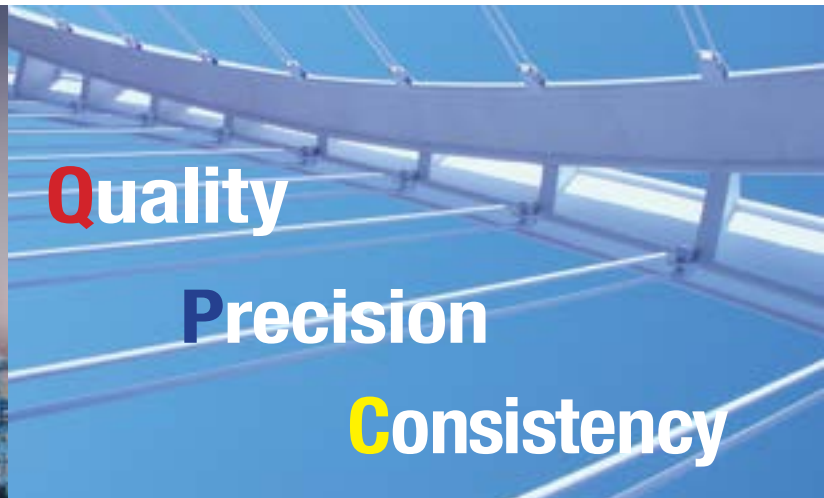




# AMERICAN FILLER METALS

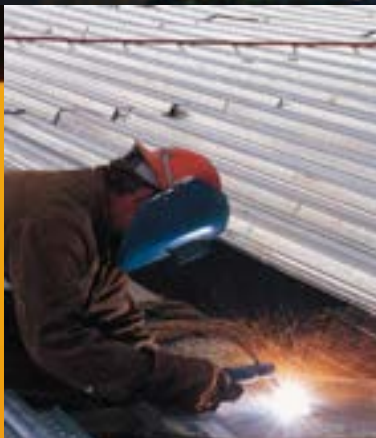
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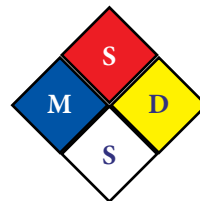
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# AMERICAN FILLER METALS

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### *For Carbon Steel*

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### *For Heat-Resisting Steel*

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### *For Low Alloy Steel*

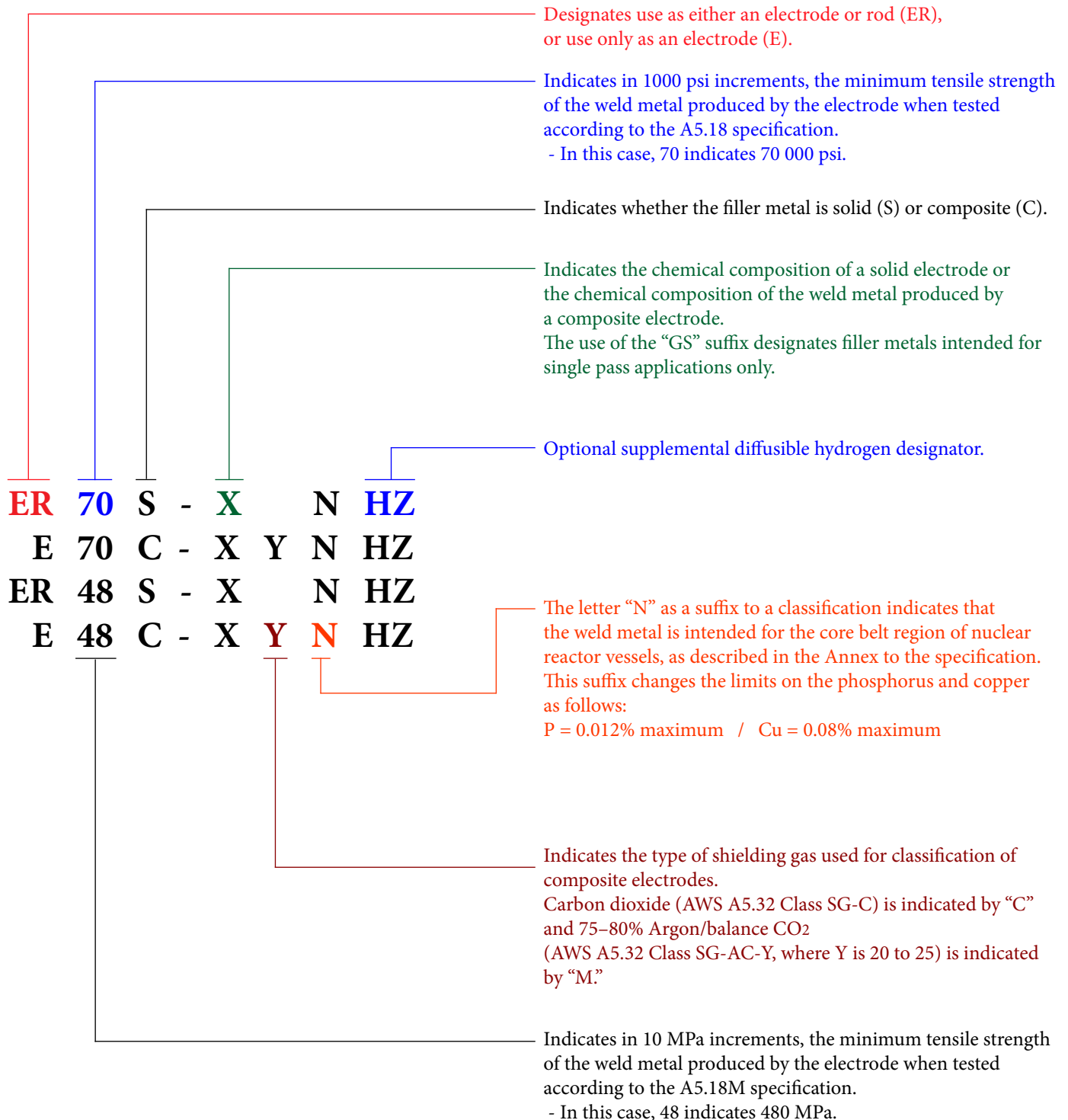
AFM Product	AWS Classification		Page
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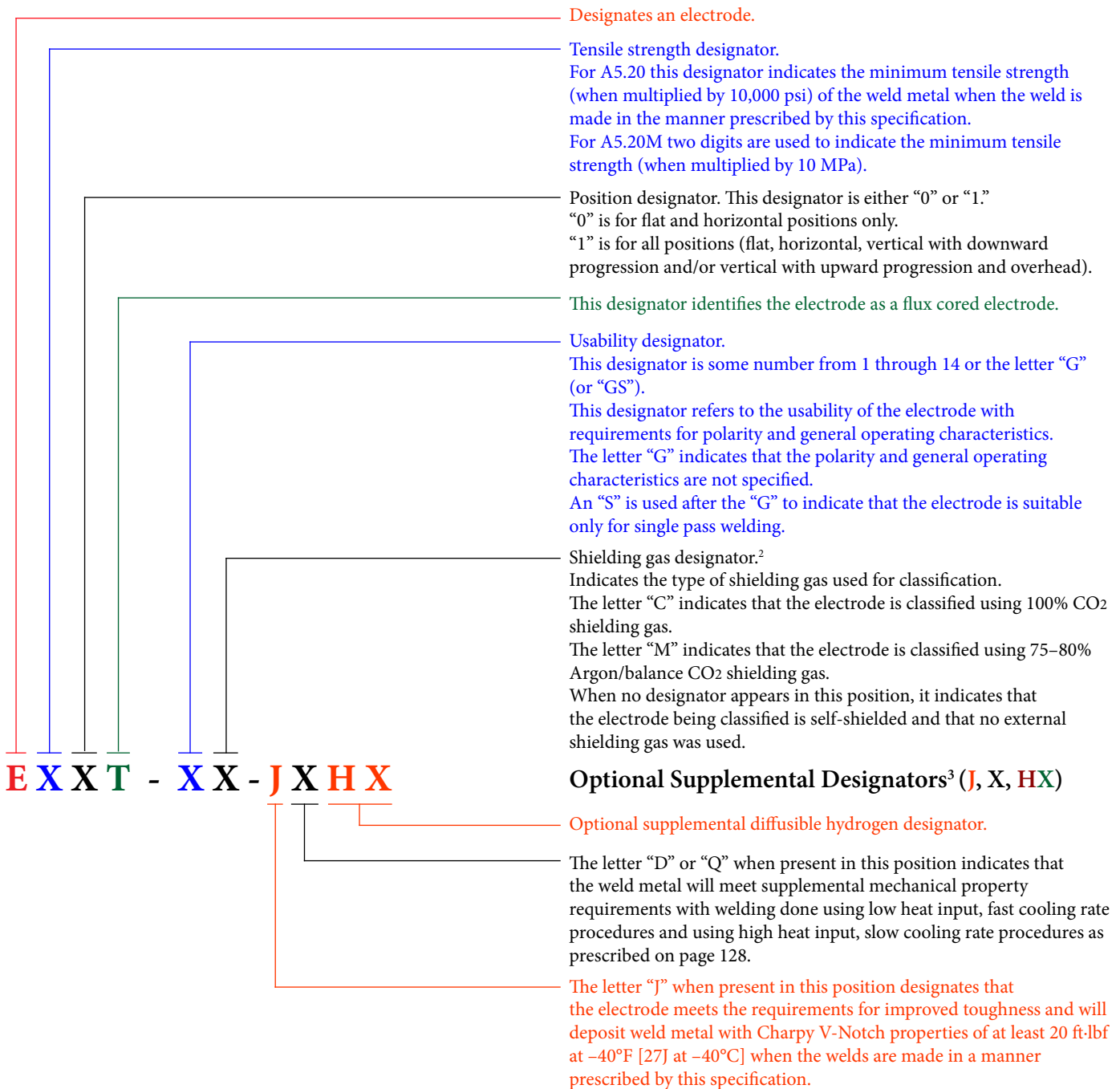


## Order of Mandatory Classification Designators AWS/SFA A5.18



## Order of Mandatory Classification Designators

AWS/SFA A5.20

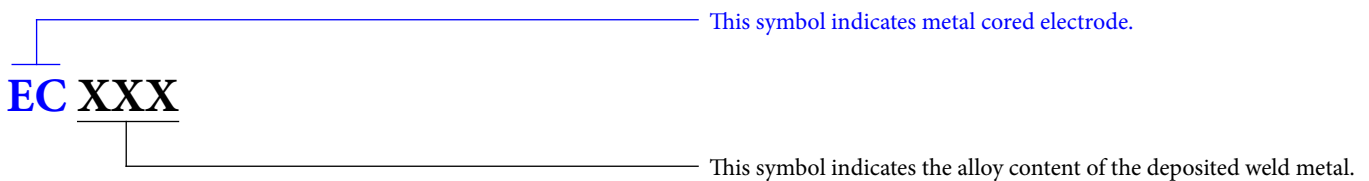
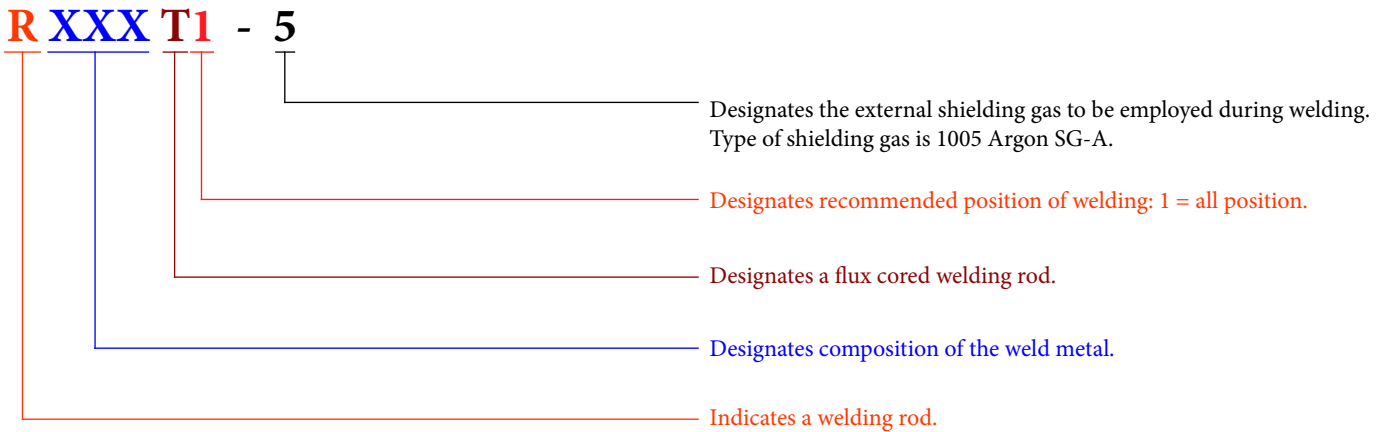
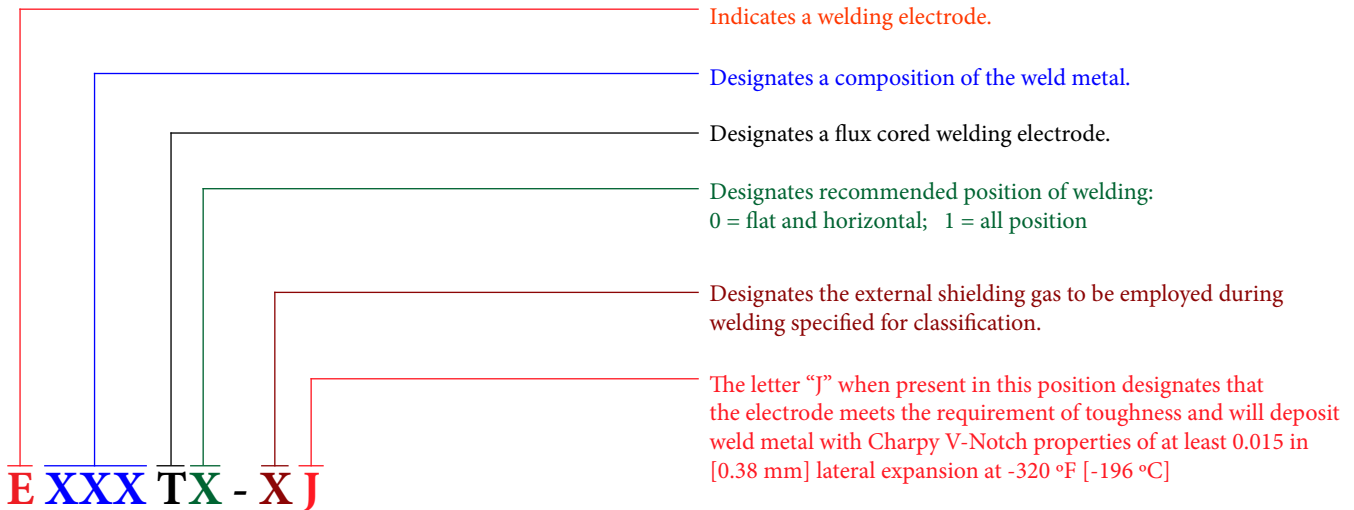


Notes:

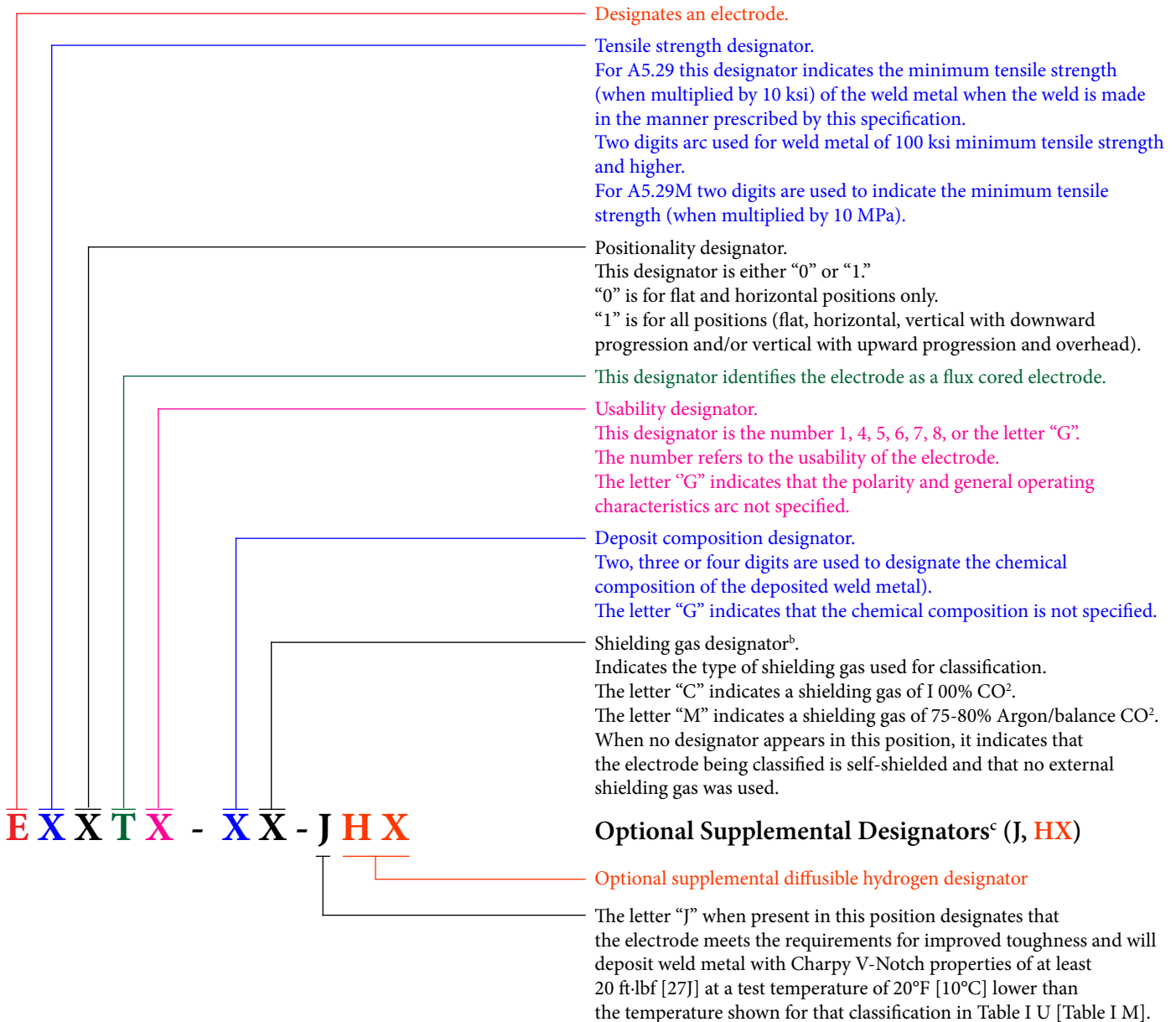
1. The combination of these designators constitutes the flux cored electrode classification.
2. See AWS A5.32/A5.32M.
3. These designators are optional and do not constitute a part of the flux cored electrode classification.

## Order of Mandatory Classification Designators

AWS/SFA A5.22



## Order of Mandatory Classification Designators AWS/SEA A5.29



**Notes:**

- The combination of these designators constitutes the flux cored electrode classification.  
Note that specific chemical compositions are not always identified with specific mechanical properties in the specification.  
A supplier is required by the specification to include the mechanical properties appropriate for a particular electrode in the classification of the electrode.  
Thus, for example, a complete designation is E80T5-Ni3. EXXT5-Ni3 is not a complete classification.
- See AWS A5.32/A5.32M, *Specification for Welding Shielding Gases*.
- These designators are optional and do not constitute a part of the flux cored electrode classification.



AWS A5.20/A5.20M:2005

### Diffusible Hydrogen Limits for Weld Metal<sup>a</sup>

Optional Supplemental Diffusible Hydrogen Designator <sup>b, c, d</sup>	Average Diffusible Hydrogen, Maximum <sup>e, f</sup> mL/100g Deposited Metal
H16	16.0
H8	8.0
H4	4.0

**Notes:**

- a. Limits on diffusible hydrogen when tested in accordance with AWS A4.3.
- b. See page 127.
- c. The lower diffusible hydrogen levels (H8 and H4) may not be available in some classifications.
- d. Electrodes which satisfy the diffusible hydrogen limit for the H4 designator also satisfy the limits for the H8 and H16 designators.  
Electrodes which satisfy the diffusible hydrogen limit for the H8 category also satisfy the limits for the H16 designator.
- e. These hydrogen limits are based on welding in air containing a maximum of 10 grains of water per pound [1.43 g/kg] of dry air.  
Testing at any higher atmospheric moisture level is acceptable provided these limits are satisfied.
- f. The maximum average diffusible hydrogen requirement for electrodes identified with the “Q” optional, supplemental designator shall be either 5.0 mL/100 g deposited metal or 8.0 mL/100 g deposited metal when testing according to the provisions of this specification.

AWS A5.20/A5.20M:2005

## Procedure Requirements for “D” and “Q” Optional Supplemental Designators

Optional Supplemental Designator	Procedure Heat Input (Fast or Slow Cooling Rate)	Preheat Temperature °F [°C]	Interpass Temperature °F [°C]	Heat Input Requirement for Any Single Pass	Required Average Heat Input for All Passes
<b>D</b>	low (fast cooling rate)	70° ± 25°F [20° ± 15°C]	200° ± 25°F [90° ± 15°C]	For electrode diameters < 3/32 in [2.4 mm]	
				33 kJ/in [1.3 kJ/mm] maximum	30 +2, -5 kJ/in [1.2 +0.1, -0.2 kJ/mm]
	high (slow cooling rate)	300° ± 25°F [150° ± 15°C]	500° ± 50°F [260° ± 25°C]	For electrode diameters ≥ 3/32 in [2.4 mm]	
				44 kJ/in [1.7 kJ/mm] maximum	40 +2, -5 kJ/in [1.6 +0.1, -0.2 kJ/mm]
<b>Q</b>	low (fast cooling rate)	70° ± 25°F [20° ± 15°C]	150°F max. [65°C max.]	33 kJ/in [1.3 kJ/mm] maximum	30 +2, -5 kJ/in [1.2 +0.1, -0.2 kJ/mm]
	high (slow cooling rate)	300° ± 25°F [150° ± 15°C]	300° ± 25°F [150° ± 15°C]	60 kJ/in [2.4 kJ/mm] minimum	70 +5, -2 kJ/in [2.8 +0.2, -0.1 kJ/mm]

Note:

a. Does not apply to first layer. The first layer may have one or two passes.

AWS A5.20/A5.20M:2005

## Mechanical Property Requirements for “D” and “Q” Optional Supplemental Designators

Optional Supplemental Designator	Tensile Test Requirements	Minimum Charpy V-Notch Requirements
<b>D</b>	58 ksi [400 MPa] min. yield strength 70 ksi [490 MPa] min. tensile strength 22% min. % elongation in 2 in [50 mm]	40 ft·lbf at +70°F [54] at +20°C (see Notes a, b)
	58 to 80 ksi [400–550 MPa] yield strength for high heat input, slow cooling rate test	
<b>Q</b>	90 ksi [620 MPa] max. yield strength for low heat input, fast cooling rate test	20 ft·lbf at –20°F [27] at –30°C (see Note d)
	22% min. % elongation in 2 in [50 mm] (see Note c)	

Notes:

- a. Five specimens are to be tested. The lowest and highest values obtained from each of five specimens from a single test plate shall be disregarded.  
Two of the remaining three values shall equal, or exceed, the specified toughness of 40 ft·lbf [54J] energy level at the testing temperature.  
One of the three may be lower, but not lower than 30 ft·lbf [41J], and the average of the three shall not be less than the required 40 ft·lbf [54J] energy level.
- b. The electrode shall also meet a minimum toughness requirement of 20 ft·lbf at 0°F [27] at –18°C] when tested according to the standard A5.20[A5.20M] classification test requirements.
- c. Tensile specimens shall not be aged when testing for the “Q” designator.
- d. Five specimens shall be tested. One of the five specimens may be lower than the specified 20 ft·lbf [27 J] energy level, but not lower than 15 ft·lbf [20 J], and the average of the five shall not be less than the required minimum 20 ft·lbf [27 J] energy level.

## AFM E70C-6M

AWS/SFA A5.18

AFM E70C-6M is designed for welding of 490MPa high tensile steel with only Ar + CO<sub>2</sub> mixtures. It is especially suitable for fillet welding and has a high tolerance to primer.

It is a metal type of flux cored wire for flat and horizontal position welding and provides excellent CVN toughness at low temperatures.

It features good penetration, high resistance to porosity, good wetting behaviour as well as low hydrogen contents.

AFM E70C-6M is intended for semi-automatic, automatic, single and multiple pass welding.

The shielding gas should be used Ar + 20 ~ 25% CO<sub>2</sub> for welding.

### Typical chemical composition of all-weld-metal (%):

Shielding Gas	75% ~ 85% Ar + Balance CO <sub>2</sub> or 100 % CO <sub>2</sub>	C	Mn	Si	S	P
		0.12	1.75	0.90	0.03	0.03
		Ni*	Cr**	Mo**	V*	Cu
		0.50	0.20	0.30	0.08	0.50

\* Use of a shielding gas other than that specified will result in different weld metal composition.

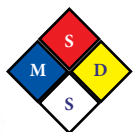
\*\* The sum of Ni, Cr, Mo & V shall not exceed 0.50%

### Typical mechanical properties of all-weld-metal:

Tensile Strength	psi	70,000
	MPa	480
Yield Strength	psi	58,000
	MPa	400
Elongation in 2"	(%)	22

### Standard Packaging:

0.045"	1.2 mm	25 Lb & 44 Lb Spools
0.052"	1.4 mm	
1/16"	1.6 mm	



## AFM E71T-1 (Unbaked)

AWS/SFA A5.20

AFM E71T-1 (Unbaked) is designed for welding of 490 MPa high tensile strength steel with outstanding mechanical properties.

The wire is a titania type of flux cored wire for all-position welding.

It provides low fume generation and has good impact strength at low temperatures.

AFM E71T-1 (Unbaked Wire) has excellent usability with stable arc, less spatter levels, better bead appearance as like a solid wire.

The shielding gas is 100% CO<sub>2</sub>.

### Applications:

AFM E71T-1 (Unbaked) is commonly used for machineries, shipbuilding, offshore structures, bridges & general fabrications.

### Typical chemical composition of all-weld-metal (%):

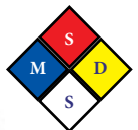
Shielding Gas	C	Mn	Si	S	P
CO <sub>2</sub> 100%	0.03	1.35	0.38	0.010	0.015

### Typical mechanical properties of all-weld-metal:

Tensile Strength	psi	75,000
	MPa	520
Yield Strength	psi	82,000
	MPa	570
Elongation in 2"	(%)	28
Charpy V-Notch	@ 0°F	20ft. Lbs

### Standard Packaging:

0.045"	1.2 mm	25 Lb & 44 Lb Spools 60Lb Coils
0.052"	1.4 mm	
1/16"	1.6 mm	



## AFM E71T-1 (Baked)

### AWS/SFA A5.20

AFM E71T-1 (Baked) is designed for welding of 490 MPa high tensile strength steel with slow freezing slag system.

The wire is a titania type of flux cored wire for all-position welding.

It produces excellent mechanical properties, easy slag removal, low spatter loss smooth bead surface, high X-ray safety.

AFM E71T-1 (Baked) is a very efficient method of the welding due to the higher deposition rate.

It can be used with 100% CO<sub>2</sub> or 75% Ar + 25% CO<sub>2</sub>

### Applications:

AFM E71T-1 (Baked) is commonly used for machineries, shipbuilding, offshore structures, bridges & general fabrications.

### Typical chemical composition of all-weld-metal (%):

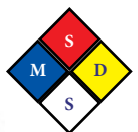
Shielding Gas	C	Mn	Si	S	P
CO <sub>2</sub> 100%	0.04	1.30	0.45	0.012	0.015

### Typical mechanical properties of all-weld-metal:

Tensile Strength	psi	75,000
	MPa	520
Yield Strength	psi	84,000
	MPa	580
Elongation in 2"	(%)	29
Charpy V-Notch	@ 0°F	20ft. Lbs

### Standard Packaging:

0.045"	1.2 mm	25 Lb & 44 Lb Spools 60Lb Coils
0.052"	1.4 mm	
1/16"	1.6 mm	



## AFM E71T-11

AWS/SFA A5.20

AFM E71T-11 is a self-shielded flux cored wire for lap and fillet welds of mild and medium tensile steels not exceeding 510 MPa.

It is suitable for a variety of applications such as prefab. building fabrication, tanks, ornamental iron, farm implement, repairs and general fabrication.

### Characteristics on Usage:

- Wire is for all-positional welding of single and multiple pass fabrications.
- The arc characteristics are so smooth and stable, even the most novice welder can produce good welds.
- It is designed for on site general fabrication and structural work requiring no impact properties.
- It can be used DCEN polarity.

### Base Materials:

ASTM A36 Gr. all; A 123; A 179; A 181 Gr. 60, 70; A266 Gr. 1; A283 Gr. A, B, C, D; A284 Gr. C, D; A285 Gr. A, B, C; A500 Gr. all; A501 Gr. all; A556 Gr. A2; A557 Gr. B2, C2; A562; A619-622; A 709 Gr. 36, 50.

### Typical chemical composition of all-weld-metal (%):

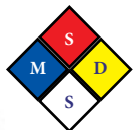
Shielding Gas	C	Mn	Si	S	P	Al
None	010	0.55	0.10	0.006	0.016	1.20

### Typical mechanical properties of all-weld-metal:

Tensile Strength	psi	72,500
	MPa	500
Yield Strength	psi	76,800
	MPa	530
Elongation in 2"	(%)	23

### Size available & Recommended currents - DC Wire (-):

Diameter (mm)		0.045" (1.2 mm)	1/16" (1.6 mm)	5/64" (2.0 mm)
Amp.	F	80 ~ 200	160 ~ 270	180 ~ 280



## AFM E71TGS

AWS/SFA A5.20

AFM E71TGS is a self-shielded flux-cored wire for general purpose use and welding in all positions. It is especially suited for single-pass fillet and lap welds on thin-gauge mild or galvanized steel.

### Applications:

AFM E71TGS is used for prefab, building fabrication, tanks, ornamental iron, farm implement, repairs and general fabrication.

### Characteristics on Usage:

- Wire is for all-positional welding of single pass automatic and semiautomatic fabrications.
- It can be applicable for aluminized steel and galvanized steel from 0.045” (1.2 mm) to 3/16” (4.8 mm).
- It is designed for on site general fabrication and structural work requiring no impact properties.
- It can be used DCEN polarity.

### Typical chemical composition of all-weld-metal (%):

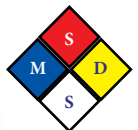
Shielding Gas	C	Mn	Si	S	P	Al
None	016	0.82	0.31	0.006	0.014	1.30

### Typical mechanical properties of all-weld-metal:

Tensile Strength	psi	75,400
	MPa	520
Longitudinal Guided Bend Test	No Defects	

### Size available & Recommended currents - DC Wire (+), (-):

Diameter (mm)		0.045” (1.2 mm)	1/16” (1.6 mm)	5/64” (2.0 mm)
Amp.	F	80 ~ 200	160 ~ 270	180 ~ 280





# AFM E81T1-B2

## AWS/SFA A5.29

AFM E81T1-B2 is an all-position flux cored wire that contains 1-1/4% Cr-1/2% Mo. The weld metal analysis is very similar to AFM E8018-B2 low hydrogen electrode. It is used for welding 1/2% Cr-1/2% Mo, 1% Cr-1/2% Mo, and 1-1/4% Cr-1/2% Mo steels, such as ASTM A335-P11 pipe and ASTM A387 Gr.11 plate. The wire can be used in either single or multiple pass welding. AFM E81T1-B2 should be used with 100% CO<sub>2</sub> shielding gas.

### Chemical Composition Requirements for Undiluted Weld Metal:

C	Mn	P	S	Si	Ni	Cr	Mo
0.05 ~ 0.12	1.25	0.030	0.030	0.80	-	1.00-1.50	0.40 ~ 0.65

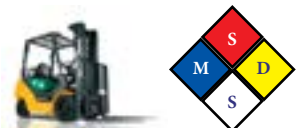
All values are considered maximum, unless otherwise noted.

### Tension Test Requirements:

Tensile Strength	psi	80,000 ~ 100,000
	MPa	550 ~ 690
Yield Strength @ 0.2% Offset, Min.	psi	68,000
	MPa	470
Elongation in 2"	(%)	19 Min.

### Standard Packaging:

0.045"	1.2 mm	33 Lb Spools
1/16"	1.6 mm	



# AFM E91T1-B3

## AWS/SFA A5.29

AFM E91T1-B3 is an all-position flux cored wire that contains 2-1/4% Cr-1% Mo. The weld metal analysis is similar to AFM E9018-B3 low hydrogen electrode. It is recommended for welding 2-1/4% Cr-1% Mo steels, such as ASTM A335-P22 pipe and ASTM A387 r.22 plate, and can be used for single or multiple pass welding. AFM E91T1-B3 should be used with 100% CO<sub>2</sub> shielding gas.

### Chemical Composition Requirements for Undiluted Weld Metal:

C	Mn	P	S	Si	Ni	Cr	Mo
0.05 ~ 0.12	1.25	0.030	0.030	0.80	-	2.00-2.50	0.90 ~ 1.20

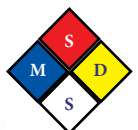
All values are considered maximum, unless otherwise noted.

### Tension Test Requirements:

Tensile Strength	psi	90,000 ~ 110,000
	MPa	620 ~ 760
Yield Strength @ 0.2% Offset, Min.	psi	78,000
	MPa	540
Elongation in 2"	(%)	17 Min.

### Standard Packaging:

0.045"	1.2 mm	33 Lb Spools
1/16"	1.6 mm	



## AFM E81T1-Ni1

AWS/SFA A5.29

AFM E81T1-Ni1 is an all-position wire which has a smooth, easily controlled arc that produces a spray-like transfer.

The easily removable slag firmly holds the molten puddle for out-of-position work.

It exhibits excellent low temperature impact toughness as welded and stress relieved.

AFM E81T1-Ni1 is commonly used on petrochemical equipment, offshore oil construction, ship fabrication, and heavy machinery.

The weld metal analysis is similar to AFM E8018-C3 low hydrogen electrode and is used with a 75% Ar +25% CO<sub>2</sub> shielding gas.

### Chemical Composition Requirements for Undiluted Weld Metal:

C	Mn	P	S	Si	Ni	Cr	Mo	V
0.12	1.50	0.030	0.030	0.80	0.80 ~ 1.10	0.15	0.35	0.05

All values are considered maximum, unless otherwise noted.

### Tension Test Requirements:

Tensile Strength	psi	80,000 ~ 110,000
	MPa	550 ~ 690
Yield Strength @ 0.2% Offset, Min.	psi	68,000
	MPa	470
Elongation in 2"	(%)	19 Min.

### Standard Packaging:

0.045"	1.2 mm	33 Lb Spools
1/16"	1.6 mm	



## AFM E81T1-Ni2

AWS/SFA A5.29

AFM E81T1-Ni2 is an all-position flux cored wire that deposits 2-1/2% Ni deposit with an 80 ksi tensile strength.

It may be used with CO2 or Argon mixtures, which reduce spatter and further improve weldability.

It is used commonly used on shipbuilding and heavy machinery construction.

The weld metal analysis is similar to AFM E8018-C1 low hydrogen electrode.

### Chemical Composition Requirements for Undiluted Weld Metal:

C	Mn	P	S	Si	Ni
0.12	1.50	0.030	0.030	0.80	1.75 ~ 2.75

All values are considered maximum, unless otherwise noted.

### Tension Test Requirements:

Tensile Strength	psi	90,000 ~ 110,000
	MPa	620 ~ 760
Yield Strength @ 0.2% Offset, Min.	psi	78,000
	MPa	540
Elongation in 2"	(%)	17 Min.

### Standard Packaging:

0.045"	1.2 mm	33 Lb Spools
1/16"	1.6 mm	



## AFM E308HT1-1/-4

AWS/SFA A5.22

AFM E308HT1-1/-4 is formulated for MAG welding of 18% Cr - 8% Ni stainless steel for high temperature service. (SUS 304H, 307H & 308H).

It is titania type flux cored wire for all position welding.

AFM E308HT1-1/-4 provides low spatter, easy slag removal & excellent weld soundness for your welding job. It is also developed for welding steel resistant to austenitic fluency type CrNi / AISI 304H in working temperatures up to +600 °C [+1,112 °F].

### [Recommended Welding Tips]

- Recommended shielding gas - 100% CO<sub>2</sub> Gas or Ar + 20% ~ 25% CO<sub>2</sub> gas.
- The optimum gas flow - For CO<sub>2</sub> Gas - 20l/min ~ 25l/min [42.40 cfh ~ 53 cfh].
- It is strongly recommended to use the wind shield screen to prevent the possible blowholes.
  - Wind velocity  $\geq$  2m/sec [ $\geq$  6.56 ft/sec]
- Electrode Extension - 15 mm ~ 25 mm [0.56" ~ 0.98"].

### Typical Chemical Composition of all-weld-metal (%):

	C	Si	Mn	P	S	Cr	Ni	Ferrite No.
AWS Classification	0.04 ~ 0.08	$\leq$ 1.0	0.5 ~ 2.5	$\leq$ 0.04	$\leq$ 0.03	18.0 ~ 21.0	9.0 ~ 11.0	-
AFM 308HT1-1/-4	0.06	0.60	1.04	0.02	0.007	19.50	10.00	6.0

### Typical Mechanical Properties of all-weld-metal:

	Tensile Strength	Elongation
	(N/mm <sup>2</sup> ) - MPa	%
AWS Classification	$\geq$ 550	$\geq$ 35
AFM 308HT1-1/-4	580	40

### Available sizes & Recommended Welding Parameters (DC+):

Position / Diameter	0.045" (1.2 mm)		1/16" (1.6 mm)	
	Current (A)	Voltage (V)	Current (A)	Voltage (V)
Flat	180 ~ 220	25 ~ 35	200 ~ 280	25 ~ 35
Horizontal Fillet	180 ~ 220	25 ~ 35	200 ~ 280	25 ~ 35
Vertical Up	120 ~ 160	20 ~ 30	160 ~ 220	20 ~ 30



## AFM E308LT0-1/-4 & AFM E308LT1-1/-4

### AWS/SFA A5.22

AFM E308LT0-1/-4 & E308LT1-1/-4 are designed for MAG welding of low carbon 18% Cr ~ 8% Ni stainless steel.

- AFM E308LT0-1/-4 is titania type of flux cored wire for flat & horizontal position welding.
- AFM E308LT1-1/-4 is titania type of flux cored wire for all position welding.

AFM E308LT series wires provide stable arc, easier slag removal, less spatter & welding fume than solid wires. The weld metal with optimum ferrite contents in its austenitic structures provides excellent weldability and lower crack susceptibility.

#### [Recommended Welding Tips]

- Recommended shielding gas - 100% CO<sub>2</sub> Gas or 80% Ar + 20% CO<sub>2</sub> gas.

#### Typical Chemical Composition of all-weld-metal (%):

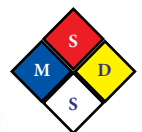
	C	Si	Mn	P	S	Cr	Ni	Ferrite No.
AWS Classification	≤ 0.04	≤ 1.0	0.5 ~ 2.5	≤ 0.04	≤ 0.03	18.0 ~ 21.0	9.0 ~ 11.0	-
AFM 308LT0-1/-4	0.03	0.65	1.35	0.020	0.010	19.60	9.60	8
AFM 308LT1-1/-4	0.03	0.62	1.38	0.022	0.009	19.80	9.80	10

#### Typical Mechanical Properties of all-weld-metal:

	Yield Strength	Tensile Strength	Elongation	Charpy V-Notch Impact Value
	(N/mm <sup>2</sup> ) - MPa	(N/mm <sup>2</sup> ) - MPa	%	-20 °C [-68 °F]
AWS Classification		≥ 520	≥ 30	
AFM 308LT0-1/-4	431	570	39	48 J [35.40 ft/lb]
AFM 308LT1-1/-4	422	572	41	46 J [33.93 ft/lb]

#### Available sizes & Recommended Welding Parameters (DC+):

Position / Diameter	Product	0.045" (1.2 mm)		1/16" (1.6 mm)	
		Current (A)	Voltage (V)	Current (A)	Voltage (V)
Flat	AFM E308LT0-1/-4 & AFM E308LT1-1/-4	180 ~ 220	25 ~ 35	200 ~ 280	25 ~ 35
Horizontal Fillet	AFM E308LT0-1/-4 & AFM E308LT1-1/-4	180 ~ 220	25 ~ 35	200 ~ 280	25 ~ 35
Vertical Up	AFM E308LT1-1/-4 Only	120 ~ 160	20 ~ 30	160 ~ 220	20 ~ 30



## AFM E309LMoT1-1/-4

AWS/SFA A5.22

AFM E309LMoT1-1/-4 is a titania type of flux cored wire for all-position welding. This product is designed for MAG welding of low carbon 22% Cr ~12% Ni-Mo stainless steels.

- Dissimilar joint welds ; of and between high-strength, mild steels and low-alloyed QT-steels, stainless, ferritic Cr- and austenitic Cr-Ni steels, manganese steels.
- Cladding ; for the first layer of corrosion resistant weld claddings on ferritic-pearlitic steels in boiler and pressure vessel parts up to fine-grained steel S500N.

Weld metals contain comparatively much more ferrite in their austenitic, therefore they provide better weldability together with superior heat resistance, and corrosion resistance for Mo-alloyed claddings the product is necessary for the 1st layer.

### [Recommended Welding Tips]

- Recommended shielding gas - 100% CO<sub>2</sub> Gas only.

### Typical Chemical Composition of all-weld-metal (%):

	C	Mn	Si	P	S	Cr	Ni	Mo	Ferrite No.
AWS Classification	≤ 0.04	0.5 ~ 2.5	≤ 1.0	≤ 0.04	≤ 0.03	21.0 ~ 25.0	12.0 ~ 16.0	2.0 ~ 3.0	-
AFM 309LMoT1-1/-4	0.035	1.20	0.60	0.017	0.010	22.80	13.30	2.50	20

### Typical Mechanical Properties of all-weld-metal:

	Yield Strength	Tensile Strength	Elongation	Charpy V-Notch Impact Value
	(N/mm <sup>2</sup> ) - MPa	(N/mm <sup>2</sup> ) - MPa	%	0 °C [32 °F]
AWS Classification		≥ 520	≥ 25	
AFM 309LMoT1-1/-4	560	680	33	40 J [29.50 ft/lb]

### Available sizes & Recommended Welding Parameters (DC+):

Position / Diameter	0.045" (1.2 mm)		1/16" (1.6 mm)	
	Current (A)	Voltage (V)	Current (A)	Voltage (V)
Flat	180 ~ 220	25 ~ 35	200 ~ 280	25 ~ 35
Horizontal Fillet	180 ~ 220	25 ~ 35	200 ~ 280	25 ~ 35
Vertical Up	120 ~ 160	20 ~ 30	160 ~ 220	20 ~ 30



## AFM E309LT0-1/-4 & AFM E309LT1-1/-4

AWS/SFA A5.22

AFM E309LT0-1/-4 & E309LT1-1/-4 are designed for MAG welding of 22% Cr ~ 12% Ni steel and heat resistant & dissimilar joint such as a stainless steel to carbon steel of low alloy steel.

Under layer welding on clad side groove clad stainless steel or carbon steel where stainless steel weld metal is overlaid.

- AFM E309LT0-1/-4 is titania type of flux cored wire for flat & horizontal position welding.
- AFM E309LT1-1/-4 is titania type of flux cored wire for all position welding.

AFM E309LT series wires provide stable arc, easier slag removal, less spatter & welding fume than solid wires. The weld metal with optimum ferrite contents in its austenitic structures provides excellent weldability and lower crack susceptibility.

*[Recommended Welding Tips]*

- Recommended shielding gas - 100% CO<sub>2</sub> Gas or 80% Ar + 20% CO<sub>2</sub> gas.

### Typical Chemical Composition of all-weld-metal (%):

	C	Si	Mn	P	S	Cr	Ni	Ferrite No.
AWS Classification	≤ 0.04	≤ 1.0	0.5 ~ 2.5	≤ 0.04	≤ 0.03	22.0 ~ 25.0	12.0 ~ 14.0	-
AFM 309LT0-1/-4	0.035	0.75	1.30	0.022	0.009	22.80	12.30	18
AFM 309LT1-1/-4	0.029	0.64	1.33	0.019	0.011	23.30	12.80	20

### Typical Mechanical Properties of all-weld-metal:

	Yield Strength	Tensile Strength	Elongation	Charpy V-Notch Impact Value
	(N/mm <sup>2</sup> ) - MPa	(N/mm <sup>2</sup> ) - MPa	%	0 °C [32 °F]
AWS Classification		≥ 520	≥ 30	
AFM 309LT0-1/-4	432	590	37	50 J [36.88 ft/lb]
AFM 309LT1-1/-4	426	593	38	48 J [35.40 ft/lb]

### Available sizes & Recommended Welding Parameters (DC+):

Position / Diameter	Product	0.045" (1.2 mm)		1/16" (1.6 mm)	
		Current (A)	Voltage (V)	Current (A)	Voltage (V)
Flat	AFM E309LT0-1/-4 & AFM E309LT1-1/-4	180 ~ 220	25 ~ 35	200 ~ 280	25 ~ 35
Horizontal Fillet	AFM E309LT0-1/-4 & AFM E309LT1-1/-4	180 ~ 220	25 ~ 35	200 ~ 280	25 ~ 35
Vertical Up	AFM E309LT1-1/-4 Only	120 ~ 160	20 ~ 30	160 ~ 220	20 ~ 30





## AFM E316LT0-1/-4 & AFM E316LT1-1/-4

### AWS/SFA A5.22

AFM E316LT0-1/-4 & E316LT1-1/-4 are designed for welding of low carbon 18%Cr ~12%Ni ~ 2% Mo stainless steel.

Under layer welding on clad side groove clad stainless steel or carbon steel where stainless steel weld metal is overlaid.

- AFM E316LT0-1/-4 is titania type of flux cored wire for flat & horizontal position welding.
- AFM E316LT1-1/-4 is titania type of flux cored wire for all position welding.

AFM E309LT series wires provide excellent usability with stable arc, less spattering, good bead appearance, better slag removal, and less quantity of welding fume comparable to solid wire. Excellent weldability and increased creep resistance at elevated temperature.

#### [Recommended Welding Tips]

- Recommended shielding gas - 100% CO<sub>2</sub> Gas or 80% Ar + 20% CO<sub>2</sub> gas.

#### Typical Chemical Composition of all-weld-metal (%):

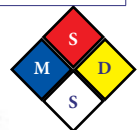
	C	Si	Mn	P	S	Cr	Ni	Ferrite No.
AWS Classification	≤ 0.04	≤ 1.0	0.5 ~ 2.5	≤ 0.04	≤ 0.03	17.0 ~ 20.0	11.0 ~ 14.0	-
AFM 316LT0-1/-4	0.030	0.62	1.42	0.022	0.011	18.56	12.39	8
AFM 316LT1-1/-4	0.031	0.60	1.33	0.021	0.010	18.61	12.44	7

#### Typical Mechanical Properties of all-weld-metal:

	Yield Strength	Tensile Strength	Elongation	Charpy V-Notch Impact Value
	(N/mm <sup>2</sup> ) - MPa	(N/mm <sup>2</sup> ) - MPa	%	0 °C [32 °F]
AWS Classification		≥ 485	≥ 30	
AFM 316LT0-1/-4	425	575	42	55 J [40.57 ft/lb]
AFM 316LT1-1/-4	422	578	42	58 J [42.78 ft/lb]

#### Available sizes & Recommended Welding Parameters (DC+):

Position / Diameter	Product	0.045" (1.2 mm)		1/16" (1.6 mm)	
		Current (A)	Voltage (V)	Current (A)	Voltage (V)
Flat	AFM E316LT0-1/-4 & AFM E316LT1-1/-4	180 ~ 220	25 ~ 35	200 ~ 280	25 ~ 35
Horizontal Fillet	AFM E316LT0-1/-4 & AFM E316LT1-1/-4	180 ~ 220	25 ~ 35	200 ~ 280	25 ~ 35
Vertical Up	AFM E316LT1-1/-4 Only	120 ~ 160	20 ~ 30	160 ~ 220	20 ~ 30



## AFM E317LT1-1/-4

AWS/SFA A5.22

AFM E317LT1-1/-4 is formulated for MAG Welding of 19% Cr ~ 13% Ni ~ 3% Mo stainless Steels. The principal area of application is process and chemical plant, shipbuilding as well as nuclear plant industries (AISI 316L, 316LN, 317L, 317NL & UNS S31726)

AFM E317LT1-1/-4 is a titania type of flux cored wire with all-position welding.

It has low spatter, easy slag removal & good weld soundness.

It also contains higher levels of Mo for increased corrosion-resistance when compared to AFM E316LT1-1/-4.

### [Recommended Welding Tips]

- Recommended shielding gas - 100% CO<sub>2</sub> Gas.
- The optimum flow of CO<sub>2</sub> for shielding is 20l/min. ~ 25l/min [42.40 cfh ~ 53 cfh].
- It is strongly recommended to use the wind shield screen to prevent the possible blowholes.
  - Wind velocity  $\geq$  2m/sec [ $\geq$  6.56 ft/sec]
- Electrode Extension -15 mm ~ 25 mm [0.56" ~ 0.98"].
- For multi-layer welding, keep preheat & inter-pass temperature below 150 °C [302 °F].

### Typical Chemical Composition of all-weld-metal (%):

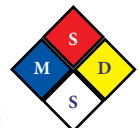
	C	Si	Mn	P	S	Cr	Ni	Mo
AWS Classification	$\leq$ 0.04	$\leq$ 1.0	0.5 ~ 2.5	$\leq$ 0.04	$\leq$ 0.03	18.0 ~ 21.0	12.0 ~ 14.0	3.0 ~ 4.0
AFM 317LT1-1/-4	0.03	0.65	1.26	0.02	0.07	18.9	13.7	3.5

### Typical Mechanical Properties of all-weld-metal:

	Tensile Strength	Elongation
	(N/mm <sup>2</sup> ) - MPa	%
AWS Classification	$\geq$ 520	$\geq$ 20
AFM 316LT1-1	610	36

### Available sizes & Recommended Welding Parameters (DC+):

Position / Diameter	0.045" (1.2 mm)		1/16" (1.6 mm)	
	Current (A)	Voltage (V)	Current (A)	Voltage (V)
Flat	180 ~ 220	25 ~ 35	200 ~ 280	25 ~ 35
Horizontal Fillet	180 ~ 220	25 ~ 35	200 ~ 280	25 ~ 35
Vertical Up	120 ~ 160	20 ~ 30	160 ~ 220	20 ~ 30



## AFM E347T1-1

AWS/SFA A5.22

AFM E347T1-1 is formulated for MAG Welding of 18% Cr ~ 8% Ni-Nb stainless Steels. (AISI 347, 321, ASTM A296; A157 Gr. C9; A320 Gr. B8C or D)

AFM E347T1-1 is a titania type of flux cored wire with all-position welding.

It has low spatter, easy slag removal & good weld soundness.

Nb componet improves the resistance to intergranular corrosion of the weld metal.

### [Recommended Welding Tips]

- Recommended shielding gas - 100% CO<sub>2</sub> Gas or 75% ~ 80% Ar + 20% ~ 25% CO<sub>2</sub> gas.
- The optimum flow of CO<sub>2</sub> for shielding is 20l/min. ~ 25l/min [42.40 cfh ~ 53 cfh].
- It is strongly recommended to use the wind shield screen to prevent the possible blowholes.
  - Wind velocity ≥ 2m/sec [≥ 6.56 ft/sec]
- Electrode Extension -15 mm ~ 25 mm [0.56" ~ 0.98"].
- For multi-layer welding, keep preheat & inter-pass temperature below 150 °C [302 °F].

### Typical Chemical Composition of all-weld-metal (%):

	C	Si	Mn	P	S	Cr	Ni	Mo
AWS Classification	≤ 0.08	≤ 1.0	0.5 ~ 2.5	≤ 0.04	≤ 0.03	18.0 ~ 21.0	9.0 ~ 11.0	8 x C ~ 1.0
AFM 347T1-1	0.03	0.60	1.26	0.02	0.07	19.3	10.1	0.40

### Typical Mechanical Properties of all-weld-metal:

	Tensile Strength	Elongation	Impact Value (J)
	(N/mm <sup>2</sup> ) - MPa	%	-18 °C
AWS Classification	≥ 520	≥ 30	
AFM 347T1-1	586	41	60

### Available sizes & Recommended Welding Parameters (DC+):

Position / Diameter	0.045" (1.2 mm)		1/16" (1.6 mm)	
	Current (A)	Voltage (V)	Current (A)	Voltage (V)
Flat	180 ~ 220	25 ~ 35	200 ~ 280	25 ~ 35
Horizontal Fillet	180 ~ 220	25 ~ 35	200 ~ 280	25 ~ 35
Vertical Up	120 ~ 160	20 ~ 30	160 ~ 220	20 ~ 30



AWS A5.22	Chemical Composition Requirements for Flux Cored Electrodes for Undiluted Weld Metal											
AFM	C	Cr	Ni	Mo	Nb + Ta	Mn	Si	P	S	N	Cu	Other
E308HTX-X	0.04 ~ 0.08	18.00 ~ 21.00	9.00 ~ 11.00	0.75	-	0.50~ 2.50	1.00	0.04	0.03	-	0.75	-
E308LTX-X	0.04	18.00 ~ 21.00	9.00 ~ 11.00	0.75	-	0.50 ~ 2.50	1.00	0.04	0.03	-	0.75	-
E309TX-X	0.10	22.00 ~ 25.00	12.00 ~ 14.00	0.75	-	0.50 ~ 0.25	1.00	0.04	0.03	-	0.75	-
E309LTX-X	0.04	22.00 ~ 25.00	12.00 ~ 14.00	0.75	-	0.50 ~ 2.50	1.00	0.04	0.03	-	0.75	-
E309LMoTX-X	0.04	21.00 ~ 25.00	12.00 ~ 16.00	2.00 ~ 3.00	-	0.50 ~ 2.50	1.00	0.04	0.03	-	0.75	-
E310TX-X	0.20	25.00 ~ 28.00	20.00 ~ 22.50	0.75	-	1.00 ~ 2.50	1.00	0.03	0.03	-	0.75	-
E312TX-X	0.15	28.00 ~ 32.00	8.00 ~ 10.50	0.75	-	0.50 ~ 2.50	1.00	0.04	0.03	-	0.75	-
E316TX-X	0.08	17.00 ~ 20.00	11.00 ~ 14.00	2.00 ~ 3.00	-	0.50 ~ 2.50	1.00	0.04	0.03	-	0.75	-
E316LTX-X	0.04	17.00 ~ 20.00	11.00 ~ 14.00	2.00 ~ 3.00	-	0.50 ~ 2.50	1.00	0.04	0.03	-	0.75	-
E317LTX-X	0.04	18.00 ~ 21.00	12.00 ~ 14.00	3.00 ~ 4.00	-	0.50 ~ 2.50	1.00	0.04	0.03	-	0.75	-
E347TX-X	0.08	18.00 ~ 21.00	9.00 ~ 11.00	0.75	8 x C Min. ~ 1.00 Max.	0.50 ~ 2.50	1.00	0.04	0.03	-	0.75	-
E410TX-X	0.12	11.00 ~ 13.50	0.60	0.75	-	1.20	1.00	0.04	0.03	-	0.75	-
E2209TX-X	0.04	21.00 ~ 24.00	7.50 ~ 10.00	2.50 ~ 4.00	-	0.50 ~ 2.00	1.00	0.04	0.03	0.08 ~ 0.20	0.75	-
E2253TX-X	0.04	24.00 ~ 27.00	8.50 ~ 10.50	2.90 ~ 3.90	-	0.50 ~ 1.50	0.75	0.04	0.03	0.10 ~ 0.25	1.50 ~ 2.50	-

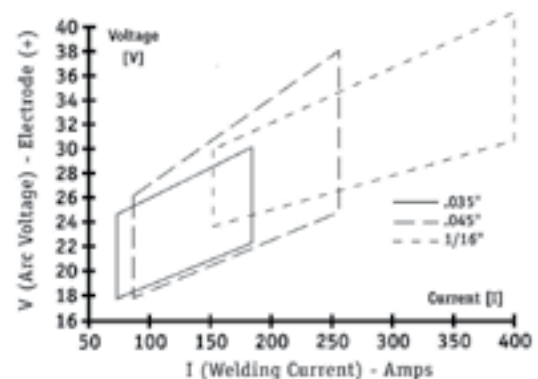
\* E904LTX-X - NO AWS Classification

### WELDING PARAMETERS:

AFM's flux cored stainless steel wires can be welded over an extensive range of parameters with excellent results.

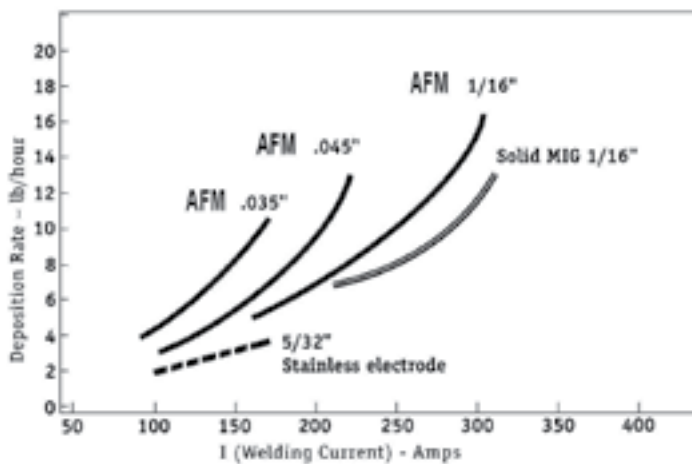
Typical range (V-I) with 75% Ar + 25% CO<sub>2</sub>  
(Increase V by 1-2V with 100% CO<sub>2</sub>)

In this table,, the "X" following the "T" refers to the position of welding. (1 - All-Position Operation, 0 - Flat or Horizontal Operation)  
Also, the "X" following the dash refers to the shielding medium. (-1 or -4) as shown in the AWS Classification column in Table 2 of A5.22/A5.22M:2010.



Minimum Mechanical Properties				
AWS Classification	Tensile Strength		Elongation (%)	Postweld Heat Treatment
	ksi	MPa		
E308HTX-X	80	550	30	-
E308LTX-X	75	520	30	-
E309TX-X	80	550	30	-
E309LTX-X	75	520	30	-
E309LMoTX-X	75	520	25	-
E310TX-X	80	550	30	-
E312TX-X	95	660	22	-
E316TX-X	75	520	30	-
E316LTX-X	70	485	30	-
E317LTX-X	75	520	20	-
E347TX-X	75	520	30	-
E410TX-X	75	520	20	(*)
E2209TX-X	100	690	20	-
E2253TX-X	11	760	15	-

\* Note: All mechanical properties listed are minimal values which may vary substantially with base plate, parameters and other variables out of the manufacturer's control.



(\*) E410TX-X - Postweld Heat Treatment:  
 Heat to 1,350 °F to 1,400 °F [730 °C to 760 °C],  
 hold for one hour (-0, +15 minutes),  
 furnace cool at a rate not exceeding 200 °F per hour  
 to 600 °F [315 °C] and air cool to ambient.

**Performance::**  
 AFM's flux cored stainless deposition rate is the highest in the industry, commonly 3 times faster than manual electrodes.

### Shielding Gases:

Argon + CO<sub>2</sub>    75% + 25%    or    82% + 18% } Gas flow rate 25 – 35 Cu. Ft / Hr  
 CO<sub>2</sub>                    100%

The use of either mixed gas or CO<sub>2</sub> will ensure sound weld metal. The carbon content of the weld metal increases marginally with increased CO<sub>2</sub> content. Slag detachment behavior may alter slightly with gas composition and with base metal, particularly when welding stainless to carbon steels.