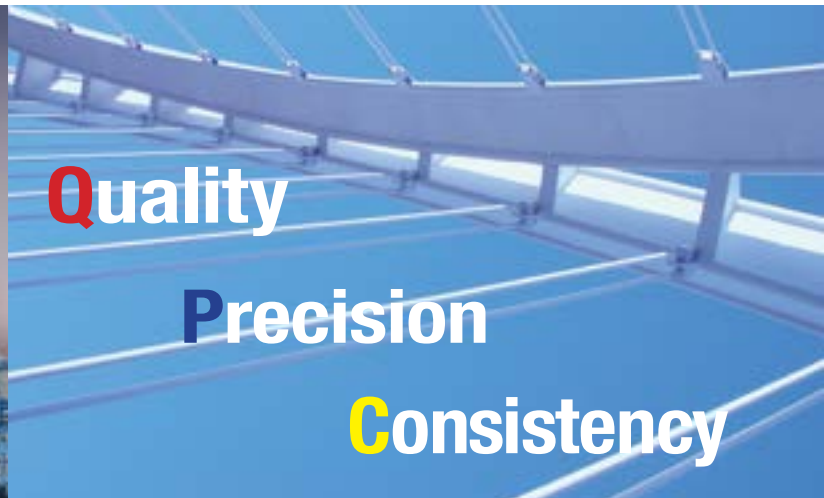




# AMERICAN FILLER METALS

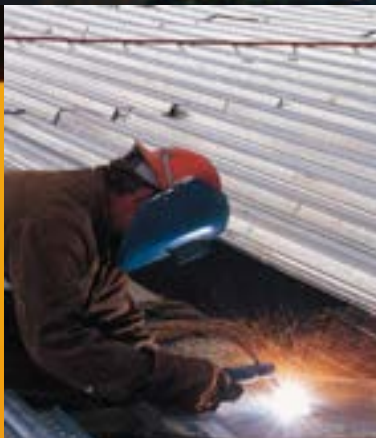
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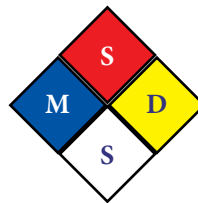
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# AMERICAN FILLER METALS

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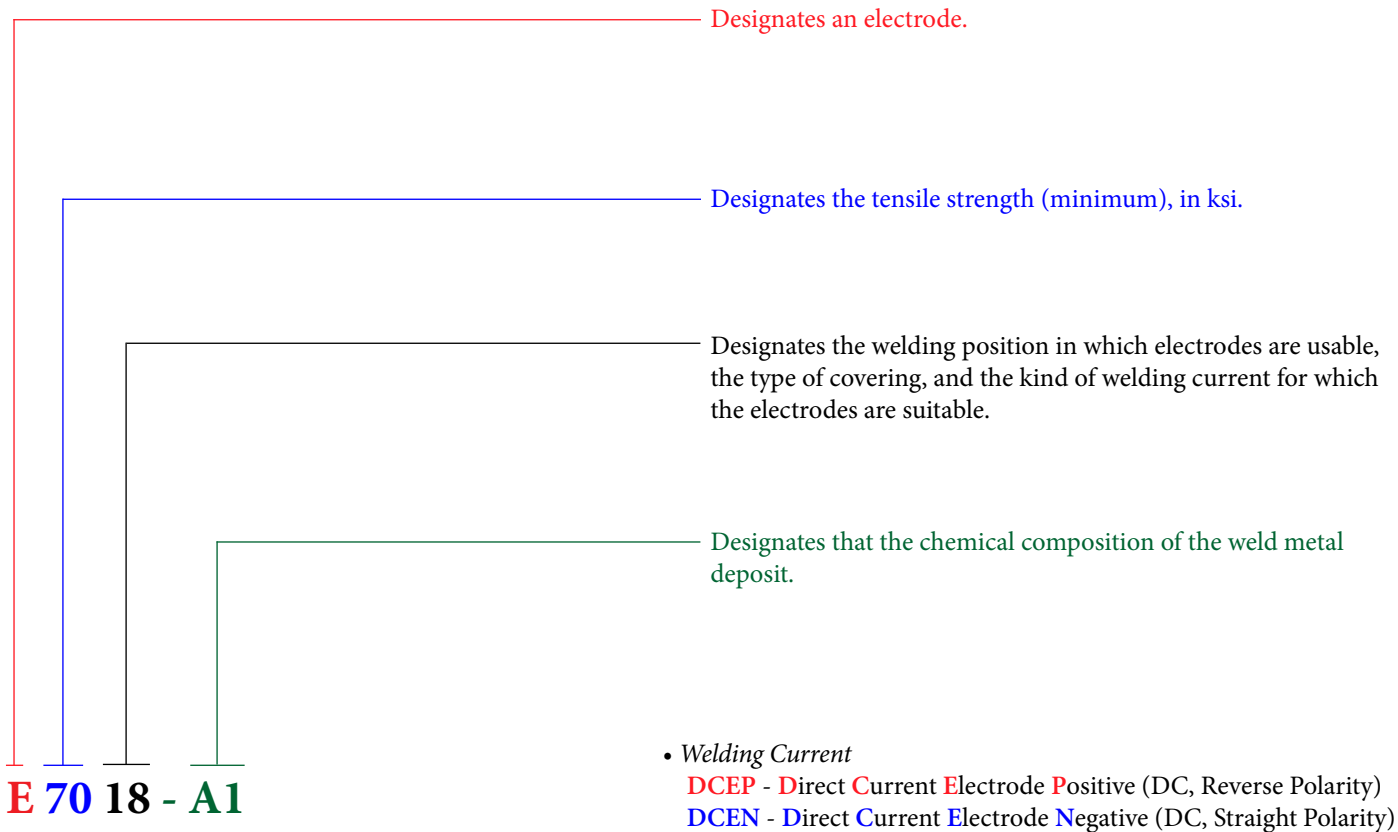
## *Coated Electrode*

AFM Product	AWS Classification		Page
AFM E7018-A1	<a href="#">AWS/SFA A5.5</a>	E7018-A1	17
AFM E8018-B2	<a href="#">AWS/SFA A5.5</a>	E8018-B2	18
AFM E9018-B3	<a href="#">AWS/SFA A5.5</a>	E9018-B3	19
AFM E8018-C1	<a href="#">AWS/SFA A5.5</a>	E8018-C1	20
AFM E8018-C2	<a href="#">AWS/SFA A5.5</a>	E8018-C2	21
AFM E8018-C3	<a href="#">AWS/SFA A5.5</a>	E8018-C3	22
AFM E801X-B6	<a href="#">AWS/SFA A5.5</a>	E801X-B6	23
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## Order of Mandatory Classification Designators AWS/SFA A5.5

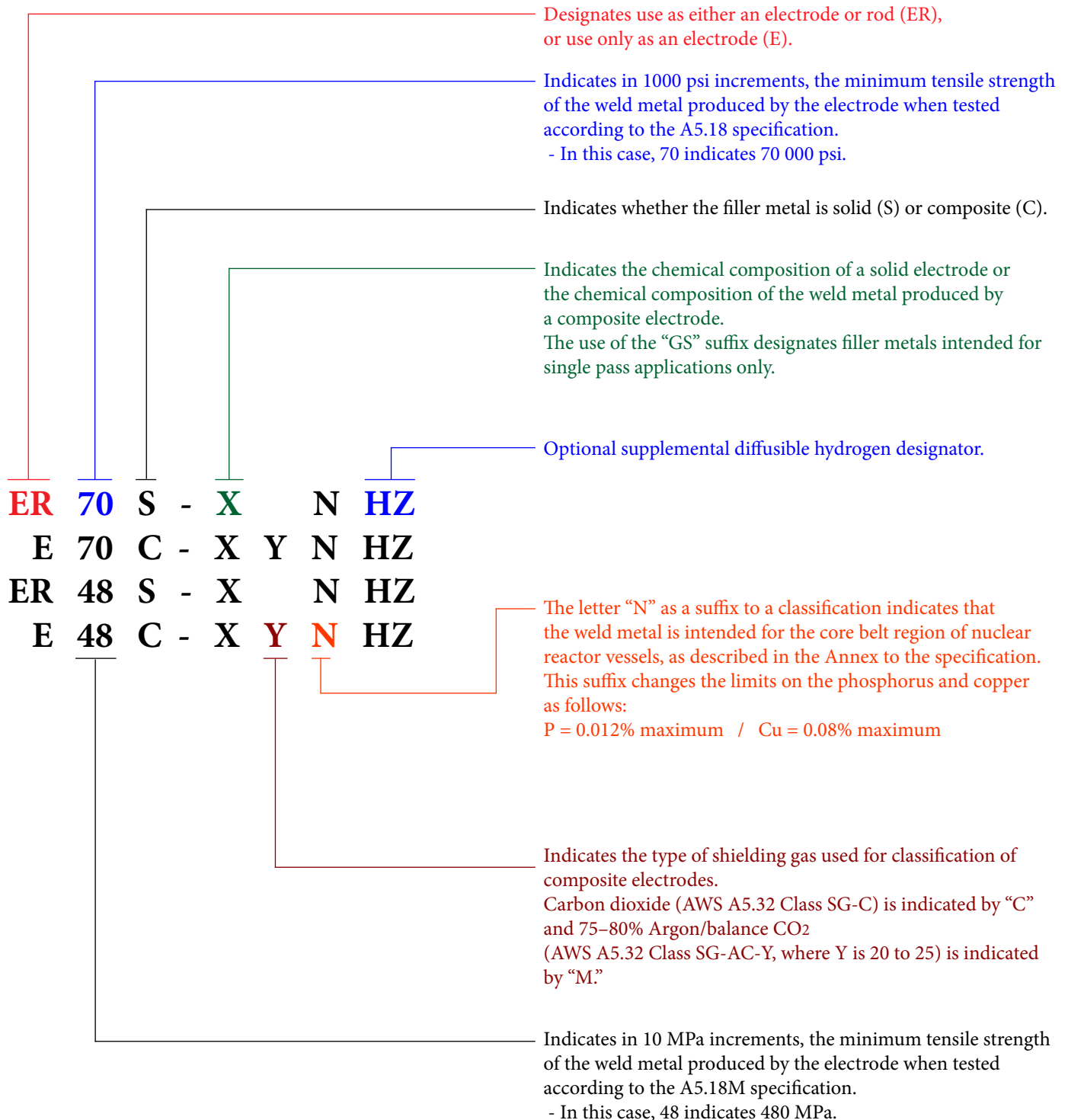


- *Welding Position*

Type of Welding	Welding Position	Designation	
		BS EN	AWS
Butt Welding	Flat	PA	1G
	Horizontal	PC	2G
	Vertical Downwards	PG	3G
	Vertical Upwards	PF	3G
	Overhead	PE	4G
Fillet Welding	Flat	PA	1F
	Horizontal	PB	2F
	Vertical Downwards	PG	3F
	Vertical Upwards	PF	3F
	Horizontal Overhead	PD	4F

## Order of Mandatory Classification Designators

AWS/SFA A5.18



## AFM E7018-A1

AWS/SFA A5.5

Low Hydrogen Potassium, Iron Powder Covering

### Description:

AFM E7018-A1 electrodes are very similar to AFM E7018, except that 1/2% molybdenum has been added. This addition increases the strength of the weld metal, especially at elevated temperatures, and provides some increase in corrosion resistance; however, it may reduce the notch toughness of the weld metal.

### Applications:

AFM E7018-A1 is commonly used to weld CMo steel base metals such as ASTM A204 plate and A335-P1 pipe.

### Welding Characteristics:

AFM E7018-A1 has a high deposition rate, fine bead appearance, low spatter, easily removable slag, and medium penetration.

### Preheat:

See Table “Preheat, Interpass & Postweld Heat Treatment Temperatures” on page 31.

### Recommended Current Ranges (AC or DC+):

Dia. (inch)	3/32”	1/8”	5/32”	3/16”
Dia. (mm)	2.4 mm	3.2 mm	4.0 mm	4.8 mm
Flat	70 ~ 100	90 ~ 160	130 ~ 220	200 ~ 300

### Typical Mechanical Properties:

Tensile Strength	psi	98,000
Yield Strength	psi	86,000
Elongation in 2”	(%)	28
Reduction in Area	(%)	70
Charpy V-Notch	@ -20°F	87 ft. Lbs

### Typical Weld Metal Chemistry (%):

C	Mn	Si	P	S	Mo
0.06	0.72	0.49	0.016	0.013	0.53

### Standard Packaging:

10# Package; 60# Master Carton.





## AFM E8018-B2

AWS/SFA A5.5

Low Hydrogen Potassium, Iron Powder Covering

### Description:

AFM E8018-B2 is a low hydrogen electrode that may be used with AC or DC reverse polarity. It is different from “fast freeze” electrodes in that the weld metal freezes quite rapidly even though the slag is relatively fluid.

### Applications:

AFM E8018-B2 is used for the welding of 1/2% Cr-1/2% Mo, 1% Cr-1/2% Mo, and 1 1/4% Cr-1/2% Mo steels.

It is used to weld A355-P11 Pipe and A387 Fr. 11 Plate. Common applications include boiler steam pipes in power plants, oil refining equipment, ships and chemical plants.

### Preheat:

See Table “Preheat, Interpass & Postweld Heat Treatment Temperatures” on page 31.

### Recommended Current Ranges (AC or DC+):

Dia. (inch)	3/32”	1/8”	5/32”	3/16”
Dia. (mm)	2.4 mm	3.2 mm	4.0 mm	4.8 mm
Flat	60 ~ 100	90 ~ 130	130 ~ 190	190 ~ 250
V & O	60 ~ 90	80 ~ 120	110 ~ 170	N/A

### Typical Mechanical Properties:

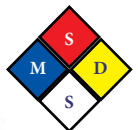
Tensile Strength	psi	99,000
Yield Strength	psi	87,000
Elongation in 2”	(%)	25
Reduction in Area	(%)	70
Charpy V-Notch	@ -32°F	22 ft. Lbs

### Typical Weld Metal Chemistry (%):

C	Mn	Si	Cr	Mo	P	S
0.06	0.90	0.63	1.32	0.55	0.013	0.007

### Standard Packaging:

10# Package; 60# Master Carton.





## AFM E9018-B3

AWS/SFA A5.5

Low Hydrogen Potassium, Iron Powder Covering

### Description:

AFM E9018-B3 is a low hydrogen electrode that may be used with AC or DC reverse polarity. It is different from “fast freeze” electrodes in that the weld freezes quite rapidly even though the slag is relatively fluid.

### Applications:

AFM E9018-B3 is used for welding chromemoly steels such as those of the 2 1/4% Cr-1% Mo type. It is used to weld A335-P22 Pipe and A387 Gr. 22 Plate. Common applications include cast steels, boiler and heat exchanger tubes, cast and forged steels.

### Preheat:

See Table “Preheat, Interpass & Postweld Heat Treatment Temperatures” on page 31.

### Recommended Current Ranges (AC or DC+):

Dia. (inch)	3/32”	1/8”	5/32”	3/16”
Dia. (mm)	2.4 mm	3.2 mm	4.0 mm	4.8 mm
Flat	60 ~ 100	90 ~ 130	130 ~ 190	190 ~ 250
V & O	60 ~ 90	80 ~ 120	110 ~ 170	N/A

### Typical Mechanical Properties:

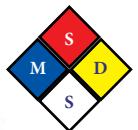
Tensile Strength	psi	110,000
Yield Strength	psi	87,000
Elongation in 2”	(%)	22
Charpy V-Notch	@ -40°F	24 ft. Lbs

### Typical Weld Metal Chemistry (%):

C	Mn	Si	Cr	Mo	P	S
0.06	0.77	0.75	2.25	1.02	0.014	0.010

### Standard Packaging:

10# Package; 60# Master Carton.



## AFM E8018-C1

AWS/SFA A5.5

Low Hydrogen Potassium, Iron Powder Covering

### Description:

AFM E8018-C1 is a low hydrogen electrode that contains about 2.50% Ni. It produces weld metal with increased strength without being airhardenable or with increased notch toughness at temperatures as low as -75°F (-59°C).

### Applications:

AFM E8018-C1 is used for welding nickelbearing steels in low temperature applications where toughness of the weld metal at lower temperatures is important.

### Preheat:

See Table “Preheat, Interpass & Postweld Heat Treatment Temperatures” on page 31.

### Recommended Current Ranges (AC or DC+):

Dia. (inch)	3/32”	1/8”	5/32”	3/16”
Dia. (mm)	2.4 mm	3.2 mm	4.0 mm	4.8 mm
Flat	45 ~ 75	110 ~ 150	150 ~ 190	200 ~ 240
V & O	45 ~ 75	100 ~ 140	120 ~ 170	N/A

### Typical Mechanical Properties:

Tensile Strength	psi	87,000
Yield Strength	psi	73,000
Elongation in 2”	(%)	32
Reduction in Area	(%)	60
Charphy V-Notch	@ -75°F	94 ft. Lbs

### Typical Weld Metal Chemistry (%):

C	Mn	Si	P	S	Ni
0.06	0.98	0.60	0.013	0.007	2.41

### Standard Packaging:

10# Package; 60# Master Carton.



## AFM E8018-C2

AWS/SFA A5.5

Low Hydrogen Potassium, Iron Powder Covering

### Description:

AFM E8018-C2 is a low hydrogen electrode that contains about 3.50% Ni. It produces weld metal with increased strength without being airhardenable or with increased notch toughness at temperatures as low as -100°F (-73°C).

### Applications:

AFM E8018-C2 is used for welding 2%-4% nickel-bearing steels in low temperature applications where toughness of the weld metal at lower temperatures is important.

### Preheat:

See Table “Preheat, Interpass & Postweld Heat Treatment Temperatures” on page 31.

### Recommended Current Ranges (AC or DC+):

Dia. (inch)	3/32”	1/8”	5/32”	3/16”
Dia. (mm)	2.4 mm	3.2 mm	4.0 mm	4.8 mm
Flat	65 ~ 95	90 ~ 130	135 ~ 180	190 ~ 240
V & O	60 ~ 90	80 ~ 120	110 ~ 170	N/A

### Typical Mechanical Properties:

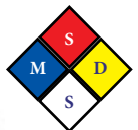
Tensile Strength	psi	94,000
Yield Strength	psi	83,000
Elongation in 2”	(%)	22
Charpy V-Notch	@ -100°F	44 ft. Lbs

### Typical Weld Metal Chemistry (%):

C	Mn	Si	P	S	Ni
0.07	1.12	0.32	0.015	0.007	3.45

### Standard Packaging:

10# Package; 60# Master Carton.



## AFM E8018-C3

AWS/SFA A5.5

Low Hydrogen Potassium, Iron Powder Covering

### Description:

AFM E8018-C3 is low hydrogen electrodes deposit 1% Ni weld metal. It is used primarily to weld high-tensile steels in the 70-80 ksi tensile strength range where notch toughness at temperatures as low as -40°F (-40°C) is required.

### Preheat:

See Table “Preheat, Interpass & Postweld Heat Treatment Temperatures” on page 31.

### Recommended Current Ranges (AC or DC+):

Dia. (inch)	3/32”	1/8”	5/32”	3/16”
Dia. (mm)	2.4 mm	3.2 mm	4.0 mm	4.8 mm
Flat	65 ~ 95	90 ~ 130	135 ~ 180	190 ~ 240
V & O	60 ~ 90	80 ~ 120	110 ~ 170	N/A

### Typical Mechanical Properties:

Tensile Strength	psi	87,000
Yield Strength	psi	77,000
Elongation in 2”	(%)	31
Charpy V-Notch	@ -40°F	44 ft. Lbs

### Typical Weld Metal Chemistry (%):

C	Mn	Si	P	S	Ni
0.07	1.12	0.32	0.015	0.007	0.80 ~ 1.10

### Standard Packaging:

10# Package; 60# Master Carton.



## AFM E801X-B6

### AWS/SFA A5.5

AFM E801X-B6 was formally classified as E502 stainless steel under AWS A5.4-81.

It is used in welding ASTM A 387 Grade 5 base material.

X-denotes 5,6, & 8

E8015-B6 - Low Hydrogen Sodium Covering

E8016-B6 - Low Hydrogen Potassium Covering

E8018-B6 - Low Hydrogen Potassium, Iron Powder Covering

### Description:

AFM E8015-B6, E8016-B6 & E8018B6 electrodes are used for welding base metal of similar composition (alloy 501 & 502), usually in the form of pipe or tubing.

The alloy is an air-hardening material; therefore, when welding with AFM E8015-B6, E8016-B6 & E8018-B6 preheat and post weld heat treatment are required.

### Preheat:

See Table “Preheat, Interpass & Postweld Heat Treatment Temperatures” on page 31.

### Recommended Current Ranges (AC or DC+):

Dia. (inch)	3/32”	1/8”	5/32”	3/16”
Dia. (mm)	2.4 mm	3.2 mm	4.0 mm	4.8 mm
Flat	70 ~ 100	90 ~ 160	130 ~ 220	190 ~ 290
V & O	60 ~ 90	80 ~ 120	110 ~ 170	N/A

### Typical Mechanical Properties:

Tensile Strength	psi	89,000
Yield Strength	psi	73,000
Elongation in 2”	(%)	23

### Typical Weld Metal Chemistry (%):

C	Mn	Si	Cr	P	S	Ni	Mo
0.06	0.60	0.23	4.60	0.01	0.01	0.10	0.46

### Standard Packaging:

10# Package; 60# Master Carton.



## AFM E801X-B8

### AWS/SFA A5.5

AFM E801X-B8 was formally classified as E505 stainless steel under AWS A5.4-81.

It is used in welding ASTM A 387 Grade 9 base materials.

X-denotes 5,6, & 8

E8015-B8 - Low Hydrogen Sodium Covering

E8016-B8 - Low Hydrogen Potassium Covering

E8018-B8 - Low Hydrogen Potassium, Iron Powder Covering

### Description:

AFM E8015-B8, E8016-B8 & E8018-B8 electrodes are used for welding base metal of similar composition (alloy 501 & 502), usually in the form of pipe or tubing.

The alloy is an air-hardening material; therefore, when welding with AFM E8015-B8, E8016-B8 & E8018-B8 preheat and post weld heat treatment are required.

### Preheat:

See Table “Preheat, Interpass & Postweld Heat Treatment Temperatures” on page 31.

### Recommended Current Ranges (AC or DC+):

Dia. (inch)	3/32”	1/8”	5/32”	3/16”
Dia. (mm)	2.4 mm	3.2 mm	4.0 mm	4.8 mm
Flat	70 ~ 100	90 ~ 160	130 ~ 220	190 ~ 290
V & O	60 ~ 90	80 ~ 120	110 ~ 170	N/A

### Typical Mechanical Properties:

Tensile Strength	psi	100,000
Yield Strength	psi	79,000
Elongation in 2”	(%)	23

### Typical Weld Metal Chemistry (%):

C	Mn	Si	Cr	P	S	Ni	Mo
0.05	0.74	0.31	8.97	0.015	0.008	0.09	0.94

### Standard Packaging:

10# Package; 60# Master Carton.



## AFM E9015-B9

AWS/SFA A5.5

Low Hydrogen Sodium Covering

### Description:

AFM E9015-B9 is a 9% Cr-1% Mo, low hydrogen electrode modified with niobium (columbium) and vanadium designed to provide improved creep strength, toughness, fatigue life, and oxidation and corrosion resistance at elevated temperatures.

Due to the higher elevated temperature properties of AFM E9015-B9, components that are now fabricated from stainless and ferritic steels may be fabricated from a single alloy, eliminating the problems associated with dissimilar welds.

### Applications:

AFM E9015-B9 is used for welding A213-T91 Tube, A335-P91 Pipe, and A387 Gr. 91 Plate.

### Preheat:

See Table “Preheat, Interpass & Postweld Heat Treatment Temperatures” on page 31.

### Recommended Current Ranges (DC+):

Dia. (inch)	3/32”	1/8”	5/32”	3/16”
Dia. (mm)	2.4 mm	3.2 mm	4.0 mm	4.8 mm
Flat	70 ~ 100	90 ~ 160	130 ~ 220	190 ~ 290
V & O	60 ~ 90	80 ~ 120	110 ~ 170	N/A

### Typical Mechanical Properties:

Tensile Strength	psi	110,000
Yield Strength	psi	100,000
Elongation in 2”	(%)	18

### Typical Weld Metal Chemistry (%):

C	Mn	Si	P	S	Cr	Ni
0.10	1.0	0.20	0.01	0.01	9.0	0.20
Mo	V	Cb	Cu	Al	N	
1.0	0.20	0.03	0.10	<0.01	0.04	

### Standard Packaging:

10# Package; 40# Master Carton.





## AFM E9018-B9

AWS/SFA A5.5

Low Hydrogen Potassium, Iron Powder Covering

### Description:

AFM E9018-B9 is a 9% Cr-1% Mo, low hydrogen electrode modified with niobium (columbium) and vanadium designed to provide improved creep strength, toughness, fatigue life, and oxidation and corrosion resistance at elevated temperatures.

It is similar to AFM E9015-B9, except it contains an addition of iron powder which improves deposition rates. Due to the higher elevated temperature properties of AFM E9018-B9, components that are now fabricated from stainless and ferritic steels may be fabricated from a single alloy, eliminating the problems associated with dissimilar welds.

### Applications:

AFM E9018-B9 is used for welding A213-T91 Tube, A335-P91 Pipe, and A387 Gr. 91 Plate.

### Preheat:

See Table “Preheat, Interpass & Postweld Heat Treatment Temperatures” on page 31.

### Recommended Current Ranges (AC or DC+):

Dia. (inch)	3/32”	1/8”	5/32”	3/16”
Dia. (mm)	2.4 mm	3.2 mm	4.0 mm	4.8 mm
Flat	60 ~ 90	110 ~ 150	150 ~ 190	200 ~ 240
V & O	50 ~ 80	100 ~ 140	120 ~ 170	N/A

### Typical Mechanical Properties:

Tensile Strength	psi	110,000
Yield Strength	psi	100,000
Elongation in 2”	(%)	18

### Typical Weld Metal Chemistry (%):

C	Mn	Si	P	S	Cr	Ni
0.10	1.0	0.20	0.01	0.01	9.0	0.20
Mo	V	Cb	Cu	Al	N	
1.0	0.20	0.03	0.10	<0.01	0.04	

### Standard Packaging:

10# Package; 40# Master Carton.



## AFM E11018M

AWS/SFA A5.5

Iron Powder, Low Hydrogen Covering

### Description:

AFM E11018M was originally designed for military applications such as welding HY80 and HY100 type steels. To achieve desired weldmetal properties and soundness, AFM E11018M has small alloy additions (especially some Ni) and require careful control of moisture in the electrode covering and from other sources of hydrogen.

### Applications:

AFM E11018M is used to weld all forms of T-1 steel. It can also be used where high-strength welds with excellent low temperature impact properties are desired.

### Preheat:

See Table “Preheat, Interpass & Postweld Heat Treatment Temperatures” on page 31.

### Recommended Current Ranges (AC or DC+):

Dia. (inch)	3/32”	1/8”	5/32”	3/16”
Dia. (mm)	2.4 mm	3.2 mm	4.0 mm	4.8 mm
Flat	60 ~ 90	110 ~ 150	150 ~ 190	200 ~ 240
V & O	50 ~ 80	100 ~ 140	120 ~ 170	N/A

### Typical Mechanical Properties:

Tensile Strength	psi	115,000
Yield Strength	psi	104,800
Elongation in 2”	(%)	23
Reduction in Area	(%)	62
Charphy V-Notch	@ -60°F	44 ft. Lbs

### Typical Weld Metal Chemistry (%):

C	Mn	Si	P	S	Cr	Ni	Mo
0.05	1.50	0.30	0.018	0.015	0.30	1.75	0.30

### Standard Packaging:

10# Package; 40# Master Carton.



## AFM E12018M

AWS/SFA A5.5

Iron Powder, Low Hydrogen Covering

### Description:

AFM E12018M is used to weld low alloy, high tensile steels where welds of 120 ksi minimum tensile strength is required.

### Applications:

AFM E12018M is commonly used to weld forgings, plate castings, and pressure vessels.

### Preheat:

See Table “Preheat, Interpass & Postweld Heat Treatment Temperatures” on page 31.

### Recommended Current Ranges (DC+):

Dia. (inch)	3/32”	1/8”	5/32”	3/16”
Dia. (mm)	2.4 mm	3.2 mm	4.0 mm	4.8 mm
Flat	60 ~ 90	110 ~ 150	150 ~ 190	200 ~ 240
V & O	50 ~ 80	100 ~ 140	120 ~ 170	N/A

### Typical Mechanical Properties:

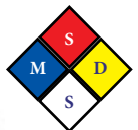
Tensile Strength	psi	133,400
Yield Strength	psi	120,500
Elongation in 2”	(%)	18
Reduction in Area	(%)	56
Charpy V-Notch	@ -60°F	26 ft. Lbs

### Typical Weld Metal Chemistry (%):

C	Mn	Si	P	S	Cr	Ni	Mo
0.05	1.65	0.34	0.019	0.016	0.85	2.0	0.45

### Standard Packaging:

10# Package; 40# Master Carton.



## AFM 4130

No AWS Class

### Description:

AFM 4130 is used to weld heat-treatable, low alloy SAE 4130 and 8630 steels and steel castings with comparable hardening characteristics.

### Preheat:

Between 400 ~ 600°F (204 ~ 316°C), with the same temperature held at interpass, in order to prevent cracking.

### Recommended Current Ranges (AC or DC+):

Dia. (inch)	3/32"	1/8"	5/32"	3/16"
Dia. (mm)	2.4 mm	3.2 mm	4.0 mm	4.8 mm
Flat	60 ~ 90	110 ~ 150	150 ~ 190	200 ~ 240
V & O	50 ~ 80	100 ~ 140	120 ~ 170	N/A

### Typical Weld Metal Chemistry (%):

C	Mn	Si	P	S	Cr	Ni	Mo
0.20	1.25	0.40	0.013	0.015	0.50	1.30	0.20



**Standard Packaging:**  
10# Package; 40# Master Carton.

## AFM 4140

No AWS Class

### Description:

AFM 4140 is used for welding SAE 4140 and similar heat-treatable steel where the weld metal must match the heat treating properties of the parent metal.

### Preheat:

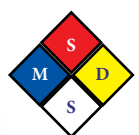
Between 400 ~ 600°F (204 ~ 316°C), with the same temperature held at interpass, in order to prevent cracking.

### Recommended Current Ranges (AC or DC+):

Dia. (inch)	3/32"	1/8"	5/32"	3/16"
Dia. (mm)	2.4 mm	3.2 mm	4.0 mm	4.8 mm
Flat	60 ~ 90	110 ~ 150	150 ~ 190	200 ~ 240
V & O	50 ~ 80	100 ~ 140	120 ~ 170	N/A

### Typical Weld Metal Chemistry (%):

C	Mn	Si	P	S	Cr	Mo
0.35	0.80	0.50	0.012	0.014	0.75	0.33



**Standard Packaging:**  
10# Package; 40# Master Carton.

### AFM 4340

No AWS Class

#### Description:

AFM 4340 is used for welding heat treatable, high strength steels SAE 4130, 4330, 4340 and steel castings with similar hardening properties.

#### Preheat:

Between 400 ~ 600°F (204 ~ 316°C), with the same temperature held at interpass, in order to prevent cracking.

#### Recommended Current Ranges (AC or DC+):

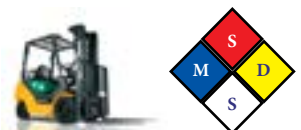
Dia. (inch)	3/32"	1/8"	5/32"	3/16"
Dia. (mm)	2.4 mm	3.2 mm	4.0 mm	4.8 mm
Flat	60 ~ 90	110 ~ 150	150 ~ 190	200 ~ 240
V & O	50 ~ 80	100 ~ 140	120 ~ 170	N/A

#### Typical Weld Metal Chemistry (%):

C	Mn	Si	P	S	Cr	Ni	Mo
0.35	0.85	0.50	0.011	0.014	0.80	1.80	0.25

#### Standard Packaging:

10# Package; 40# Master Carton.



## Preheat, Interpass & Postweld Heat Treatment Temperatures

AWS Classification	Preheat & Interpass Temperature		Post Weld Heat Treatment Temperature	
	°F	°C	°F	°C
E7018-A1	200 ~ 225	93 ~ 107	1,150 ± 25	620 ± 14
E7018-B2L E8018-B2 E8018-B3L E9018-B3	300 ~ 375	163 ~ 191	1,275 ± 25	690 ± 14
E8015-B6 E8016-B6	350 ~ 450	177 ~ 232	1,375 ± 25	740 ± 14
E8015-B8 E8016-B8	400 ~ 500	205 ~ 260	1,375 ± 25	740 ± 14
E9015-B9 E9018-B9	450 ~ 550	232 ~ 288	1,375 ± 25	740 ± 14
E8018-C1 E8018-C2	200 ~ 225	93 ~ 107	1,125 ± 25	605 ± 14
E8018-C3 E11018M E12018M	200 ~ 250	93 ~ 121	Not Specified	