

WELDING PRODUCTS



VANGUARD STEEL LTD.



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Precautions and Safe Welding Practices

WARNINGS

Protect yourself and others, read and understand this information

Fumes and Gases

Welding and cutting should only be performed in a properly ventilated environment. There are a number of options that should be used to make sure to keep your head out of the fume plumes which include adequate ventilation, repositioning of the work, the operators head or both.

Adequate ventilation keeps exposure to airborne contaminants below allowable/safe limits. This can consist of the use of natural ventilation, mechanical ventilation, fixed or moveable exhaust hoods, or local exhaust at the arc. There are a number of factors to ensure proper ventilation for welding cells/fab shops:

- Workspace volume
- Number of welders
- Consumables used (mild steel, hardfacing, stainless, etc.)
- Material welded (always make sure to including paint or plating)
- Workspace configuration
- Welding process and current
- Allowable levels (TLV, PEL, etc.)
- Natural airflow

A technically qualified company/person should determine the ventilation requirements. The use of an approved respirator should be used when ventilation is neither adequate nor practical.

Arc Rays

Ultraviolet radiation (UV) is generated by the electric arc in the welding process. Skin exposure to UV can result in severe burns, in many cases without prior warning. UV radiation can also damage the lens of the eye. Many arc welders are aware of the condition known as "arc-eye," a sensation of sand in the eyes. This condition is caused by excessive eye exposure to UV. Exposure to ultraviolet rays may also increase the skin effects of some industrial chemicals (coal tar and cresol compounds, for example).

Exposure to infrared radiation (IR), produced by the electric arc and other flame cutting equipment may heat the skin surface and the tissues immediately below the surface. Except for this effect, which can progress to thermal burns in some situations, infrared radiation is not dangerous to welders.

Exposure of the human eye to intense visible light can produce adaptation, pupillary reflex, and shading of the eyes. Such actions are protective mechanisms to prevent excessive light from being focused on the retina. In the arc welding process, eye exposure to intense visible light is prevented for the most part by the welder's helmet. However, some individuals have sustained retinal damage due to careless "viewing" of the arc. At no time should the arc be observed without eye protection.

The use of proper/approved protective eye wear, ear wear and clothing should be used at all times when welding or cutting.

Electric Shock

Electric shock is a risk commonly associated with electric resistance and electric arc welding. The risk of shock can be caused due to improper grounding of the welding equipment (direct contact ground with energized lead) or from contact with the welding lead (moist gloves, clothing, damp floor and/or humidity in the air). Confined work spaces create greater risk for electric shock; regular inspection of all welding cells can reduce the risk of shock.



Stainless Steel Electrodes

E308 - 16

CWB to CSA W48
AWS A 5.4 – 06 E308-16

Suitable welding positions:



Typical applications:

Welding of low carbon 18% Cr – 8% Ni stainless steel (AISI 301, 302, 304 and 308).

Characteristics on usage:

Very good welding performance without hardening or brittleness thanks to the austenitic structure of the deposited weld metal.

This electrode offers good heat resistance and corrosion resistance.

General information:

- Remove water, rust, oil and all other foreign matters from the groove prior to welding
- Weaving width should be within 2-1/2 times the diameter of the electrode
- The electrode should be re-dried prior to use at between 250 - 350°C for 30 - 60 minutes
- Keep the arc as short as possible

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

	C	Si	Mn	P	S	Cr	Ni	Mo	Cu
E308 - 16	0.05	0.78	1.22	0.024	0.018	19.3	9.3	0.2	0.3
E308L - 16	0.03	0.80	0.84	0.023	0.016	19.3	9.6	0.2	0.3

Typical mechanical properties of all-weld –metal

	Minimum Tensile Strength	Minimum Elongation
E308 - 16	550 MPa	35%
E308L - 16	520 MPa	35%

Dimensions and recommended currents range (AC or DC+)

Diameter		Length		E308 - 16			E308L - 16		
Inches	mm	Inches	mm	Part Number	Amperage		Part Number	Amperage	
					F	V & O/H		F	V & O/H
5/64	2.0	9.8	250		40 - 50	35 - 45		40 - 50	35 - 45
3/32	2.4	11.8	300	6007 2409	50 - 80	45 - 60	6008 2409	55 - 80	45 - 60
1/8	3.2	13.8	350	6007 3209	80 - 110	70- 100	6008 3209	90 - 130	70- 90
5/32	4.0	13.8	350	6007 4009	110 - 150	90 - 130	6008 4009	110 - 150	90 - 130
3/16	5.0	13.8	350	6007 4809	140 - 180	N/A	6008 4809	140 - 180	N/A

Standard Packaging

Sleeve		Master Carton	
4.5 kgs	10 Lbs	4.5 kgs	10 Lbs

E308L - 16

CWB to CSA W48
AWS A 5.4-06 E308L - 16

Suitable welding positions:



Typical applications:

Welding of low carbon 18% Cr – 8% Ni stainless steel (AISI 304L and 308L).

Characteristics on usage:

Excellent welding efficiency due to the extremely high deposition rate. The low carbon content minimizes the formation of chromium carbides reducing the potential of inter-granular corrosion. Preheating is generally not necessary.

Inter-granular corrosion resistance is superior to E308 – 16 electrodes.



Stainless Steel Electrodes

E309 - 16

CWB to CSA W48
AWS A 5.4-06 E309 - 16

Suitable welding positions:



Typical applications:

Welding of low carbon 22% Cr – 12% Ni steel, heat resisting casting, and clad side of type 304 clad steel. Also commonly used when joining dissimilar metals such as Cr-Mo or carbon steel to stainless steel.

Characteristics on usage:

The deposited weld metal has optimal ferrite levels to resist weld metal cracking. Good heat and corrosion resistance.

General information:

- Remove water, rust, oil and all other foreign matters from the groove prior to welding
- Weaving width should be within 2-1/2 times the diameter of the electrode
- The electrode should be re-dried prior to use at between 250 - 350°C for 30 - 60 minutes
- Keep the arc as short as possible

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

	C	Si	Mn	P	S	Cr	Ni	Mo	Cu
E309 - 16	0.06	0.72	1.36	0.028	0.012	23.6	12.6	0.2	0.3
E309L - 16	0.03	0.71	1.34	0.027	0.013	23.7	12.6	0.2	0.3

Typical mechanical properties of all-weld –metal

	Minimum Tensile Strength	Minimum Elongation
E309 - 16	550 MPa	30%
E309L - 16	520 MPa	30%

Dimensions and recommended currents range (AC or DC+)

Diameter		Length		E309 - 16			E309L - 16		
Inches	mm	Inches	mm	Part Number	Amperage		Part Number	Amperage	
					F	V & O/H		F	V & O/H
5/64	2.0	9.8	250		40 - 50	35 - 45		30 - 50	25 - 45
3/32	2.4	11.8	300	6011 2409	50 - 80	45 - 60	6012 2409	50 - 80	45 - 65
1/8	3.2	13.8	350	6011 3209	80 - 110	70 - 90	6012 3209	80 - 110	70 - 90
5/32	4.0	13.8	350	6011 4009	110 - 150	90 - 130	6012 4009	110 - 150	90 - 130
3/16	5.0	13.8	350	6011 4809	140 - 180	N/A	6012 4809	140 - 180	N/A

Standard Packaging

Sleeve		Master Carton	
4.5 kgs	10 Lbs	18 kgs	40 Lbs

E309L - 16

CWB to CSA W48
AWS A 5.4-06 E309L - 16

Suitable welding positions:



Typical applications:

Welding of low carbon 22% Cr – 12% Ni steel, heat resisting casting and clad side of type 304 clad steel.

Also commonly used when joining dissimilar metals such as stainless steel to carbon or low alloy steels.

Characteristics on usage:

The deposited weld metal has optimal ferrite levels to resist weld metal cracking. This electrode is extremely resistant to corrosion and inter-granular attack (superior to E309 – 16 electrodes).



Stainless Steel Electrodes

E310 - 16

CWB to CSA W48
AWS A 5.4-06 E310 - 16

Suitable welding positions:



Typical applications:

Welding of stainless steel of similar composition in cast and wrought forms, AISI (SUS) 310S, SCS 18 and clad side of 18% Cr – 8% Ni stainless clad steel.

Scale resistant at extreme temperatures -196°C to 1200°C (-320°F to 2200°F).

Characteristics on usage:

The deposited weld metal has optimized austenitic structure, and as such minimum heat input is required during welding.

Good mechanical properties and heat resistance of the deposited weld metal.

General information:

- Remove water, rust, oil and all other foreign matters from the groove prior to welding
- Weaving width should be within 2-1/2 times the diameter of the electrode
- The electrode should be re-dried prior to use at between 250 - 350°C for 30 - 60 minutes
- Keep the arc as short as possible

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

	C	Si	Mn	P	S	Cr	Ni	Mo	Cu
E310 - 16	0.11	0.40	1.86	0.025	0.013	25.6	20.8	0.2	0.3
E312 - 16	0.08	0.45	1.30	0.028	0.012	29.1	8.5	0.2	0.3

Typical mechanical properties of all-weld –metal

	Minimum Tensile Strength	Minimum Elongation
E310 - 16	550 MPa	30%
E312 - 16	660 MPa	22%

Dimensions and recommended currents range (AC or DC+)

Diameter		Length		Part Number	E310 - 16		E312 - 16		
Inches	mm	Inches	mm		Amperage		Part Number	Amperage	
					F	V & O/H		F	V & O/H
5/64	2.0	9.8	250		30 - 50	25 - 45			
3/32	2.4	11.8	300	6016 2409	50 - 80	45 - 60	6020 2409	40 - 80	35 - 75
1/8	3.2	13.8	350	6016 3209	80 - 110	70 - 90	6020 3209	70 - 110	70 - 90
5/32	4.0	13.8	350	6016 4009	110 - 140	90 - 130	6020 4009	110 - 140	80 - 120
3/16	5.0	13.8	350	6016 4809	140 - 180	N/A	6020 4809	140 - 180	N/A

Standard Packaging

Sleeve		Master Carton	
4.5 kgs	10 Lbs	18 kgs	40 Lbs

E312 - 16

AWS A 5.4-06 E312 - 16

Suitable welding positions:



Typical applications:

Welding wrought and cast alloys of similar compositions as well as for welding dissimilar metals. Welding of 29% Cr - 9% Ni type cast steels and difficult-to-weld steels.

Joint welding and hardfacing of stainless steel and heat-resisting steels.

Characteristics on usage:

Improved crack resistance due to the high quantity of ferrite in the deposited weld metal.

Weld deposits exhibit high tensile strength and offer some resistance to abrasion.



Stainless Steel Electrodes

E316 - 16

CWB to CSA W48
AWS A 5.4-06 E316 - 16

Suitable welding positions:



Typical applications:

Welding of low carbon 18% Cr – 12% Ni-Mo stainless steel, austenitic stainless steel which is required where heat treatment after welding is impossible.

Characteristics on usage:

Very good electrode for both flat and horizontal fillet welding. Very good corrosion resistance against sulphurous acid, phosphoric acid and acetic acid.

General information:

- Remove water, rust, oil and all other foreign matters from the groove prior to welding
- Weaving width should be within 2-1/2 times the diameter of the electrode
- The electrode should be re-dried prior to use at between 250 - 350°C for 30 - 60 minutes
- Keep the arc as short as possible

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

	C	Si	Mn	P	S	Cr	Ni	Mo	Cu
E316- 16	0.06	0.73	1.18	0.028	0.012	18.3	12.5	2.3	0.3
E316L - 16	0.03	0.72	1.08	0.028	0.013	18.4	12.5	2.5	0.3

Typical mechanical properties of all-weld –metal

	Minimum Tensile Strength	Minimum Elongation
E316- 16	520 MPa	30 %
E316L - 16	490 MPa	30 %

Dimensions and recommended currents range (AC or DC+)

Diameter		Length		E316 - 16			E316L - 16		
Inches	mm	Inches	mm	Part Number	Amperage		Part Number	Amperage	
					F	V & O/H		F	V & O/H
5/64	2.0	9.8	250		30 – 50	25 – 45	6029 2009	40 - 50	35 – 45
3/32	2.4	11.8	300	6028 2409	50 – 80	45 – 60	6029 2409	55 - 70	45 - 65
1/8	3.2	13.8	350	6028 3209	80 – 110	70 – 90	6029 3209	80 - 110	70 - 90
5/32	4.0	13.8	350	6028 4009	110 – 140	90 - 130	6029 4009	120 - 150	90 - 130
3/16	5.0	13.8	350	6028 4809	140 - 180	N/A	6029 4809	140 - 180	N/A

Standard Packaging

Sleeve		Master Carton	
4.5 kgs	10 Lbs	18 kgs	40 Lbs

E316L - 16

CWB to CSA W48
AWS A 5.4-06 E316L - 16

Suitable welding positions:



Typical applications:

Welding of low carbon 18% Cr – 12% Ni-Mo stainless steel, austenitic stainless steel which is required where heat treatment after welding is impossible. Food grade welding electrode.

Characteristics on usage:

Very good electrode for both flat and horizontal fillet welding. Excellent corrosion resistance against sulphurous acid, phosphoric acid and acetic acid.

Inter-granular corrosion resistance is superior to E316 – 16 electrodes.



Stainless Steel Tig Wire

ER308L

CWB to CSA W48
AWS A 5.4-06 E308L

Typical applications: Welding of 18% Cr - 8% Ni austenite stainless steels. Used to weld base metals of similar composition such as AISI 201, 202, 205, 301, 302, 304, 305 and 308 as well as the low carbon grades. Most commonly used grade of Tig wire.

ER309L

CWB to CSA W48
AWS A 5.4-06 E309L

Typical applications: Welding of 22% Cr – 12% Ni STS and dissimilar steels such as 304 to mild steel or low alloy steels, also used for joining dissimilar stainless steels such as 409 to itself or to 304L stainless

ER316L

CWB to CSA W48
AWS A 5.4-06 E316L

Typical applications: Welding of 18% Cr – 12% Ni – 2% Mo austenite stainless steel AISI STS 316, 316L, 318 and 319L that may be exposed to either organic or inorganic acids. Excellent resistance against intergranular corrosion

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

	C	Si	Mn	Ni	Cr	Mo	Nb + Ta
ER308L	0.024	0.42	1.65	10.33	20.10	---	---
ER309L	0.023	0.39	1.98	12.9	23.88	---	---
ER 316L	0.025	0.42	1.91	12.58	19.1	2.57	---

Typical mechanical properties of all-weld –metal

	Minimum Tensile Strength	Minimum Elongation	High Temperature Tensile Strength (850°C)
ER308L	578 MPa	42%	---
ER309L	588 MPa	43%	---
ER 316L	558 MPa	40%	

Dimensions, Standard Packaging and Part Numbers

					ER308L	ER309L	ER316L
Diameter		Length		Standard Packaging/Tube	Part Number		
Inches	mm	Inches	mm				
3/64	1.2	39	1,000	5 Kgs	6306 1200V	6309 1200V	6318 1200V
1/16	1.6	39	1,000	5 Kgs	6306 1600V	6309 1600V	6318 1600V
3/32	2.4	39	1,000	5 Kgs	6306 2400V	6309 2400V	6318 2400V
1/8	3.2	39	1,000	5 Kgs	6306 3200V	6309 3200V	6318 3200V
5/32	4.0	39	1,000	5 Kgs	6306 4000V	6309 4000V	6318 4000V
3/16	4.8	39	1,000	5 Kgs	6308 4800V	6309 4800V	6318 4800V



Stainless Steel Mig Wire

ER308L AWS A5.9/A5.9M:2006

Suitable welding positions:



Typical applications:

Welding of 18% Cr – 8% Ni austenite stainless steels AISI STS 301, 302 and 304 apparatuses.

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

	C	Si	Mn	Ni	Cr	Mo	Nb + Ta
ER308L	0.02	0.38	1.9	9.77	19.79	---	---
ER308L HiSil	0.01	0.85	1.68	9.89	19.63	---	---

Typical mechanical properties of all-weld –metal

	Minimum Tensile Strength	Minimum Elongation	High Temperature Tensile Strength (850°C)
ER308L	520 MPa	35%	---
ER308L HiSil	520 MPa	35%	---

ER308L HiSil CWB to CSA W48 AWS A5.9/A5.9M:2006

Suitable welding positions:



Typical applications:

Welding of 18% Cr – 8% Ni austenite stainless steels AISI STS 301, 302 and 304.

ER309L AWS A5.9/A5.9M:2006

Suitable welding positions:



Typical applications:

Welding of 22% Cr – 12% Ni STS and dissimilar steels such as 304 to mild steel or low alloy steels.

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

	C	Si	Mn	Ni	Cr	Mo	Nb + Ta
ER309L	0.01	0.45	1.64	13.78	23.09	---	---
ER309L HiSil	0.01	0.91	1.86	13.62	23.07	---	---

Typical mechanical properties of all-weld –metal

	Minimum Tensile Strength	Minimum Elongation	High Temperature Tensile Strength (850°C)
ER309L	520 MPa	30%	---
ER309L HiSil	520 MPa	30%	---

ER309L HiSil AWS A5.9/A5.9M:2006

Suitable welding positions:



Typical applications:

Welding of 22% Cr – 12% Ni STS and dissimilar steels such as 304 to mild steel or low alloy steels.



Stainless Steel Mig Wire

ER310

AWS A5.9/A5.9M:2006

Suitable welding positions:



Typical applications:

Welding of 25% Cr – 20% Ni STS austenite stainless steel (AISI 310S, SCH, 18, SCH 21, 22 and SUH 310).

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

	C	Si	Mn	Ni	Cr	Mo	Nb + Ta
ER310	0.10	0.41	1.60	20.84	26.74	---	---
ER312	0.01	0.41	1.81	8.92	30.63	---	---

Typical mechanical properties of all-weld –metal

	Minimum Tensile Strength	Minimum Elongation	High Temperature Tensile Strength (850°C)
ER310	550 MPa	30%	---
ER312	660 MPa	22%	---

ER312

AWS A5.9/A5.9M:2006

Suitable welding positions:



Typical applications:

Welding of 29% Cr – 9% Ni STS and dissimilar steels such as 304L to mild steels or low alloy steels.

ER316L

AWS A5.9/A5.9M:2006

Suitable welding positions:



Typical applications:

Welding of 18% Cr – 12% Ni – 2% Mo austenite stainless steel (AISI STS 316, 316L).

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

	C	Si	Mn	Ni	Cr	Mo	Nb + Ta
ER316L	0.04	0.44	1.60	12.17	19.22	2.49	---
ER316L HiSi	0.01	0.87	1.55	11.57	18.58	2.54	---

Typical mechanical properties of all-weld –metal

	Minimum Tensile Strength	Minimum Elongation	High Temperature Tensile Strength (850°C)
ER316L	490 MPa	30%	---
ER316L HiSi	490 MPa	30%	---

ER316L HiSi

AWS A5.9/A5.9M:2006

Suitable welding positions:



Typical applications:

Welding of 18% Cr – 12% Ni – 2% Mo austenite stainless steel (AISI STS 316, 316L).



Stainless Steel Mig Wire

Dimensions, Standard Packaging and Part Numbers

Diameter		ER308L			ER308L HiSil		
		1Kg	5Kg	15Kg	1Kg	5Kg	15Kg
Inches	mm						
0.023	0.6	6206 0601V	6206 0605V	---	---	---	---
0.030	0.8	6206 0801V	6206 0805V	6206 0800	---	---	6207 0800
0.035	0.9	6206 0901V	6206 0905V	6206 0900	---	---	6207 0900
0.045	1.2	6206 1201V	6206 1205V	6206 1200	---	---	6207 1200
0.062	1.6	---	---	6206 1600	---	---	6207 1600

Diameter		ER309L			ER310		
		1Kg	5Kg	15Kg	1Kg	5Kg	15Kg
Inches	mm						
0.023	0.6	6211 0601V	6211 0605V	---	---	---	---
0.030	0.8	6211 0801V	6211 0805V	6211 0800	---	---	6210 0800
0.035	0.9	6211 0901V	6211 0905V	6211 0900	---	---	6210 0900
0.045	1.2	6211 1201V	6211 1205V	6211 1200	---	---	6210 1200
0.062	1.6	---	---	6211 1600	---	---	6210 1600

Diameter		ER316L			ER316L HiSil		
		1Kg	5Kg	15Kg	1Kg	5Kg	15Kg
Inches	mm						
0.023	0.6	6217 0601V	6217 0605V	---	---	---	---
0.030	0.8	6217 0801V	6217 0805V	6217 0800	---	---	6218 0800
0.035	0.9	6217 0901V	6217 0905V	6217 0900	---	---	6218 0900
0.045	1.2	6217 1201V	6217 1205V	6217 1200	---	---	6218 1200
0.062	1.6	6217 1601V	6217 1205V	6217 1600	---	---	6218 1600

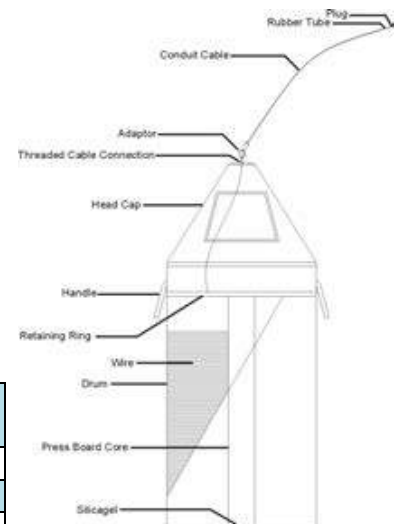
* Spools are precision wound

Pail Packs (Drums)

Dimensions, Standard Packaging and Part Numbers

Wire Diameter		Drum Diameter		ER308L HiSil 120Kg Pail Packs
Inches	mm	Inches	mm	
0.035	0.8	20	508	6207 0109
0.045	1.2	20	508	6207 0112
0.062	1.6	20	508	6207 0116

* Additional grades, diameter and packages sizes available upon request. Minimum order quantity may apply





Stainless Steel Flux Cored Wire

E308LT-1/4

CWB to CSA W48
AWS A5.22/A5.22M:2012

Suitable welding positions:



Typical applications:

Metal active gas (MAG) welding of low carbon 18% Cr – 8% Ni stainless steel, also used to join austenitic stainless steel (AISI 304, 304L, 304LN, ASTM A157 Gr. C9; A320 Gr. B8C or D).

Characteristics on usage:

- Excellent weldability and low crack susceptibility
- Titania type flux core with self-detaching slag
- Low spatter generation
- Very good weld soundness of the weld-metal

Polarity and shielding gases

DCEP DC+	CO ₂ : 100% CO ₂ (15 – 25l/Minute)	Mix: Ar + 20% CO ₂ (15 – 25l/Minute)
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Typical chemical composition of all-weld-metal (%)

Shielding Gas	C	Si	Mn	Cr	Ni	Mo	FN
CO ₂	0.03	0.60	1.15	20.3	9.60	---	9
Mix	0.03	0.65	1.25	20.4	9.70	---	10

Typical mechanical properties of all-weld –metal

Minimum Tensile Strength	Minimum Elongation
520 MPa	35%

Proper ranges of welding (DC+, 100% CO₂)

Current (Amperage)	Diameter	0.9mm (0.035")	1.2mm (0.045")	1.6mm (0.062")
	Flat		80 ~ 160	140 ~ 240
Horizontal Flat		100 ~ 160	160 ~ 240	200 ~ 300
Vertical Up		100 ~ 120	160 ~ 200	200 ~ 240

Standard Packaging and Product Codes

Standard Spool Size		Part Number		
		0.035" (0.9mm)	0.045" (1.2mm)	0.062" (1.6mm)
15 Kgs	33 Lbs	6291 0900	6291 1200	6291 1600



Stainless Steel Flux Cored Wire

E309LT-1/4 CWB to CSA W48
AWS A5.22/A5.22M:2012

Suitable welding positions:



Typical applications:

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

Characteristics on usage:

- Excellent weldability
- Superior heat and corrosion resistance
- Easy to use
- Powerful penetrating spray arc transfer
- Low spatter generation and self-releasing slag
- Very good weld soundness of the weld-metal

Polarity and shielding gases

DCEP DC+	CO ₂ : 100% CO ₂ (15 – 25l /Minute)	Mix: Ar + 20% CO ₂ (15 – 25l/Minute)
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Typical chemical composition of all-weld-metal (%)

Shielding Gas	C	Si	Mn	Cr	Ni	Mo	FN
CO ₂	0.03	0.60	1.12	23.7	13.20	---	14
Mix	0.03	0.75	1.20	23.9	13.20	---	15

Typical mechanical properties of all-weld –metal

Minimum Tensile Strength	Minimum Elongation
550 MPa	30%

Proper ranges of welding (DC+, 100% CO₂)

		Diameter	0.9mm (0.035")	1.2mm (0.045")	1.6mm (0.062")
Part Number			6292 0900	6292 1200	6292 1600
Current (Amp)	Flat		80 ~ 160	140 ~ 240	180 ~ 300
	Horizontal Flat		100 ~ 160	160 ~ 240	200 ~ 300
	Vertical Up		100 ~ 120	160 ~ 200	200 ~ 240

Standard Packaging and Product Codes

Standard Spool Size		Part Number		
		0.035" (0.9mm)	0.045" (1.2mm)	0.062" (1.6mm)
15 Kgs	33 Lbs	6292 0900	6292 1200	6292 1600



Stainless Steel Flux Cored Wire

E316LT-1/4

CWB to CSA W48
AWS A5.22/A5.22M:2012

Suitable welding positions:



Typical applications:

Metal active gas (MAG) welding of low carbon 18% Cr – 12% Ni – 2% Mo stainless steel. The low carbon content of this wire provides very good resistance to most types of corrosion of the weld metal (AISA 316L, 316Ti).

Characteristics on usage:

- Excellent weldability and low crack susceptibility
- Titania type flux core with self-detaching slag
- Low spatter generation
- Very good weld soundness of the weld-metal

Polarity and shielding gases

DCEP DC+	CO ₂ : 100% CO ₂ (15 – 25l /Minute)	Mix: Ar + 20% CO ₂ (15 – 25l/Minute)
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Typical chemical composition of all-weld-metal (%)

Shielding Gas	C	Si	Mn	Cr	Ni	Mo	FN
CO ₂	0.03	0.60	1.15	19.5	12.70	2.4	7.5
Mix	0.03	0.65	1.2	19.7	12.70	2.4	8.0

Typical mechanical properties of all-weld –metal

Minimum Tensile Strength	Minimum Elongation
485 MPa	30%

Proper ranges of welding (DC+, 100% CO₂)

		Diameter	0.035" (0.9mm)	0.045" (1.2mm)	0.062" (1.6mm)
Part Number			6294 0900	6294 1200	6294 1600
Current (Amperage)	Flat		80 ~ 160	140 ~ 240	180 ~ 300
	Horizontal Flat		100 ~ 160	160 ~ 240	200 ~ 300
	Vertical Up		100 ~ 120	160 ~ 200	200 ~ 240

Standard Packaging and Product Codes

Standard Spool Size		Part Number		
		0.035" (0.9mm)	0.045" (1.2mm)	0.062" (1.6mm)
15 Kgs	33 Lbs	6292 0900	6292 1200	6292 1600



Flux Core Wires Notes on usage

General information:

- 1) Flux cored wire is softer than solid Mig wire so you must always be sure not to over tighten the rollers in the wire feeder
- 2) When flat butt welding use the back-step process for maximum penetration stability. When horizontal and over-head welding use the straight sequence, this will ensure a good flat bead appearance.
- 3) When welding horizontal fillets to primer coated plate you are likely to encounter blow- hole defects such as pitting and gas holes. To avoid this always ensure to select the correct wire and use the appropriate welding parameters.
- 4) When welding is performed using excessive heat and/or welding currents you may lower the mechanical properties of the weld metal.
- 5) Welding using excessive heat also tends to reduce the impact values.
- 6) Cold cracks are caused by diffusible hydrogen; to prevent this it is necessary to remove the diffusible hydrogen by selecting the proper pre-heat and interpass temperature (this is dependent on the welding process). Normally as the tensile strength becomes higher it is better to apply a higher pre-heat and interpass temperature.
- 7) Rust, oil and dirt can cause welding defects such as pitting and blowholes, to prevent this the work surface should be thoroughly cleaned before welding.
- 8) To minimize cracking of hard surfacing the following steps should be taken in the order shown:

A) Preparation of the base metal	B) Heat and temperature control	C) Penetration
D) Welding distortion	E) Underlaying	

Welding power source: Use a DC power source with constant voltage or a polarity DCEP inverter type welding power source. Ordinary currents should be used and the pulse switch should be turned off. The use of certain pulse arc power sources can create excessive spatter.

Shielding gas: For general applications the recommended shielding gas is CO₂. Argon - CO₂ mixtures with 20 – 50% CO₂ can also be used but when compared with CO₂ porosity (pit, blowhole) is more likely to occur. The proper flow rate of the shielding gas is 20 – 50 liters/minute.

Mixed gases:

- 1) When using mixed gases (Ar + 80% CO₂) for spray transfer welding, the voltage should be lowered (1~2). The use of an excessively low arc voltage may generate a large sound in spray arc welding with mixed gas, it makes for a shallower welding depth and it may cause welding defects for low shielding power.
- 2) When you use shorter wire extension you should be able to achieve better bead shape and welding depth.
- 3) Always make sure to use the appropriate welding conditions, high heat input of over welding condition make limited heating, base metal easily deform.

Wire extension: Keep the wire extension at about 15mm for 0.9mm diameter wire and 15 -20mm for 1.2 to 1.6mm wire diameters. The use of a shorter wire extension may cause pit and worm-tracking porosity. Please note that the wire extension when welding with Argon-CO₂ mixtures should be 5mm longer than when using straight CO₂.

Protection against wind: When wind velocity at the vicinity of an arc is more than 1m/second, blowhole is more likely to occur and dissolution of nitrogen into the weld metal may deteriorate slag removal and decrease the ferrite content of the weld metal, thereby causing hot cracking. To prevent these problems from occurring use an adequate shielding gas flow rate and a welding screen.

Welding fumes: Flux-cored wires generate higher levels of welding fumes when compared to solid wires. To protect welders from harmful welding fumes proper air extraction and an appropriate respirators are required.

Storage of wire: Once a flux cored wire is unpacked the wire should be stored in an area of low humidity, taking the appropriate preventative measures against dew fall water and dust. If not properly stored the wire can pick up moisture which may cause pitting and worm tracking when welding.



Tungsten Electrodes

Tungsten is a rare metallic element used for manufacturing TIG or Gas tungsten arc welding (GTAW,) electrodes. The TIG process relies on tungsten’s hardness and high temperature resistance to carry the welding current to the arc.

Bonarc Tungsten electrodes have a smooth round, bright centerless ground finish. The ends are color coded for easy identification and they meet the AWS A5.12 specifications.

Material	Recommended Tungsten
Carbon Steel	2% Ceriated and 2% Thoriated
Stainless Steel	2% Ceriated and 2% Thoriated
Aluminum	Pure, 2% Ceriated and 2% Thoriated
Copper and Copper Alloys	2% Ceriated and 2% Thoriated
Magnesium Alloys	2% Ceriated and 2% Thoriated

Type	Dimensions (Diameter x Length)		Product Code
	mm	Inches	
Pure (Green Tipped) AWS Class EWP	1.6 x 178	1/16 x 7	6400 1600
	2.4 x 178	3/32 x 7	6400 2400
	3.2 x 178	1/8 x 7	6400 3200
	4.0 x 178	5/32 x 7	6400 4000
2% Thoriated (Red Tipped) AWS Class EWTh-2	1.6 x 178	1/16 x 7	6402 1600
	2.4 x 178	3/32 x 7	6402 2400
	3.2 x 178	1/8 x 7	6402 3200
	4.0 x 178	5/32 x 7	6402 4000
2% Ceriated (Orange Tipped/Radiation Free) AWS Class EWCe-2	1.6 x 178	1/16 x 7	6406 1600
	2.4 x 178	3/32 x 7	6406 2400
	3.2 x 178	1/8 x 7	6406 3200
	4.0 x 178	5/32 x 7	6406 4000

* Additional rare earth tungsten, diameters and lengths available. Minimum order quantity may apply



Aluminum Filler Metal Chart

Base Metal	201 206 224	319 333 354 355 C355	356 A356 357 A357 413 443 A444	511 512 513 514 535	7004 7005 7039 710 712	6009 6010 6070	6005 6051 6063 6101 6151 6201 6351 6951	5456	5454	5154 5254	5086	5083	5052 5652	5005 5050	3004 Alc- 3004	2219	2014 2036	1100 3003 Alc- 3003	1060 1070 1080 1350	
1060 1070 1080 1360	4145	4145	4043 4145 4047	5356 4043 5183	5356 4043 5183	4043 4145 4047	4043 4047	5356 5183	4043 4047 5183	5356 4043 5183	5356 5183 5556	5356 5183 5556	4043 4047 5183	1100 4047 4043	4043 4047 5183	4145 4047 4043	4145	1100 4047 4043	1188 4047 4043	
1100 3003 Alc- 3003	4145	4145	4043 4145 4047	5356 4043 5183	5356 4043 5183	4043 4145 4047	4043 4047	-	4043 4047 5183	5356 4043 5183	5356 5183 5556	5356 5183 5556	4043 4047 5183	1100 4047 4043	4043 4047 5183	4145 4047 4043	4145	1100 4047 4043		
2014 2036	4145 2319	4145 2319	4145	-	-	4145	4145	-	-	-	-	-	-	4145	4145	4145 4043	4145 2319			
2219	2319 4145	4145 2319	4145 4047 4043	4043	4043	4043 4145 4047	4043 4145 4047	5356 5183 5556	4043 4047	4043	-	-	4043 4047	4043 4145 4047	4043 4145 4047	2319 4145				
3004 Alc 3004		4043 4047	4043 4047	5356 5183 5554	5356 5183 5554	4043 4047	4043 4047 5183	5356 5183 5556	5356 5183 5554	5356 5183 5554	5356 5183 5556	5356 5183 5556	5356 5183 5556	5356 5183 5556	5356 5183 5556					
5005 5050		4043 4047	4043 5183	5356 5183 5554	5356 5183 5554	4043 4047	4043 4047 5183	5356 5183 5554	5356 5183 5556	5356 5183 5554	5356 5183 5556	5356 5183 5556	5356 5183 5556	5356 5183 5556						
5052 5652	-	4143 4047	4043 5183	5356 5183 5554	5356 5183 5554	4043 4047	4043 4043 5183	5183 5356 5556	5356 5183 5554	5356 5183 5554	5356 5183 5556	5356 5183 5556	5354 4043 5183							
5083	-	-	5356 4043 5183	5356 5183 5556	5183 5356 5556	-	5356 5183 5556	5183 5356 5556	5356 5183 5556	5356 5183 5556	5356 5183 5556	5356 5183 5556								
5086	-	-	5356 4043 5183	5183 5356 5556	5356 5183 5556	-	5356 5183 5556	5183 5356 5556	5356 5183 5556	5356 5183 5556	5356 5183 5556									
5154 5254	-	-	4043 5183 5356	5356 5183 5554	5356 5183 5554	-	5356 5183 5554	5356 5183 5554	5356 5183 5554	5356 5183 5554										
5454	-	4043 4047	4043 5183 5356	5356 5183 5554	5356 5183 5554	4043 4047	4043 4043 5183	5356 5183 5554	5356 5183 5554	5554 4043 5183										
5456	-	-	5356 4043 5183	5356 5183 5556	5556 5183 5356	-	5356 5183 5556	5556 5183 5356												
6005 6061 6063 6101 6151 6201 6351 6951	4145	4145 4047 4043	4043 4047 5183	5356 5183 5554	5356 4043 5183	4043 4145	4043 4047 5183													
6009 6010 6070	4145	4145 4047 4043	4043 4145 4047	4043	4043	4043 4145 4047														
7004 7005 7039 710 712	-	4043 4047	4043 4047 5183	5356 5183 5554	5356 5183 5556															
511 512 513 514 535	-	-	4043 5183 5356	5356 5183 5554																
356 A356 357 A357 413 443 A444	4145	4145 4047 4043	4043 4047																	
319 333 354 355 C355	4145 2319	4145 4047 4043																		
201 206 224	2319 4145																			



Aluminum Tig and Mig Wire

ER4043

CWB to CSA W48
AWS A 5.10/A5.10M:2012
Classification ER4043, R4043

Suitable welding positions:



Typical applications:

4043 is 5% silicon all position aluminum welding wire, used to weld heat treatable alloys such as 6XXX base metals and cast alloys. The silicon within this alloy results in improved fluidity (wetting action) yielding a less crack sensitive bright weld bead. Commonly uses include fabricating bicycles, trucks, trailers, automotive parts and equipment.

Maximum chemical composition of all-weld-metal (%)

Al	Mn	Fe	Cu	Zn	Be	Si	Mg	Ti	Other
Remainder	0.05	0.80	0.30	0.10	0.0008	4.5-6.0	0.05	0.20	*

* Other elements have a maximum of 0.05 and the other elements cannot exceed 0.015 in total

Typical mechanical properties of all-weld –metal

Melting Range		Tensile Strength	Yield Strength	Elongation (in 2")	Density	Post Anodize Color
574 - 632° C	1065 - 1170° F	21 – 33,000 psi	10 - 27,500 psi	5 – 12%	0.097 Lbs/cu in	Gray

MIG Welding Procedures; DCEP

Wire Diameter (Inches)	WFS ipm	Amps	Volts	Consumption (lb/100ft)	Argon (cfh)
0.030	480 – 625	60 – 175	15 – 24	0.65 – 1.25	25 - 30
0.035	450 – 750	70 – 185	15 – 27	1.0 – 4.25	30 – 35
0.045	330 – 500	125 – 260	20 – 29	1.0 – 4.25	35 – 45

TIG Welding Procedures; ACHF with Pure or Zirconiated hemisphere shaped tungsten

Base Thickness	Filler Wire Size	Tungsten Diameter	Amps	Consumption (lb/100ft)	Gas Cup Size	Argon (cfh)
1/16"	1/16"	1/16"	60 – 80	0.75	3/8"	20
3/32"	3/32"	3/32"	85 – 120	1.00	3/8"	20
1/8"	3/32"	3/32"	125 – 160	1.50	3/8"	20
3/16"	1/8"	1/8"	190 – 220	4.5 - 6	7/16"	25

MIG Standard Packaging and Part Numbers

Diameter		Part Number	
Inches	mm	0.454 Kg / 1 Lb	7.27 Kg / 16 Lb
0.030	0.8	6520 0108	6520 1508
0.035	0.9	6520 0109	6520 1509
0.045	1.2	6520 0112	6520 1512

TIG Standard Packaging and Part Numbers

Diameter		Part Number
Inches	mm	4.54 Kg / 10 Lb
1/16	1.6	6570 1016
3/32	2.4	6570 1024
1/8	3.2	6570 1032
3/16	4.8	6570 1048

* Additional diameters & packaging sizes available upon request. Minimum order quantity may apply



Aluminum Tig and Mig Wire

ER5356

CWB to CSA W48
AWS A 5.10
Classification ER5356, R5356

Suitable welding positions:



Typical applications;

5356 is 5% magnesium all position non-heat treatable aluminum welding wire, used to weld 5XXX series alloys. Commonly welding applications include boats, ships, bicycles, trucks, pressure vessels, automotive parts and equipment.

Maximum chemical composition of all-weld-metal (%)

Al	Si	Fe	Cu	Zn	Be	Mn	Mg	Cr	Ti	Other
Remainder	0.25	0.40	0.10	0.10	0.0008	0.05-0.20	4.5-5.5	0.05-0.20	0.06-0.20	*

* Other elements have a maximum of 0.05 and the other elements cannot exceed 0.015 in total

Typical mechanical properties of all-weld –metal

Melting Range		Tensile Strength	Yield Strength	Elongation (in 2")	Density	Post Anodize Color
571 - 635°C	1060 - 1175°F	29 – 45,000 psi	12 – 30,000 psi	10 – 18%	0.096Lbs/cu in	White

MIG Welding Procedures; DCEP

Wire Diameter (Inches)	WFS ipm	Amps	Volts	Consumption (lb/100ft)	Argon (cfh)
0.030	480 – 625	60 – 175	15 – 24	0.65 – 1.25	25 – 30
0.035	450 – 750	70 – 185	15 – 27	1.0 – 4.25	30 – 35
0.045	330 - 500	125 - 260	20 - 29	1.0 – 4.25	35 - 45

TIG Welding Procedures; ACHF with Pure or Zirconiated hemisphere shaped tungsten

Base Thickness	Filler Wire Size	Tungsten Diameter	Amps	Consumption (lb/100ft)	Gas Cup Size	Argon (cfh)
1/16"	1/16"	1/16"	60 – 80	0.75	3/8"	20
3/32"	3/32"	3/32"	85 – 120	1.00	3/8"	20
1/8"	3/32"	3/32"	125 – 160	1.50	3/8"	20
3/16"	1/8"	1/8"	190 – 220	4.5 - 6	7/16"	25

MIG Standard Packaging and Part Numbers

Diameter		Part Number	
Inches	mm	0.454 Kg / 1 Lb	7.27 Kg / 16 Lb
0.030	0.8	6530 0108	6530 1508
0.035	0.9	6530 0109	6530 1509
0.045	1.2	6530 0112	6530 1512

TIG Standard Packaging and Part Numbers

Diameter		Part Number
Inches	mm	4.54 Kg / 10 Lb
1/16	1.6	6580 1016
3/32	2.4	6580 1024
1/8	3.2	6580 1032
3/16	4.8	6580 1048

* Additional diameters & packaging sizes available upon request. Minimum order quantity may apply



Mild Steel Electrodes

E6010

CWB to CSA W48-06
 Classification E4310
 AWS/ASME A5.1 - 04 E6010

Suitable welding positions:



Typical applications:

Covering is high cellulose type, common applications include welding of pressure piping, ship building, storage tank fabrication, galvanized steel and cast repairs.

Characteristics on usage:

- Excellent penetration with good fusion makes this the preferred choice for pipeline welding
- High ductility root weld, low slag volume and easy slag removal with very good bead appearance
- Re-dry the electrode at 70 - 80°C for 30 - 60 minutes prior to use

Typical chemical composition of all-weld –metal (%)

C	Si	Mn	P	S	Ni	Cr	Mo	V
0.11	0.36	0.63	0.015	0.013	0.02	0.03	0.01	0.01

Minimum Typical mechanical properties of all-weld-metal

Yield Strength	Tensile Strength	Elongation	Charpy V-Notch (J) at -30°C
330 Mpa	430 Mpa	22%	27

Dimensions and recommended currents (DC+)

Part Number	Dimensions (Diameter x Length)		Amperage	
	mm	Inches	Flat	Vertical and Over Head
6178 2400	2.6 x 350	3/32 x 13-3/4	50 - 80	40 - 70
6178 3200	3.2 x 350	1/8 x 13-3/4	70 - 110	60 - 100
6178 4000	4.0 x 350	5/32 x 13-3/4	110 - 150	90 - 130
6178 5000	5.0 x 350	3/16 x 13-3/4	160 - 200	140 - 170

* Not all sizes are standard stock items, minimum order quantities may apply

Standard Packaging

Sleeve		Master Carton		Pallet	
4.5 Kg	10 Lbs	22.5 Kgs	50 Lbs	1125 Kgs	2478 Lbs



Mild Steel Electrodes

E6011

CWB to CSA W48-06
Classification E4311
AWS/ASME A5.1 - 04 E6011

Suitable welding positions:



Typical applications:

Covering is high cellulose type, common applications include welding of steel sheets, piping and ship construction.

Characteristics on usage:

- Excellent all position general construction electrode designed for use on both DC and AC current
- Very good electrode when welding in poor groove fit up and vertical-down, all position welding of pipe
- Slightly higher slag volume than E6010 electrodes, good bead appearance
- High ductility root weld and easy slag removal
- Produces good mechanical properties, meets X-ray requirements
- Redry the electrode at 70 - 80°C for 30 – 60 minutes prior to use

Typical chemical composition of all-weld –metal (%)

C	Si	Mn	P	S	Ni	Cr	Mo	V
0.08	0.31	0.58	0.017	0.018	0.02	0.03	0.01	0.01

Minimum Typical mechanical properties of all-weld-metal

Yield Strength	Tensile Strength	Elongation	Charpy V-Notch (J) at -30°C
330 Mpa	430 Mpa	22%	27

Dimensions and recommended currents (AC or DC+)

Part Number	Dimensions (Diameter x Length)		Amperage	
	mm	Inches	Flat	Vertical and Over Head
6180 2400	2.6 x 300	3/32 x 11.80	50 - 80	40 - 70
6180 3200	3.2 x 350	1/8 x 13.80	70 - 110	60 - 100
6180 4000	4.0 x 350	5/32 x 13.80	110 - 150	90 - 130
6180 5000	5.0 x 350	3/16 x 13.80	160 - 200	140 - 170

* Not all sizes are standard stock items, minimum order quantities may apply

Standard Packaging

Sleeve		Master Carton		Pallet	
4.5 Kg	10 Lbs	22.5 Kgs	50 Lbs	1125 Kgs	2478 Lbs



Mild Steel Electrodes

E6013

CWB to CSA W48-06
 Classification E4313
 AWS/ASME A5.1 - 04 E6013

Suitable welding positions:



Typical applications:

Covering is high titania type; common welding applications include light to medium construction (in all position) and pipe welding, very good operator appeal.

Characteristics on usage:

- Excellent striking and re-striking properties
- Excellent slag removal, arc transfer and bead appearance without undercut
- Redry the electrode at 70 - 100°C for 30 – 60 minutes prior to use

Typical chemical composition of all-weld –metal (%)

C	Si	Mn	P	S	Ni	Cr	Mo	V
0.06	0.35	0.40	0.020	0.011	0.02	0.03	0.01	0.01

Minimum Typical mechanical properties of all-weld-metal

Yield Strength	Tensile Strength	Elongation	Charpy V-Notch (J) at -30°C
330 MPa	430 MPa	17%	Not specified

Dimensions and recommended currents (AC or DC+)

Part Number	Dimensions (Diameter x Length)		Amperage	
	mm	Inches	Flat	Vertical and Over Head
6182 2400	2.6 x 350	3/32 x 13.80	60 - 100	60 - 90
6182 3200	3.2 x 350	1/8 x 13.80	80 - 130	80 - 130
6182 4000	4.0 x 400	5/32 x 15.70	110 - 150	90 - 140
6182 5000	5.0 x 400	3/16 x 15.70	160 - 200	120 - 190
6182 6000	6.0 x 450	1/4 x 17.70	210 - 280	---

* Not all sizes are standard stock items, minimum order quantities may apply

Standard Packaging

Sleeve		Master Carton		Pallet	
4.5 Kg	10 Lbs	22.5 Kgs	50 Lbs	1125 Kgs	2478 Lbs



Mild Steel Electrodes

E7014

CWB to CSA W48-06
Classification E4914
AWS/ASME A5.1 - 04 E7014

Suitable welding positions:



Typical applications:

Covering is iron powder, titania type; common welding applications include fillet welding of structural steels for buildings, bridge, ship structures and general structures.

Characteristics on usage:

- Very good striking and re-striking properties
- Excellent slag removal and good bead appearance
- Quiet and stable arc
- Redry the electrode at 120 - 150°C for 30 - 60 minutes prior to use

Typical chemical composition of all-weld –metal (%)

C	Si	Mn	P	S	Ni	Cr	Mo	V
0.08	0.41	0.73	0.020	0.014	0.02	0.03	0.01	0.01

Minimum Typical mechanical properties of all-weld-metal

Yield Strength	Tensile Strength	Elongation	Charpy V-Notch (J) at -30°C
400 MPa	490 MPa	17%	Not specified

Dimensions and recommended currents (AC or DC+)

Part Number	Dimensions (Diameter x Length)		Amperage	
	mm	Inches	Flat	Vertical and Over Head
6184 2400	2.6 x 300	3/32 x 11.80	60 - 100	50 - 90
6184 3200	3.2 x 350	1/8 x 13.80	90 - 140	80 - 130
6184 4000	4.0 x 350	5/32 x 13.80	140 - 200	110 - 170
6184 5000	5.0 x 350	3/16 x 13.80	190 - 240	180 - 200
---	6.0 x 450	1/4 x 17.70	150 - 200	---

* Not all sizes are standard stock items, minimum order quantities may apply

Standard Packaging

Sleeve		Master Carton		Pallet	
4.5 Kg	10 Lbs	22.5 Kgs	50 Lbs	1125 Kgs	2478 Lbs



Mild Steel Electrodes

E7018

CWB to CSA W48-06
 Classification E4918
 AWS/ASME A5.1 - 04 E7018

Suitable welding positions:



Typical applications:

Covering is low hydrogen, iron powder; common of welding applications include 71 ksi (490MPa) class high tensile strength steels found in structural steels for buildings, bridge construction, storage tanks fabrication, ship building, and industrial and mining machinery fabrication.

Characteristics on usage:

- Very good striking and re-striking properties
- Excellent usability with direct current applications
- Excellent mechanical properties and radiographic soundness
- Good bead appearance and slag removal
- Redry the electrode at 300 - 400°C for 60 - 120 minutes prior to use

Typical chemical composition of all-weld –metal (%)

C	Si	Mn	P	S	Ni	Cr	Mo	V
0.07	0.61	0.87	0.015	0.011	0.02	0.03	0.01	0.01

Minimum Typical mechanical properties of all-weld-metal

Yield Strength	Tensile Strength	Elongation	Charpy V-Notch (J) at -30°C
400 MPa	490 MPa	22%	27

Dimensions and recommended currents (AC or DC+)

Part Number	Dimensions (Diameter x Length)		Amperage	
	mm	Inches	Flat	Vertical, and Over Head
6188 2400	2.6 x 350	3/32 x 13.80	60 - 100	50 - 80
6188 3200	3.2 x 350	1/8 x 13.80	90 - 130	80 - 120
6188 4000	4.0 x 400	5/32 x 15.70	130 - 180	110 - 170
6188 5000	5.0 x 400	3/16 x 15.70	200 - 250	160 - 210
6188 6400	6.4 x 450	1/4 x 17.70	250 - 310	---

* Not all sizes are standard stock items, minimum order quantities may apply

Standard Packaging

Sleeve		Master Carton		Pallet	
4.5 Kg	10 Lbs	22.5 Kgs	50 Lbs	1125 Kgs	2478 Lbs



Mild Steel Electrodes

E7018-1

CWB to CSA W48-06
 Classification E4918-1
 AWS/ASME A5.1 - 04 E7018-1

Suitable welding positions:



Typical applications:

Covering is low hydrogen, iron powder; common of welding applications include structural steels for buildings, bridge construction, storage tanks fabrication, ship building, and industrial and mining machinery fabrication., fabrication and repair of LPG storage tanks and LPG Tankers.

Characteristics on usage:

- Excellent impact value at -46°C (-51°F)
- Very good striking and re-striking properties
- Excellent usability with direct current applications
- Excellent mechanical properties and radiographic soundness
- Good bead appearance and slag removal
- Redry the electrode at 300 - 400°C for 60 - 120 minutes prior to use

Typical chemical composition of all-weld –metal (%)

C	Si	Mn	P	S	Ni	Cr	Mo	V
0.07	0.58	1.38	0.013	0.012	0.15	0.03	0.01	0.01

Minimum Typical mechanical properties of all-weld-metal

Yield Strength	Tensile Strength	Elongation	Charpy V-Notch (J) at -45°C
400 MPa	490 MPa	22%	27

Dimensions and recommended currents (AC or DC+)

Part Number	Dimensions (Diameter x Length)		Amperage	
	mm	Inches	Flat	Vertical and Over-Head
6189 2400	2.6 x 300	3/32 x 11.80	70 - 100	60 - 90
6189 3200	3.2 x 350	1/8 x 13.80	90 - 130	85 - 120
6189 4000	4.0 x 350	5/32 x 13.80	150 - 190	110 - 160
6189 5000	5.0 x 350	3/16 x 13.80	160 - 220	130 - 180
---	6.0 x 450	1/4 x 17.70	180 - 230	---

* Not all sizes are standard stock items, minimum order quantities may apply

Standard Packaging

Sleeve		Master Carton		Pallet	
4.5 Kg	10 Lbs	22.5 Kgs	50 Lbs	1125 Kgs	2478 Lbs



Mild Steel Electrodes

E7024

CWB to CSA W48-06
Classification E4918
AWS/ASME A5.1 - 04 E7024

Suitable welding positions:



Typical applications:

Covering is iron powder, titania type. Used for flat and horizontal fillet welding of structural steels for buildings, bridge, ship structures and general structures.

Characteristics on usage:

- Designed for high efficiency single pass and multiple pass welding
- Very good striking and re-striking properties
- Excellent slag removal and good bead appearance
- Quiet and stable arc
- Re-dry the electrode at 120 - 150°C for 30 - 60 minutes prior to use

Typical chemical composition of all-weld –metal (%)

C	Si	Mn	P	S	Ni	Cr	Mo	V
0.07	0.58	1.38	0.013	0.012	0.15	0.03	0.01	0.01

Minimum Typical mechanical properties of all-weld-metal

Yield Strength	Tensile Strength	Elongation	Charpy V-Notch (J) at -30°C
400 MPa	490 MPa	17%	Not specified

Dimensions and recommended currents (AC or DC+)

Part Number	Dimensions (Diameter x Length)		Amperage	
	mm	Inches	Flat	Horizontal Fillet
6190 2400	2.6 x 300	3/32 x 11.80	70 - 100	70 - 100
6190 3200	3.2 x 350	1/8 x 13.80	100 - 150	100 - 150
6190 4000	4.0 x 350	5/32 x 13.80	140 - 190	140 - 190
6190 5000	5.0 x 350	3/16 x 13.80	230 - 270	230 - 270

* Not all sizes are standard stock items, minimum order quantities may apply

Standard Packaging

Sleeve		Master Carton		Pallet	
4.5 Kg	10 Lbs	22.5 Kgs	50 Lbs	1125 Kgs	2478 Lbs



Mild Steel Electrodes

E8018-C3

CWB to CSA W48-06
 Classification E5518-C3
 AWS/ASME A5.5-06:E8018-C3

Suitable welding positions:



Typical applications:

Covering is low hydrogen, iron powder type for welding of 1% nickel (Ni) steel and high tensile strength steels for commercial and military applications where good impact properties is required.

Characteristics on usage:

- Fast, efficient metal transfer in all positions
- Excellent deposited weld metal with both AC and DC power source
- Re-dry the electrode at 300 - 400°C for 30 - 60 minutes prior to use

Typical chemical composition of all-weld –metal (%)

C	Si	Mn	P	S	Ni	Cr	Mo	V
0.07	0.45	0.91	0.013	0.012	1.03	0.02	0.01	0.01

Minimum Typical mechanical properties of all-weld-metal

Yield Strength	Minimum Tensile Strength	Minimum Elongation	Charpy V-Notch (J) at -40°C
470 – 550 MPa	550 MPa	24%	27

Dimensions and recommended currents (AC or DC+)

Part Number	Dimensions (Diameter x Length)		Amperage	
	mm	Inches	Flat	Horizontal Fillet
6186 2400	2.6 x 350	3/32 x 11.80	60 - 95	60 - 90
6186 3200	3.2 x 350	1/8 x 13.80	90 - 130	80 - 120
6186 4000	4.0 x 400	5/32 x 13.80	135 - 185	110 - 170
6186 5000	5.0 x 400	3/16 x 13.80	190 – 240	---

* Not all sizes are standard stock items, minimum order quantities may apply

Standard Packaging

Sleeve		Master Carton		Pallet	
4.5 Kg	10 Lbs	22.5 Kgs	50 Lbs	1125 Kgs	2478 Lbs



Mild Steel Electrodes

E 11018-M

AWS/ASME A5.5-06 E11018M

Suitable welding positions:



Typical applications:

Covering is low hydrogen, iron powder type for welding of low alloy high strength steels having tensile properties of about 740 - 790 MPa such as HY80, etc.

Characteristics on usage:

- Excellent mechanical properties especially in notch toughness
- Very good operational performance in all position
- Good bead appearance and easy slag removal
- Good impact value at -51°C
- Re-dry the electrode at 300 - 400°C for 60 - 120 minutes prior to use

Typical chemical composition of all-weld –metal (%)

C	Si	Mn	P	S	Ni	Cr	Mo	V
0.08	0.41	1.49	0.015	0.012	1.86	0.25	0.35	0.01

Typical mechanical properties of all-weld-metal

Yield Strength	Minimum Tensile Strength	Minimum Elongation	Charpy V-Notch (J) at -50°C
680 - 760 MPa	760 MPa	20%	27

Dimensions and recommended currents (AC or DC+)

Part Number	Dimensions (Diameter x Length)		Amperage	
	mm	Inches	Flat	Horizontal Fillet
6195 2400	2.6 x 350	3/32 x 13.80	50 - 100	40 - 90
6195 3200	3.2 x 350	1/8 x 13.80	90 - 130	80 - 120
6195 4000	4.0 x 400	5/32 x 15.70	130 - 180	110 - 160
6195 5000	5.0 x 400	3/16 x 15.70	180 - 240	140 - 200
---	6.0 x 450	1/4 x 17.70	250 - 320	---

Standard Packaging

Sleeve		Master Carton		Pallet	
4.5 Kg	10 Lbs	22.5 Kgs	50 Lbs	1125 Kgs	2478 Lbs



Mild Steel Wire

RG-45

Classification: RG45
AWS A5.2

Suitable welding positions:



Recommended for oxyacetylene welding, RG-45 is a copper coated gas welding rod that is used for welding ordinary low carbon steel up to 1/4" thick. It is recommended where ductility and machinability are most important.

Produces high quality welds which are ductile and free of porosity. This rod is excellent for steel sheets, plates, pipes, castings and structural shapes. No flux required

Typical chemical composition of all-weld –metal (%)

C	Si	Mn	P	S
0.04	0.02	0.45	0.013	0.010

Typical mechanical properties of all-weld-metal

	Tensile Strength	Elongation	Conditions
	Example	450 MPa	20 %
	500 MPa	17 %	Not Stress Released

Dimensions, packaging and part numbers

Dimensions (Diameter x Length)		Standard Packaging (Tubes)		Part Number
mm	Inches	Kgs	Lbs	
1.6 x 914	1/16 x 36	5.0	11.0	6374 1600
2.6 x 914	3/32 x 36	5.0	11.0	6374 2400
3.2 x 914	1/8 x 36	5.0	11.0	6374 3200

- Special Notes:**
- 1) stamped heat, grade and diameter on both ends
 - 2) additional grades and diameters available upon request, minimum order quantities may apply



Mild Steel Wire

ER70S-2

CWB to CSA W48-06
 Classification ER48S-2 (ER70S-2)
 AWS/ASME A5.18/A5.18M:2005

Suitable welding positions:



Typical Applications:

High strength welding of low alloy steels, common welding applications include root pass pipe welding, small diameter pipe and tubing, sheet metal applications, repairs of mild and low alloy steel, auto parts and repair, structural steel, ship building, bridge construction and repair.

Product Features:

- Triple deoxidizer (aluminum, titanium and zirconium)
- Superior quality welds with minimum porosity, even over rust and mill scale
- X-Ray quality welds over most surface conditions
- Suitable for welding all grades of steel
- Tig wire is stamped heat grade and diameter on both ends, Mig wire spools are precision wound

Typical chemical composition of all-weld –metal (%)

C	Si	Mn	P	S	Ti	Al
0.07	0.67	1.20	0.015	0.011	0.07	0.08

Minimum Typical mechanical properties of all-weld-metal

Yield Strength	Tensile Strength	Elongation	Charpy V-Notch (J) at -30°C
400 MPa	480 MPa	22%	27

TIG Wire Part number, Dimensions and Standard Packaging

Part Number	Dimensions (Diameter x Length)		Package Quantity	
	mm	Inches	Kgs	Lbs.
6375 1600	1.6 x 914	1/16 x 36	5.0	11.0
6375 2400	2.6 x 914	3/32 x 36	5.0	11.0
6375 3200	3.2 x 914	1/8 x 36	5.0	11.0

* Additional diameters available upon request, minimum order quantity may apply

MIG Wire Part number, Dimensions and Standard Packaging

Part Number	Diameter		Package Quantity Kgs		Amperage	
	mm	Inches	Spool	Pallet	Flat	Vertical & Overhead
6903 2009	0.9mm	0.035	20	1,200		
6903 2012	1.2mm	0.045	20	1,200	100 - 350	140 - 400
6903 2016	1.6mm	0.062	20	1,200	70 - 200	100 - 250

* Additional diameters and spools sizes or pail packs available upon request, minimum order quantity may apply



Mild Steel Wire

ER70S-3

CWB to CSA W48-06
 Classification ER48S-2 (ER70S-3)
 AWS/ASME A5.18/A5.18M:2005

Suitable welding positions:



Typical Applications:

Highly deoxidized for welding of mild steel and 490MPa tensile strength materials. Common applications include structural steel, steel castings, pressure vessels (that are subject to high stress), rimmed and killed steels and automotive parts fabrication.

Product Features:

- Suitable for high speed (all position) welding of steel sheets by short circuiting transfer
- Also an excellent wire where the welds are subject to enameling or galvanizing thanks to the low silicone levels
- Excellent performance of root welding for multiple pass welds
- Stable arc and low spatter loss??
- Spools are precision wound

Typical chemical composition of all-weld –metal (%)

C	Si	Mn	P	S
0.07	0.86	1.53	0.012	0.007

Minimum Typical mechanical properties of all-weld-metal

Yield Strength	Tensile Strength	Elongation	Charpy V-Notch (J) at -30°C
400 MPa	480 MPa	22%	27

MIG Wire Part number, Dimensions and Standard Packaging

Diameter		Packaged Quantity (Kgs)		Part Number	Packaged Quantity (Kgs)		Part Number	Amperage	
mm	Inches	Spool	Pallet		Pail	Pallet		Flat	Vertical & Overhead
0.8	0.030	20	1,200	6905 2008				50 - 120	50 - 100
0.9	0.035	20	1,200	6905 2009	300	600	6905 0309	50 - 140	50 - 120
1.0	0.040	20	1,200		300	600		80 - 250	60 - 150
1.2	0.045	20	1,200	6905 2012	300	600	6905 0312	100 - 350	70 - 200
1.4	0.052	20	1,200		300	600		140 - 400	100 -250
1.6	0.062	20	1,200	6905 2016	300	600		200 - 450	120 - 300

* Additional diameters and spools sizes or pail packs available upon request, minimum order quantity may apply

** Tig wire is also available, minimum order quantity may apply



Mild Steel Wire

ER70S-6

CWB to CSA W48-06
 Classification ER48S-2 (ER70S-6)
 AWS/ASME A5.18/A5.18M:2005

Suitable welding positions:



Typical Applications:

Mild steel wire for welding of mild steel and 490MPa tensile strength materials. Common applications include HVAC duct work, structural applications, heavy equipment fabrication and automotive parts fabrication.

Product Features:

- Excellent mechanical and toughness properties in low temperature conditions
- High silicon content ensures a highly fluid weld pool and excellent wetting
- Very low spatter generated
- Well suited for sheet metal applications that require a high welding current without burn through
- Tig wire is stamped heat grade and diameter on both ends, Mig wire spools are precision wound

Typical chemical composition of all-weld –metal (%)

C	Si	Mn	P	S
0.07	0.86	1.53	0.012	0.007

Minimum Typical mechanical properties of all-weld-metal

Yield Strength	Tensile Strength	Elongation	Charpy V-Notch (J) at -30°C
400 MPa	480 MPa	22%	27

TIG Wire Part number, Dimensions and Standard Packaging

Part Number	Diameter		Tube Size/Weight	
	mm	Inches	Kgs	Lbs.
6371 1600	1.6 x 914	1/16 x 36	5.0	11.0
6371 2400	2.6 x 914	3/32 x 36	5.0	11.0
6371 3200	3.2 x 914	1/8 x 36	5.0	11.0

* Additional diameters available upon request, minimum order quantity may apply

MIG Wire Part number, Dimensions and Standard Packaging

Diameter		Packaged Quantity (Kgs)	Part Number	Packaged Quantity (Kgs)		Part Number	Packaged Quantity (Kgs)		Part Number	Amperage	
mm	Inches			Spool	Pallet		Pail	Pallet		Flat	Vertical & Overhead
0.6	0.023	5	69100506	15	1200	69102006					
0.8	0.030	5	69100508	20	1200	69102008	300	600	69100308		
0.9	0.035	5	69100509	20	1200	69102009	300	600	69100309	50 - 200	50 - 120
1.0	0.040			20	1200		300	600		70 - 250	50 - 150
1.2	0.045	5	69100512	20	1200	69102012	300	600	69100312	100 - 350	50 - 180
1.4	0.052			20	1200		300	600	69100314	140 - 400	100 - 250
1.6	0.062			20	1200	69102016	300	600		200 - 550	120 - 300

* Additional diameters and spools sizes or pail packs available upon request, minimum order quantity may apply



Mild Steel Wire

ER70S-6

CWB to CSA W48-06
 Classification ER48S-2 (ER70S-6)
 AWS/ASME A5.18/A5.18M:2005

Suitable welding positions:



Typical Applications:

Mild steel wire for welding of mild steel and 490MPa tensile strength materials. Common applications include HVAC duct work, structural applications, heavy equipment fabrication and automotive parts fabrication.

Product Features:

- Excellent mechanical and toughness properties in low temperature conditions
- High silicon content ensures a highly fluid weld pool and excellent wetting
- Very low spatter generated
- Well suited for sheet metal applications that require a high welding current without burn through
- Mig wire spools are precision wound

Typical chemical composition of all-weld –metal (%)

C	Si	Mn	P	S
0.07	0.86	1.53	0.012	0.007

Minimum Typical mechanical properties of all-weld-metal

Yield Strength	Tensile Strength	Elongation	Charpy V-Notch (J) at -30°C
400 MPa	480 MPa	22%	27

MIG Wire Part number, Dimensions and Standard Packaging

Diameter		Package Quantity (Kgs)		Part Number	Package Quantity (Kgs)		Part Number
mm	Inches	Spool	Carton		Spool	Carton	
0.6	0.023	1		6910 0106V	5	N/A	6910 0506V
0.8	0.030	1		6910 0108V	5	N/A	6910 0508V
0.9	0.035	1		6910 0109V	5	N/A	3910 0509V
1.2	0.045	1					
1.6	0.062	1					

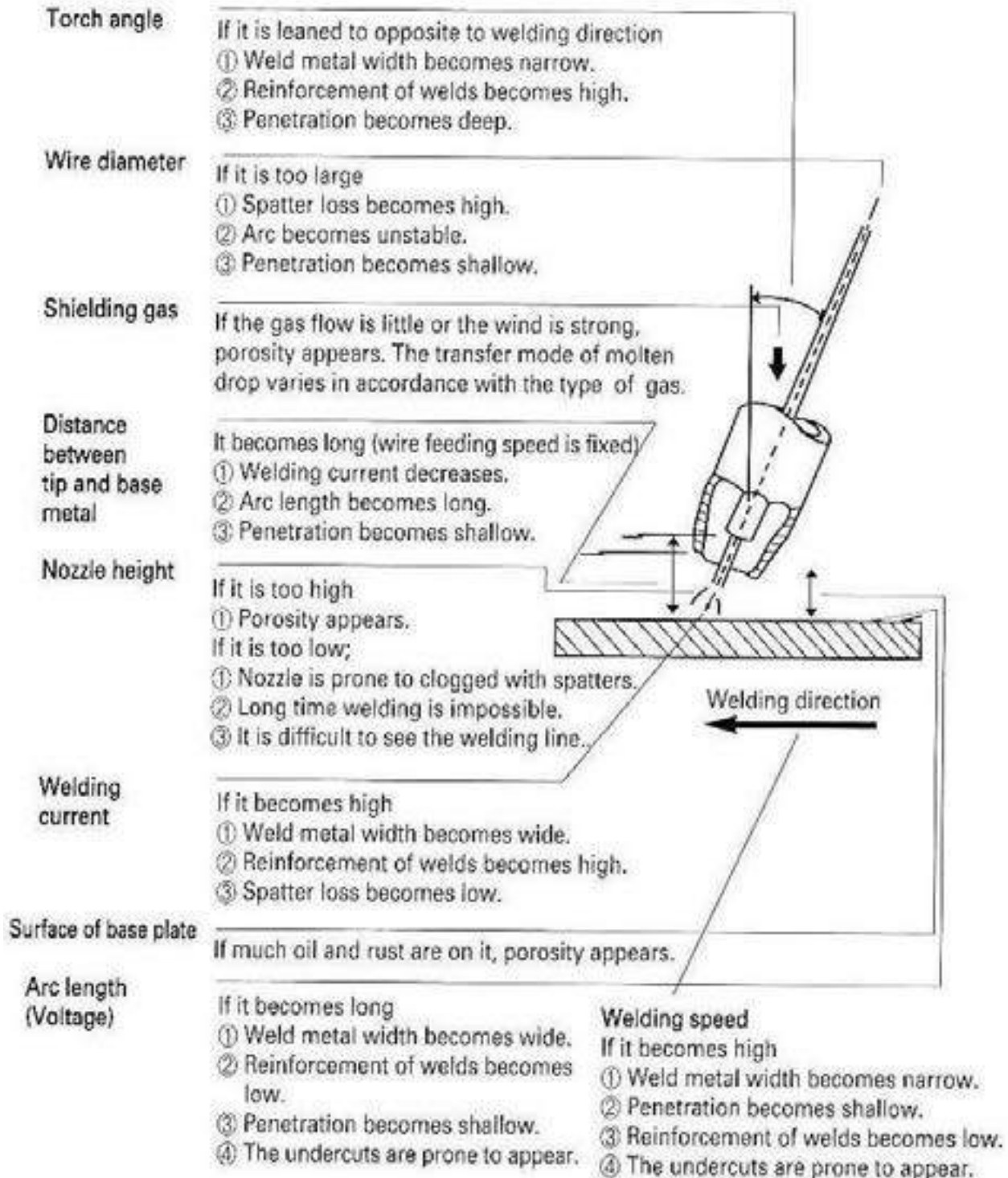
		Spool	Pallet		Drum	Pallet	
0.8	0.030	20	1,200	6910 2008V			
0.9	0.035	20	1,200	6910 2009V	250	500	6910 0259V
1.2	0.045	20	1,200	6910 2012V	250	500	6910 0212V

* Additional diameter, Tig wire, Mig wire on spool and/or pail pack sizes available upon request. Minimum order quantity may apply



Trouble Shooting

As the appearance and properties of the deposited weld metal varies broadly in accordance with the welding conditions, select the welding conditions carefully.





Pail Pack Information

Improved Welds:

The carefully balanced helix, cast and column strength of the Bonarc pail pack system prevents the wire vibration found when using spooled or coiled wire.

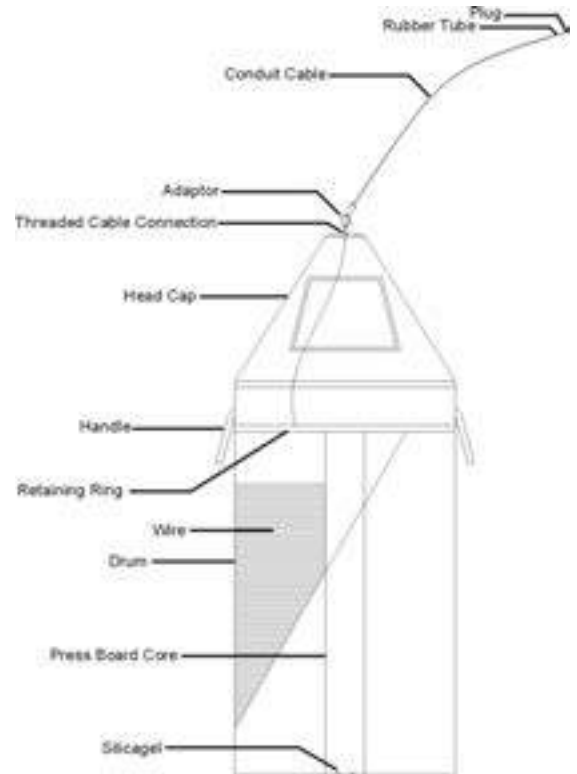
Cost efficient:

Pail pack systems increase cell productivity by reducing downtime created by frequent spool or coil changeover. Pail packs also offer the additional benefit of reduced wear on both tips and liners.

Robotic applications:

Bonarc pail pack systems are ideal for both robotic and piece work cells.

With 20% more wire per drum than most competitors pail packs while still using the existing cell foot print companies are able to increase productivity without any major changes to their existing welding set up.



Available wire diameter and pail pack details

Wire Diameter		Weight		Dimensions (Diameter x Height)	
mm	Inches	Kgs	Pounds (Approx.)	mm	Inches
0.8	0.030	200, 250	440, 550	507 x 820	20 x 32.30
0.9	0.035	200, 250, 300	440, 550, 660	507 x 820	20 x 32.30
1.0	0.040	200, 250, 300	440, 550, 660	507 x 820	20 x 32.30
1.2	0.045	250	550	507 x 820	20 x 32.30
		350, 400	660, 881	660 x 820	26 x 32.30
		450	991	660 x 870	26 x 34.25
1.4	0.052	250	550	507 x 820	20 x 32.30
		350, 400	660, 881	660 x 820	26 x 32.30
		450	991	660 x 870	26 x 34.25
1.6	0.062	350, 400	660, 881	660 x 820	26 x 32.30
		450	991	660 x 870	26 x 34.25



Self-Shielding Mild Steel Flux Cored Wire

E71T-GS

CWB W48-06
AWS A 5.20-07

Suitable welding positions:



Typical applications:

Designed for welding of 490 MPa high tensile steel typically for outdoor applications, well suited for single and multiple pass welding. Commonly used in general fabrication and structural work requiring no impact properties. (ASTM A36 Gr. All; A 109 Gr; A283 Gr. A,B,C,D; A284 C, D; A285 Gr. A, B,C; A288 Gr. 1; A372 type 1; A500 Gr. All; A501 Gr. All).

Characteristics on usage:

Good stable arc, low spatter generation, high efficiency, good bead shape and slag removal. Must be used as DCEN (DC-).

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

C	Si	Mn	P	S	Al
0.10	0.10	0.55	0.014	0.006	1.21

Typical mechanical properties of all-weld –metal

Minimum Yield Strength	Minimum Tensile Strength	Elongation
---	490 MPa	---

Standard Packaging and Part Number

Diameter		Spool Size					
mm	Inches	Kgs	Pounds	Part Number	Kgs	Pounds	Part Number
0.8	0.030	0.90	1.98	6952 0108	4.5	9.91	6952 0508
0.9	0.035	0.90	1.98	6952 0109	4.5	9.91	6952 0509
1.2	0.045	0.90	1.98	6952 0112	4.5	9.91	6952 0512

* Additional diameters and spools sizes available upon request, minimum order quantity may apply

For information/recommendations when using flux cored wires please see page 15



Mild Steel Flux Cored Wire

E70T-1/9

Classification A5.20 – 07
AWS/ASME A5.18/A5.18M:2005

Suitable welding positions:



Typical applications:

Gas shielded flux cored welding wire that is suitable for flat and horizontal welding. It is intended for semi-automatic and automatic single and multiple pass welding of low-alloy and carbon steel where a minimum 490 MPa (70,000 psi) tensile strength is required.

Typical applications include welding of structural steels, bridge building, construction equipment, ship building, farm machinery, and general carbon steel fabrications.

Product features:

- Better Charpy V-Notch at lower temperatures
- Very good resistance to porosity
- Well suited for fillet welding of inorganic zinc-primer coated steels
- Designed for semi-automatic and automatic single and multiple pass welding

Typical; chemical composition of all-weld –metal (%)

Shielding Gas	C	Si	Mn	P	S
CO ²	0.03	0.50	1.45	0.014	0.010

Minimum Typical mechanical properties of all-weld-metal

Yield Strength	Tensile Strength	Elongation	Charpy V-Notch (J) at -20°C
390 MPa	490 – 670 MPA	22%	27

Minimum Typical mechanical properties of all-weld-metal

Yield Strength	Tensile Strength	Elongation	Charpy V-Notch (J) at -20°C
390 MPa	490 – 670 MPA	22%	27

Standard Packaging and Part Number

Diameter		Spool			Coil		
mm	Inches	Kgs	Pounds	Part Number	Kgs	Pounds	Part Number
1.2	0.045	20	44.05	6949 2012	25	55.07	6949 2512
1.6	0.062	20	44.05	6949 2016	25	55.07	6949 2516

* Additional diameters and spools sizes available upon request, minimum order quantity may apply

For information/recommendations when using flux cored wires please see page 15



Mild Steel Flux Cored Wire

E71T-1/9

CWB to CSA W48-06
 Classification: E491T-9-H8/E4917-9M-H8
 AWS/ASME A 5.20-07 E71T-1C

Suitable welding positions:



Typical Applications:

Gas shielded premium quality flux cored welding wire that can be used for all-position welding. It is intended for semi-automatic and automatic single and multiple pass welding of 490 MPa high tensile steel. Engineered to yield weld-metal mechanical properties down to temperature of -30°C (-20°F), with gas mixtures of Argon + 20% CO₂ to 100% CO₂.

Typical applications include welding of structural steels, bridge building, construction equipment, ship building, farm machinery, and general carbon steel fabrications.

Characteristics on usage:

- Titania type flux cored wire for all-position welding
- Excellent mechanical properties
- X-Ray quality welds
- Good impact at low temperatures
- Excellent usability, very stable arc
- Easy slag removal, very little spatter generated and smooth bead shape

Maximum chemical composition of all-weld - metal (%)

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

Minimum Typical mechanical properties of all-weld-metal

Yield Strength	Tensile Strength	Elongation	Charpy V-Notch (J) at -20°C
390 MPa	490 - 670 MPa	22%	27

Standard Packaging and Part Number

Diameter		Spools				Coils		Pail Packs/Drums	
mm	Inches	Kgs	Part Number	Kgs	Part Number	Kgs	Part Number	Kgs	Part Number
0.9	0.035	4.5	6950 0509	15	6950 2009	25		300	
1.2	0.045	4.5	6950 0512	20	6950 2012	25	6950 2512	300	
1.3	0.051	4.5		20	6950 2013	25		300	
1.6	0.062	4.5		20	6950 2016	25	6950 2516	300	6950 0316

* Additional diameters and spools sizes available upon request, minimum order quantity may apply

For information/recommendations when using flux cored wires please see page 15



Mild Steel Flux Cored Wire

E71T-1/9 LF (Low Fume)

CWB to CSA W48-06
 Classification: E491T-9-H8/E4917-9M-H8
 AWS/ASME A 5.20-07 E71T-1C/1M

Suitable welding positions:



Typical Applications:

Premium quality low fume gas shielded flux cored welding wire that can be used for all-position welding. It is intended for semi-automatic and automatic single and multiple pass welding of 490 MPa high tensile steel. Engineered to yield weld-metal mechanical properties down to temperature of -30°C (-20°F), with gas mixtures of Argon + 20% CO₂ to 100% CO₂.

Typical applications include welding of structural steels, bridge building, construction equipment, ship building, farm machinery, and general carbon steel fabrications.

Characteristics on usage:

- Titania type flux cored wire for all-position welding
- Extremely low fume generated
- Excellent mechanical properties
- Good impact at low temperatures
- Excellent usability, very stable arc
- Easy slag removal, very little spatter generated, smooth bead shape, excellent usability, very stable arc, X-ray quality welds

Maximum chemical composition of all-weld –metal (%)

Shielding Gas	C	Si	Mn	P	S
CO ₂	0.03	0.38	1.35	0.015	0.010

Minimum Typical mechanical properties of all-weld-metal

Yield Strength	Tensile Strength	Elongation	Charpy V-Notch (J) at -20°C
390 MPa	490 - 670 MPa	22%	27

Dimensions and recommended currents DCEP

Diameter		Amperage		
mm	Inches	Flat	Horizontal-Fillet	Vertical
1.2	0.045	120 - 300	120 - 300	120 - 220
1.6	0.062	200 - 450	200 - 400	180 - 220

Standard Packaging and Part Number

Diameter			
mm	Inches		
1.2	0.045		
1.6	0.062		

* Additional diameters and spools sizes available upon request, minimum order quantity may apply

For information/recommendations when using flux cored wires please see page 15



Metal Cored Wire

E70C-6M

CWB to CSA W48-06
 Classification: E491T-9-H8/E4917-9M-H8
 AWS/ASME SFA 5.18 - 05 E70C-6M

Suitable welding positions:



General information:

Designed for welding 71 ksi high tensile steel using Argon/CO₂ covering gas. Typical applications include welding of structural steels, bridge building, heavy duty truck frame construction, construction equipment, ship building, farm machinery, and general carbon steel fabrications.

Characteristics on usage:

- Very good Charpy V notch toughness at low temperatures
- Good penetration and excellent wetting characteristics
- Excellent product for fillet welding
- High tolerance to rust, primer and mill scale (compared to E70C-3M)
- Designed for semi-automatic and automatic single and multiple pass welding
- Slag quantity is almost the same as solid wire (ER70S-6) which allows for multiple pass welding to be performed without having to remove the slag

Maximum chemical composition of all-weld –metal (%)

Shielding Gas	C	Si	Mn	P	S
Argon + 20% CO ₂	0.03	0.40	1.60	0.014	0.010

Minimum Typical mechanical properties of all-weld-metal

Yield Strength	Tensile Strength	Elongation	Charpy V-Notch (J) at -20°C
400 MPa	480 MPa	22%	27

Standard Packaging and Part Number

Diameter		Spools			Pail Packs/Drums		
mm	Kgs	Kgs	Pounds	Part Number	Kgs	Pounds	Part Number
0.9	0.035	20	44.05	6915 2009			
1.2	0.045	20	44.05	6915 2012	300	660.80	3915 03312
1.4	0.052	20	44.05	6915 2013	300	660.80	3915 0314
1.6	0.062	20	44.05	6915 2016	300	660.80	6915 0309

* Additional diameters and spools sizes or pail packs available upon request, minimum order quantity may

Antox® chemical treatment of stainless steel

Antox offer an extensive range of pickling products for the surface treatment of stainless steels. Their innovative and strong chemical processes create a scale-free surface while at the same time improving the chemical resistance of your stainless steel substrates.

Stainless steels can be found in all walks of life, is it increasingly being used for visible parts such as façades, windows, doors and kitchens. Their excellent corrosion resistance is based on a passive layer – a chrome oxide layer that forms spontaneously provided the chrome content of the stainless steel is higher than 12 %. A metallicly clean, smooth surface is one of the prerequisite for formation of a protective passive layer.

Chemical processes for metallicly clean surfaces

The protective passive layer may be damaged during the processing of stainless steels by drilling, turning, milling, bending, welding or heat treatment. The Antox technology ensures that your metal surfaces are protected from disturbing influences such as temperature-related oxidation and discoloration, metal deposition and organic impurities – without changing their surface structure.

To ecologically and economically remove the individual impurities, we offer an extensive technology portfolio under the trade name Antox. Our stainless steel pickling products improve the corrosion resistance by

- allowing a simple removal of contaminants
- achieving a metallicly clean surface
- supporting the formation of a new protective passive layer

All Antox stainless steel pickling products are free from hydrochloric acid and chlorides.

Antox line of pickling products:

- Degreasing and Cleaning
- Spray pickling agent
- Pickling cleaners
- Neutralizing paste
- Stainless steel surface care products
- Pickling Paste
- Bath pickling agent
- Pickling and polishing paste
- Passivating agents
- Tools (brushes, manual spray pickling device and pickling pumps)

Industries where these products are used:

- Architectural applications i.e. façades, railings, windows, doors
- Kitchen equipment, kitchen utensils and stainless steel tanks
- Stainless steel tanks and piping for pharmaceutical, agricultural, petrochemical and food applications

Stainless steel grades and pickling difficulty

AISI	DIN EN	Code Name	C %	Cr %	Ni %	Mo %	Others in %	Pickling
304	1.4301	X5CrNi1810	0.07	17 - 19	8.5 - 10.5		N < 0.11	Good
	1.4305	X10CrNiS189	0.12	17 - 19	8 - 10		S 0.15 - 0.36	Difficult
304L	1.4306	X2CrNi911	0.03	18 - 20	10 - 12		N < 0.11	Good
321	1.4541	X6CrNiTi1810	0.08	17 - 19	9 - 12		Ti < 0.7	Good
316	1.4401	X5CrNiMo17122	0.07	16.5 - 18.5	10 - 13	2 - 2.5		Good
316L	1.4404	X2CrNiMo17122	0.03	16.5 - 18.5	10 - 13	2 - 2.5	N < 0.11	Good
316Ti	1.4571	X6CrNiMo17122	0.08	16.5 - 18.5	10.5 - 13.5	2 - 2.5	Ti < 0.7	Good
316L	1.4435	X2CrNiMoN18143	0.03	17 - 19	12.5 - 19	2.5 - 3	N < 0.11	Good
S 31726	1.4439	X2CrNiMoN17135	0.03	16.5 - 18.5	12.5 - 14.5	4 - 5	N < 0.12 – 0.22	Average
N 08904	1.4539	X1CrNiMoCu25205	0.02	19 - 21	24 - 26	4 - 5	N < 0.15	Average

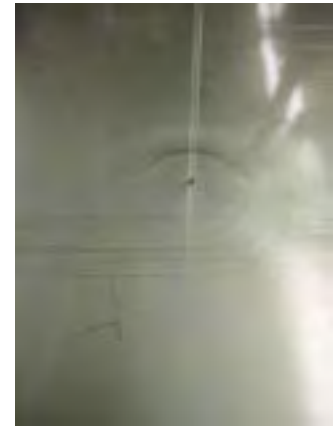
Antox® cleaning and degreasing

Aclean 400 (Slight Alkaline) Components treated with oil and formed or deep-drawn parts should be degreased using alkaline cleaners such as Aclean 400 rather than an acid based cleaner (Antox 75E). Aclean 400 should be diluted with water (the ratio is 1:5), this product is applied using a hand sprayer or a high-pressure sprayer.

If using a high-pressure sprayer Aclean 400 should be added by means of a metering pump (10 Kg of Aclean 400 being dissolved with 100 litres of cold water). A concentration level of 0.5 – 1% is required at the lance tip. The exposure time is 5 – 20 minutes. The treated material/components should then be washed with fresh water, preferably using a high pressure, warm water cleaning machine (please see disposal of waste found on page 49).

Antox 75E Surface Cleaner requires no premixing and it is applied directly to the dry work surface by means of a brush or hand held pickling sprayer. The chemical composition of this product will degrease and brighten special steel surfaces while also removing surface rust and contamination.

The exposure time of this chemical is between 15 – 30 minutes. The treated surface must then be washed with cold water (please see disposal of waste found on page 49). You can visually tell if the material is clean by pouring water on the material, if the water has a uniform wetting action the component is clean and ready to pickle



Ready to pickle

Standard Packaging and Part Number

Jars Size Kgs	Master Carton Quantity	Aclean 400	Antox 75E
1	6	7203 0001	7203 0001
5	N/A		7203 0005

* Additional Jar sizes available upon request, minimum order quantity may apply

Reaction Times and Yield

The reaction time is dependent on the degree of weld burn, the ambient air and material temperatures. The optimal pickling temperature is around 18 -22° C. You should avoid using pickling paste in direct sunlight as the pickling paste may dry prematurely.

	Reaction Time in Minutes				Approximate Yield for 1Kg	
	Rusty and acid-resistant steel, stainless steel	Nickel and Nickel Alloys	Titanium & Alloys	Aluminum	Square Metres	Square Feet
Aclean 400	30 - 90	5 - 10	5 - 10	5 - 10	20 - 25	215 - 269
Antox 75E	20 - 30	5 - 20	5 - 10	N/A	20 - 25	215 - 269

Antox® Pickling Paste Products (Manual Application)

Antox 71E Plus is more like a liquid than a paste and it can be easily applied using an acid resistant brush. The viscosity of Antox 71E has been optimized to offer excellent cost efficient consumption; it also provides a positive influence on the hydrogen ion (H-ion) migration ensuring fast pickling results. Antox 71E Plus is particularly well suited when removing tarnish that is created by welding or high alloyed specialty steels such as 904L (European Steel Grade 1.4539).

Antox 71E Extra is thicker and more paste like when compared to Antox 71E Plus, it is also easy to apply using an acid resistant brush. Antox 71E Extra contains about 10% more hydrofluoric acid than Antox 71E Plus and it is an excellent product for “strong” tarnish on high alloyed specialty steels. When pickling low-alloy specialty steels, it is recommended that you perform a preliminary test to determine the proper exposure period. This will prevent over-pickling which can weaken the material or welding seam, thus reducing the tensile strength.

Antox 21E Plus (Reduced Nitric Fumes) compared to conventional pickling pastes Antox 21E Plus has much lower nitric acid content and it releases a minimal amount of nitrous gas. It not only reduces its environmental impact, but thanks to the lower nitrous gas releases it makes working with this product more comfortable. Antox 21E Plus is particularly well suited for stainless steels such as 304 and 304L (European Steel Grade 1.4301 and 1.4306). When used on higher alloyed steels a second application maybe required.

Antox 3D is formulated to produce a clear thixotropic pickling paste which is classed as non-toxic; it can be easily applied using an acid resistant brush. It is used to remove weld burn on polished surfaces of corrosion and acid-resistant stainless steels, nickel alloys and aluminum. Antox 3D does not dull the surface or leave white halo marks when used on light MIG/TIG.

Standard Packaging and Part Number

Jars Size Kgs	Master Carton Quantity	Antox 71E Plus	Antox 71E Extra	Antox 21E Plus	Antox 3D
2	6	7201 0002	7201 1002	7201 2002	7201 5002
10	N/A	7201 0010	7201 1010		

* Additional Jar sizes available upon request, minimum order quantity may apply

Reaction Times and Yield

The reaction time is dependent on the degree of weld burn, the ambient air and material temperatures. The optimal pickling temperature is around 18 -22° C. You should avoid using pickling paste in direct sunlight as the pickling paste may dry prematurely.

	Reaction Time in Minutes				Approximate Yield for 1Kg	
	Rusty and acid-resistant steel, stainless steel	Nickel and Nickel Alloys	Titanium & Alloys	Aluminum	Running Meters	Running Feet
Antox 71E Plus	15 - 60	5 - 20	5 - 20	N/A	50 - 80	164 - 262
Antox 71E Extra	15 - 60	5 - 20	5 - 20	N/A	50 - 80	164 - 262
Antox 21E Plus	15 - 90	N/A	N/A	N/A	50 - 80	164 - 262
Antox 3D	10 - 60	5 - 20	2 - 10	2 - 10	70 - 130	229 - 426

* Additional Jar sizes available upon request, minimum order quantity may apply

Antox® Spray Pickling Products

Antox 73E Plus is used for the removal of welding flakes and built-up paints, old damaged passive layers, abrasion and built-up carbon steel, extraneous oxides and traces of handling and damages after thermal or mechanical processing of surfaces and welds in one working operation. It will unify the appearance of the surface. For austenitic materials.

Antox 23E Plus compared to conventional spray pickling pastes Antox 23E Plus has a much lower nitric acid content and it releases a minimal amount of nitrous gas (up to 90% less nitric fumes than conventional pickling products), which makes it considerably easier to work.

Antox 23E Plus is particularly well suited for stainless steels such as 304 and 304L (European Steel Grade 1.4301 and 1.4306). When used on higher alloyed steels a second application maybe required.

Standard Packaging and Part Number

Jars Size Kgs	Master Carton Quantity	Antox 73E Plus	Antox 23E Plus
10	N/A	7202 0010	7202 2010
20	N/A	7202 0020	

* Additional Jar sizes available upon request, minimum order quantity may apply

Reaction Times and Yield

The reaction time is dependent on the degree of weld burn, the ambient air and material temperatures. The optimal pickling temperature is around 18 -22° C. You should avoid using pickling paste in direct sunlight as the pickling paste may dry prematurely.

	Reaction Time in Minutes				Approximate Yield for 1Kg	
	Rusty and acid-resistant steel, stainless steel	Nickel and Nickel Alloys	Titanium & Alloys	Aluminum	Square Meters	Square Feet
Antox 73E Plus	15 - 60	5 - 20	5 - 20	N/A	4 - 6	43 - 64.5
Antox 23E Plus	30 - 90	N/A	N/A	N/A	4 - 6	43 - 64.5



Antox® Bath/Dip Pickling Products

Antox 80E Pickling of stainless steel with the bath/dip process is the best method for obtaining a chemically pure uniform surface because the bath temperature can be adjusted and monitored.

Antox 80 E can be used for pickling both low and high-alloyed special steels. It does however attack machining steel DIN EN 1.4305. Different make-up concentrations can be used to adjust the pickling bath to the prevailing situation. It is mixed with water in the ratio 1:1. If mixed with de-ionized water (< 10 mS) in the ratio 1:3, the resulting solution corresponds with the regulations of KWU TLV 9026 01/03.

Acid content and iron concentration should be checked regularly and the ideal bath temperature is between 18 - 22 °C. The baths should be heated only in exceptional cases, up to 40°C maximum because heating creates higher emission levels. Before pickling, the special steel surface should be free from oils and fats (see page 36). The exposure period largely depends on the above-mentioned bath conditions. In case of doubt, a preliminary trial should be carried out to determine the appropriate exposure period.

Standard Packaging and Part Number

Jar Size Kgs	Antox 80E
5	7204 0005
30	7204 0030

* Additional Jar sizes available upon request, minimum order quantity may apply

Reaction Times and Yield

The reaction time is dependent on the degree of weld burn, the ambient air and material temperatures. The optimal pickling temperature is around 18 -22° C. You should avoid using pickling paste in direct sunlight as the pickling paste may dry prematurely.

	Reaction Time in Minutes				Approximate Yield for 1Kg	
	Rusty and acid-resistant steel, stainless steel	Nickel and Nickel Alloys	Titanium & Alloys	Aluminum	Square Meters	Square Feet
Antox 80E	15 - 60	5 - 20	5 - 20	N/A	4	43

* Additional Jar sizes available upon request, minimum order quantity may apply



Antox® Neutralizing Paste

Antox NP is used to neutralise pickling pastes that contain hydrofluoric and nitric acids. The neutralizing paste is applied directly on top of the pickling paste before it is washed off. The pickling paste will start to bubble when in contact with the Antox NP.

To achieve complete neutralisation use equal quantities of Antox NP to that of the pickling paste. The reaction is finished when the bubbling can no longer be seen.

The use of neutralizing paste not only stops the reaction but also ensures that the pickling paste is not washed onto other areas of the job where it may cause corrosion. It also results in a solution approximately Ph7. It must be mixed well before use as it settles when stored.

Standard Packaging, Part Number and Yield

Jars Size Kgs	Master Carton Quantity	Antox NP	Approximate Yield for 1Kg	
			Running Meters	Running Feet
2	6	7206 0002	50 - 80	164 - 262

* Additional Jar sizes available upon request, minimum order quantity may apply

Antox® Passivating Solution

Antox 90E passivating solution accelerates the formation of the chrome oxide protective layer on stainless steel after pickling or mechanical finishing. This solution meets the requirements detailed in ASTM A380-06 & A967-05. Although this layer will form naturally in air it can take anything up to 14 days for complete surface protection.

The solution can be applied by acid resistant brushes, immersion in a bath or by using a chemical resistant spray unit such as the Antox hand operated sprayer. Antox 90E is ready to use and is applied undiluted to the dry surface. If used in a bath/dip application it can be diluted 1:1 but reaction times will increase.

The reaction time is dependent on the ambient air and the material temperature. The optimal pickling temperature is around 18 -22° C. Work routines should be avoided in direct sunlight due to the hazard of premature drying

Standard Packaging, Part Number, Reaction Time and Yield

Jars Size Kgs	Antox 90E	Reaction Time in Minutes	Approximate Yield for 1Kg	
		Rust and acid-resistant steels, stainless steels	Square Meters	Square Feet
5	7205 0005	20 – 30	20 - 25	215 - 323
30	7205 0030			

* Additional Jar sizes available upon request, minimum order quantity may apply

Antox® Paste for Cleaning & Polishing of Stainless Steel

Antox 2001T contains a minimal amount of HF/Nitric acid. It was designed primarily for field applications when pickling/passivating small areas of stainless steel. It is a highly effective cleaning paste used for the gentle removal of tarnish marks, oxidation, rust spots, graffiti, adhesive residues, etc.

It works very quickly, leave the shine on the work surface with no dulling and it is very easy to use, and you simply rub on, wipe off and rinse with water. Suitable for use on all Chrome-Nickel Stainless Steels.

Contents of Kit:

- Antox 2001 Paste (0.4Kg Jar)
- Two applicator sticks
- White abrasive pad
- Felt pad
- Latex gloves

Reaction Times and Yield

The reaction time is dependent on the degree of weld burn, the ambient air and material temperatures. The optimal pickling temperature is around 18 -22° C. You should avoid using picking paste in direct sunlight as the pickling paste may dry prematurely.

Standard Packaging, Part Number, Reaction Time and Approximate Yield

Jar Size Kgs	Antox 2001T Kit	Reaction Time in Minutes		Approximate Yield for 1Kg	
		Rusty and acid-resistant steel, stainless steel	Shiny stainless steel surfaces	Running Meters	Running Feet
0.40	7207 2001K	10 - 15	1 - 3	80 -100	262 - 328

* Additional Jar sizes available upon request, minimum order quantity may apply



Antox® Pickling Tools

Part Number	Description	Quantity
7250 0005	Acid Resistant Brush, Straight 1/2"	
7250 000	Acid Resistant Brush, Angled 1/2"	
7250 0006	Acid Resistant Brush, Round 3/4"	
7250 0004	Acid Resistant Brush, Straight 1"	
7250 0003	Acid Resistant Brush, Angled 1"	
7250 0001	Acid Resistant Brush, Straight	1 /12
7250 0002	Acid Resistant Brush, Angled	1 /12

* Not all sizes of brush are standard stock items



Description	1.5L Manual Spray Unit (Acid Resistant)	5L Manual Spray Unit (Acid Resistant)
Part Number		7260 1050



Antox® Product Warnings

Notes on hazards and suggestions for safety precautions

Pickling pastes contains hydrofluoric acid and nitric (azotic) acid; this is extremely toxic when inhaled or swallowed. If contact with the skin occurs, immediate application of **Calcium Gluconate gel** will stop the reaction and neutralize the acid burn.

Work routines should be carried out in a well-ventilated area. Store also in a well-ventilated enclosure (the cans should be tightly closed). Breathing apparatus should be used when ventilation facilities are insufficient. Appropriate protective goggles; gloves and clothing should always be worn whilst working.

Thorough rinsing with water should treat any contact with the eyes and thereafter a doctor should be consulted. Contaminated and soaked protective clothing should be immediately changed. A doctor should be consulted if nausea is experienced (the doctor should be shown the notes on safety precautions, the product notes or the product label). These products should not be accessible by children. The products are only intended for commercial and industrial use.

Disposal of Waste

Neither pickling paste nor the rinsing water may be disposed of in the public sewers in an untreated state. The waste water is acidic and contains alloy residue solids from the treated metal. Appropriate treatment should be carried out in a suitable neutralization plant or disposal undertaken via a licensed waste disposal enterprise. All local waste water public sewerage regulations are to be observed.

Disclaimer

The information is provided to the best of our knowledge and conscience and conforms to the laboratory and field experience at the time of going to press. However, it must only be regarded as non-binding guidelines which have to be adapted to requirements. Since the use of our products lies beyond our control, we can only accept liability for the perfect standard quality at the time of delivery. Consequential losses will only be recognized if this was expressly agreed before use in writing, stating the warranted characteristics.

For more information or for current MSDS sheets please visit our website www.vanguardsteel.com