be shielded from the ambient air atmosphere until it has cooled below 800°F [430°C].
Adequate protection by auxiliary inert gas shielding can be provided when welding is being performed in ambient air atmosphere.
Ventilation and exhaust at the arc must be carried out in such a manner that the protective inert gas shielding (arc shielding, trailing shielding, or root shielding) is not impaired.

The titanium metal should be free of thick oxide and be chemically clean prior to welding, as contamination from oxide, water, grease, or dirt will also cause embrittlement.

Titanium welding rods should be chemically dean and free of heavy oxide, absorbed moisture, grease, and dirt.
If the hot end of the filler metal is removed from the gas shield prior to cooling and then reused, it contributes to weld contamination.
The welding rod should be added by a technique that keeps the hot end within the torch gas blanket.
If the rod tip becomes contaminated, the discolored end should be cut off before reusing.

Titanium can be successfully fusion welded to zirconium, tantalum, niobium, and vanadium, although the weld metal will be stronger and less ductile than the parent metals.
Titanium should not be fusion welded to other commonly welded metals such as copper, iron, nickel, and aluminum, as brittle titanium intennetallic alloys are formed which produce extremely brittle welds.

Specification Cross Index - Including Discontinued Titanium Electrodes

Filler Metal								Base Metal
AWS Classfication				UNS Numbers	Aerospace Materials Specification	ISO Classfication[a]	Japan JIS Z3331[b]	ASTM/ ASME Grades
2007	2004	1990	1970					
ERTi-1	ERTi-1	ERTi-1	ERTi-1	R50100	4951	STi-0100	YTx 28	1
ERTi-2	ERTi-2	ERTi-2	ERTi-2	R50120	-	STi-0120	YTx-35	2
ERTi-3	ERTi-3	ERTi-3	ERTi-3	R50125	-	STi-0125	YTx 49	3
ERTi-4	ERTi-4	ERTi-4	ERTi-4	R50130	-	STi-0130	-	4
ERTi-5	ERTi-5	ERTi-5	ERTi-6Al-4V	R56402	4954	STi-6402[c]	YTAx 640	5
ERTi-7	ERTi-7	ERTi-7	ERTi-0.2Pd	R52401	-	STi-2401	YTx 49Pd	7
ERTi-9[e]	ERTi-9ELI[d]	ERTi-9ELI	ERTi-3Al-2.5V-1	R56321	-	STi-6321	-	N/A
ERTi-11	ERTi-11	-	-	R52251	-	STi-2251	Ytx 28 Pd, YTx35 PD	11
ERTi-12	ERTi-12	ERTi-12	-	R53401	-	STi-3401	-	12
ERTi-13	ERTi-13	-	-	R53423	-	STi-3423	-	13
ERti-14	ERTi-14	-	-	R53424	-	STi-3424	-	14
ERT--15A	ERTi-15A	-	-	R53416	-	STi-3416	-	15
ERTi-16	ERTi-16	-	-	R52403	-	STi-2403	-	16
ERTi-17	ERTi-17	-	-	R52253	-	STi-2253	-	17
ERTi-18	ERTi-18	-	-	R56326	-	STi-6326	-	18
ERTi-19	-	-	-	R58641	-	STi-8641[c]	-	19
ERTi-20	-	-	-	R58646	-	STi-8646[c]	-	20
ERTi-21	-	-	-	R58211	-	STi-8211[c]	-	21
ERTi-23	ERTi-23	ERTi-5ELI	ERTi-6Al-4V-1	R56408	4956	STi-6408	YTAx 640E	23
ERTi-24	ERTi-24	-	-	R56415	-	STi-6415	-	24
ERTi-25	ERTi-25	-	-	R56413	-	STi-6413	-	25
ERTi-26	ERTi-26	-	-	R52405	-	STi-2405	-	26
ERTi-27	ERTi-27	-	-	R52255	-	STi-2255	-	27
ERTi-28	ERTi-28	-	-	R56324	-	STi-6324	-	28
ERTi-29	ERTi-29	-	-	R56414	-	STi-6414	-	29
ERTi-30	ERTi-30	-	-	R53531	-	STi-3531	-	30

(Continued)

Specification Cross Index - Including Discontinued Titanium Electrodes

Filler Metal								Base Metal
AWS Classfication				UNS Numbers	Aerospace Materials Specification	ISO Classfication[a]	Japan JIS Z3331[b]	ASTM/ ASME Grades
2007	2004	1990	1970					
ERTi-31	ERTi-31	-	-	R53533	-	STi-3533	-	31
ERTi-32	ERTi-32	-	-	R55112	-	STi-5112	-	32
ERTi-33	ERTi-33	-	-	R53443	-	STi-3443	-	33
ERTi-34	ERTi-34	-	-	R53444	-	STi-3444	-	34
ERTi-36	-	-	-	R58451	-	STi-4841[c]	-	36
ERTi-38	-	-	-	R54251	-	STi-5451[c]	-	38
-	Discontinued	ERTi-6	ERTi-5Al-2.5Sn	R54522	4953	STi-5631	YTAx 525	-
-	Discontinued	ERTi-6ELI	ERTi-5Al-2.5Sn-1	R54523	-	STi-5631	-	-
-	Discontinued	ERTi-9	ERTi-3Al-2.5V	R56320	-	STi-6320	YTAx 325	9
-	Discontinued	ERTi-15	ERTi-6Al-2Cb-1Ta-1Mo	R56210	-	STi-5621	-	-
-	Discontinued		ERTi-8Al-1Mo-1V	-	-	-	-	-
-	Discontinued		ERTi-13V-11Cr-3Al	-	-	-	-	-

[a] The International system for Ti filler metal specifications has been published as ISO 24034:2005.
Welding Consumables - Solid wires and rods for fusion welding of titanium and titanium alloys - Classification.
The four-digit numbers in most instances are truncatcd from the five-digit UNS R-series numbers.
[b] The "x" designates the filler metal form, B = rods, W = wire.
[c] These designation numbers have been proposed for addition to ISO 24034:2005.
[d] Renamed ERTi-9 in this edition.
[e] The 2007 ERTi-9 composition ha" been specifically designed for welding Grade 9.
It replaces the lower interstitial levels of the previous ERTi-9ELI.

Guide to Choice of Filler Metal for General Titanium Welding

ASTM Base Metal Grade	Base Metal		Normal Compoosition	Recommended Filler Metal	Alternate Filler Metals	Comments
	UTS (min.) ksi [MPa]	YS (min.) ksi [MPa]				
1	35 [240]	20 [138]	Ti (unalloyed)	ERTi-1	-	-
2	50 [345]	40 [275]	Ti (unalloyed)	ERTi-2	-	ERTi-1 is no longer recommended for Grade 2 in structural applications
2H	58 [400]	40 [275]	Ti (unalloyed)	ERTi-2	-	Identical to Grade 2 except for higher tensile stength
3	65 [450]	55 [380]	Ti (unalloyed)	ERTi-3	-	ERTi-2 is no longer recommended for Grade 3 in structural application
4	80 [550]	70 [483]	Ti (unalloyed)	ERTi-4	-	-
5	130 [895]	120 [828]	Ti 6Al-4V	ERTi-5	-	-
6	-	-	-	NA[a]	-	-
7	50 [345]	40 [275]	Ti 0.15Pd	ERTi-7	-	-
7H	58 [400]	40 [275]	Ti 0.15Pd	ERTi-7	-	Identical to Grade 7 except for higher tensile strength
-	-	-	-	NA[a]	-	-
9	90 [620]	70 [483]	Ti 3Al-2.5V	ERTi-9	-	-
-	-	-	-	NA[a]	-	-
11	35 [240]	20 [138]	Ti 0.15Pd	ERTi-11		-
12	70 [483]	50 [345]	Ti 0.8Ni-0.3Mo	ERTi-12		-
13	40 [275]	25 [170]	Ti 0.5Ni-0.05Ru	ERTi-13		-
14	60 [410]	40 [275]	Ti 0.5Ni-0.05Ru	ERTi-14		-
15	70 [483]	55 [380]	Ti 0.5Ni-0.05Ru	ERTi-15A		"A" suffix used to distinguish from obsolete ERTi-5 composition
16	50 [345]	40 [275]	Ti 0.05Pd	ERTi-16	ERTi-7	ERTi-7 provide comparable mechanical properties and equal or better corrosion resistance
16H	58 [400]	40 [275]	Ti 0.05Pd	ERTi-16		Identical to Grade 16 except for higher tensile strength
17	35 [240]	20 [138]	Ti 0.05Pd	ERTi-17		ERTi-11 provides comparable mechanical properties and equal or better corrosion resistance
18	90 [620]	70 [483]	Ti 3Al-2.5V ELI-0.05Pd	ERTi-18		
19	115 [793]	110 [759]	Ti 3Al-8V-6Cr-4Zr-4Mo	ERTi-19		

(Continued)

Guide to Choice of Filler Metal for General Titanium Welding

ASTM Base Metal Grade	Base Metal UTS (min.) ksi [MPa]	Base Metal YS (min.) ksi [MPa]	Normal Compoosition	Recommended Filler Metal	Alternate Filler Metals	Comments
20	115 [793]	110 [759]	Ti 3Al-8V-6Cr-4Zr-4Mo-0.05Pd	ERTi-20	-	-
21	115 [793]	110 [759]	Ti 3Al-15Mo-2.5Nb-0.2Si	ERTi-21	-	-
-	-	-	-	NA[a]	-	-
23	120 [828]	110 [759]	Ti 6Al-4V ELI	ERTi-23	-	-
24	130 [895]	120 [828]	Ti 6Al-4V-0.05Pd	ERTi-24	-	-
25	130 [895]	120 [828]	Ti 6Al-4V-0.5Ni-0.5Pd	ERTi-25	-	-
26	50 [345]	40 [275]	Ti 0.10Ru	ERTi-26	ERTi-7	ERTi-7 provides comparable mechanical properties and equal or better corrosion resistance
26H	58 [400]	40 [275]	Ti 0.10Ru	ERTi-26	ERTi-7	Identical to Grade 26 except for higher tensile strength
27	35 [240]	20 [138]	Ti 0.10Ru	ERTi-27	ERTi-1	ERTi-11 provides comparable mechanical properties and equal or better corrosion resistance
28	90 [620]	70 [483]	Ti 3Al-2.5V ELI-0.10Ru	ERTi-28	ERTi-18	ERTi-18 provides comparable mechanical properties and comparable corrosion resistance
29	120 [828]	110 [759]	Ti 6Al-4VELI-0.10Ru	ERTi-29	-	-
30	50 [345]	40 [275]	Ti 0.3Co-0.05Pd	ERTi-30	-	-
31	65 [450]	55 [380]	Ti 0.3Co-0.05Pd	ERTi-31	-	-
32	100 [689]	85 [586]	Ti 5Al-1Sn-1Zr-1V-0.8Mo	ERTi-32	-	-
33	50 [345]	40 [275]	Ti 0.4Ni-0.015Pd-0.015Ru-0.14Cr	ERTi-33	-	-
34	65 [450]	55 [380]	Ti 0.4Ni-0.015Pd-0.015Ru-0.14Cr	ERTi-34	-	-
35	-	-	-	NA[a]	-	-
36	65 [450]	60 [410]	Ti 45Nb	ERTi-36	-	-
37	-	-	-	NA[a]	-	-
38	130 [895]	115 [794]	Ti 4Al-2.5V-1.5Fe	ERTi-38	-	-

[a] Either there is no current ASTM Grade or no corresponding AWS Filler Metal Grade.
Note: Properties in solution treated condition. Material is normally purchased in this condition and heat treated as required.

Chemical Composition Requirements for Titanium and Titanium-Alloy Electrodes and Rods

AWS Classfication	UNS Number[e]	Weight Percent[a,b,c,d]											
		C	O	N	H	Fe	Al	V	Pd	Ru	Ni	Other Elements	Amount
ERTi-1	R50100	0.03	0.03-0.10	0.012	0.005	0.08	-	-	-	-	-		
ERTi-2	R50120	0.03	0.08-0.16	0.015	0.008	0.12	-	-	-	-	-		
ERTi-3	R50125	0.03	0.13-0.20	0.02	0.008	0.16	-	-	-	-	-		
ERTi-4	R50130	0.03	0.18-0.32	0.025	0.008	0.25	-	-	-	-	-		
ERTi-5	R56402	0.05	0.12-0.20	0.03	0.015	0.22	5.5-6.75	3.5-4.5	-	-	-		
ERTi-7	R52401	0.03	0.08-0.16	0.015	0.008	0.12	-	-	0.12-0.25	-	-		
ERTi-9[f]	*R56321*	*0.03*	*0.06-0.12*	*0.012*	*0.005*	*0.20*	*2.5-3.5*	*2.0-3.0*	-	-	-		
ERTi-11	R52251	0.03	0.03-0.10	0.012	0.005	0.08	-	-	0.12-0.25	-	-		
ERTi-12	R53401	0.03	0.08-0.16	0.015	0.008	0.15	-	-	-	-	0.6-0.9	Mo	0.2-0.4
ERTi-13	R53423	0.03	0.03-0.10	0.012	0.005	0.08	-	-	-	0.04-0.06	0.4-0.6		
ERTi-14	R53424	0.03	0.08-0.16	0.015	0.008	0.12	-	-	-	0.04-0.06	0.4-0.6		
ERTi-15A	R53416	0.03	0.13-0.20	0.02	0.008	0.16	-	-	-	0.04-0.06	0.4-0.6		
ERTi-16	R52403	0.03	0.08-0.16	0.015	0.008	0.12	-	-	0.04-0.08	-	-		
ERTi-17	R52253	0.03	0.03-0.10	0.012	0.005	0.08	-	-	0.04-0.08	-	-		
ERTi-18	R56326	0.03	0.06-0.12	0.012	0.005	0.20	2.5-3.5	2.0-3.0	0.04-0.08	-	-		
ERTi-19	*R58641*	*0.03*	*0.06-0.10*	*0.015*	*0.015*	*0.20*	*3.0-4.0*	*7.5-8.5*	-	-	-	*Mo* *Cr* *Zr*	*3.5-4.5* *5.5-6.5* *3.5-4.5*
ERTi-20	*R58646*	*0.03*	*0.06-0.10*	*0.015*	*0.015*	*0.20*	*3.0-4.0*	*7.5-8.5*	*0.04-0.08*	-	-	*Mo* *Cr* *Zr*	*3.5-4.5* *5.5-6.5* *3.5-4.5*
ERTi-21	*R58211*	*0.03*	*0.10-0.15*	*0.012*	*0.005*	*0.20-0.40*	*2.5-3.5*	-	-	-	-	*Mo* *Nb* *Si*	*14.0-16.0* *2.2-3.2* *0.15-0.25*
ERTi-23	R56408	0.03	0.03-0.11	0.012	0.005	0.20	5.5-6.5	3.5-4.5	-	-	-		
ERTi-24	R56415	0.05	0.12-0.20	0.03	0.015	0.22	5.5-6.75	3.5-4.5	0.04-0.08	-	-		
ERTi-25	R56413	0.05	0.12-0.20	0.03	0.015	0.22	5.5-6.75	3.5-4.5	0.04-0.08	-	0.3-0.8		
ERTi-26	R52405	0.03	0.08-0.16	0.015	0.008	0.12	-	-	-	0.08-0.14	-		
ERTi-27	R52255	0.03	0.03-0.10	0.012	0.005	0.08	-	-	-	0.08-0.14	-		
ERTi-28	R56324	0.03	0.06-0.12	0.012	0.005	0.20	2.5-3.5	2.0-3.0	-	0.08-0.14	-		
ERTi-29	R56414	0.03	0.03-0.11	0.012	0.005	0.20	5.5-6.5	3.5-4.5	-	0.08-0.14	-		
ERTi-30	R53531	0.03	0.08-0.16	0.015	0.008	0.12	-	-	0.04-0.08	-	-	Co	0.20-0.80
ERTi-31	R53533	0.03	0.13-0.20	0.02	0.008	0.16	-	-	0.04-0.08	-	-	Co	0.20-0.80

(Continued)

Chemical Composition Requirements for Titanium and Titanium-Alloy Electrodes and Rods

AWS Classfication	UNS Number[e]	Weight Percent[a,b,c,d]											
		C	O	N	H	Fe	Al	V	Pd	Ru	Ni	Other Elements	Amount
ERTi-32	R55112	0.03	0.05-0.10	0.012	0.008	0.20	4.5-5.5	0.6-1.4	-	-	-	Mo	0.6-1.2
												Si	0.06-0.14
												Zr	0.6-1.4
												Sn	0.6-1.4
ERTi-33	R53443	0.03	0.08-0.16	0.15	0.008	0.12	-	-	0.01-0.02	0.02-0.04	0.35-0.55	Cr	0.1-0.2
ERTi-34	R53444	0.03	0.13-0.20	0.02	0.008	0.16	-	-	0.01-0.02	0.02-0.04	0.35-0.55	Cr	0.1-0.2
ERTi-36	*R58451*	*0.03*	*0.06-0.12*	*0.02*	*0.0035*	*0.03*	-	-	-	-	-	*Nb*	*42.0-47.0*
ERTi-38	*R54251*	*0.05*	*0.20-0.27*	*0.02*	*0.010*	*1.2-1.8*	*3.5-4.5*	*2.0-3.0*	-	-	-		

[a] Tiumium cunslilulc' the remainder of 1he composition.

[b] Single values are maximum.

[c] Analysis of Fe and the interstitial elements C, O, H. and N shall be conducted on samples of filler metal taken after the filler metal has been reduced to its final diameter and all processing operations have been completed.
Analysis of the other elements may be conducted on these same samples or it may have been conducted on samplestaken from the ingot or the rod stock from which the filler metal is made.
In case of dispute, samples from the finished filler metal shall be the refree method.

[d] Any element intentionally added (O, Fe, N, and C) must be measured and reported.
Residual elements, total, shall not exceed 0.20%, with no single element exceeding 0.05%, except for yttrium, which shall not exceed 0.005%.
Residual elements need not be reported unless specifically required by the purchaser.
A residual element is any element present in the metal in small quantities that is inherent in the sponge or scrap additions, but not intentionally added.
In titanium these elements include, among others, aluminum, vanadium, tin, chromium, molybdenum, niobium, zirconium, hafnium, bismuth, ruthenium, palladium, yttrium, copper, silicon, and cobalt.

[e] SAE HS-1086/ASTM DS-56, *Metals & Alloys in the Unified Numbering System*.

[f] ERTi-9 now conforms to the lower interstiltial levels of the previous classfication ERTi-9ELI (AWS A5.16/A5.16M:2004).