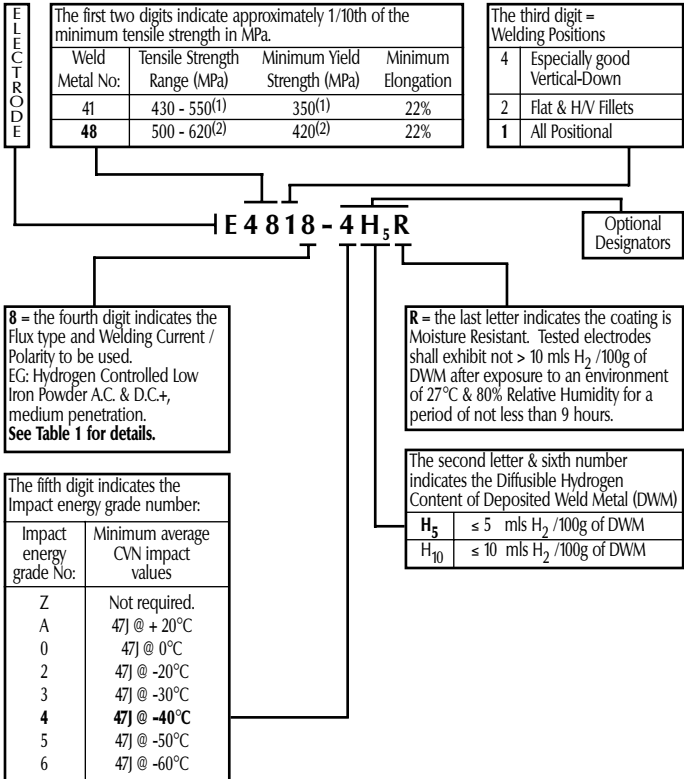


CONSUMABLES CLASSIFICATION TABLES

AS/NZS 1553 Part 1-1995 Covered Electrodes for Welding Low Carbon Steel

AS/NZS 1553.1 classifies Manual Metal Arc Welding (MMAW / Stick) electrodes by using a series of letters and digits broken into two alpha numeric groups separated by a hyphen. eg: E4818-4H5R. NB. The second group separated by the hyphen as shown is optional. ie. 4H5R is optional.

The following layout outlines this classification system in part only. For full details CIGWELD recommend you refer to the current published version of AS/NZS 1553 Part 1. obtainable from the Standards Association of Australia or Standards New Zealand.



(1) and (2) indicates that for each increase of 1% in the value of elongation over the minimum a decrease of 10 MPa in Tensile and Yield Strength is allowed to the following minimum values. EG: E41XX, Tensile: 410 MPa / Yield: 330 MPa and E48XX, Tensile: 480 MPa / Yield: 400 MPa.

CONSUMABLES CLASSIFICATION TABLES

AS/NZS 1553 Part 1-1995 Covered Electrodes for Welding Low Carbon Steel cont.

AS/NZS 1553.1 Electrode Classification Summary - Table 1

Electrode Classification	Welding Positions	Type of Current and Polarity	Type of Flux Covering and Slag Type	Penetration
EXX10	F, V, OH, H	D.C. + Fluid Slag	High Cellulose	Deep
EXX11	F, V, OH, H	A.C. & D.C. + Fluid Slag	High Cellulose	Deep
EXX12	F, V, OH, H	A.C. & D.C. + or - (Viscous)	High Titania, Stiff Slag	Medium
EXX13	F, V, OH, H	A.C. & D.C. + or -	High Titania, Fluid Slag	Medium
EXX14	F, V, OH, H	A.C. & D.C. + or - Stiff Slag (Viscous)	Low Iron Powder, Titania	Low
EXX15	F, V, OH, H	D.C. + Hydrogen Controlled	Basic,	Medium
EXX16	F, V, OH, H	A.C. & D.C. + Hydrogen Controlled	Basic,	Medium
EXX18	F, V, OH, H	A.C. & D.C. + Low Iron Powder	Basic Hydrogen Controlled,	Medium
EXX19	F, V, OH, H	A.C. & D.C. + or - Potassium	Iron Oxide Titania	Medium
EXX20	F & H/V-FILLET	A.C. & D.C. + or -	High Iron Oxide	Deep
EXX24	F & H/V-FILLET	A.C. & D.C. + or - Titania	High Iron Powder,	Low
EXX27	F & H/V-FILLET	A.C. & D.C. + or - Iron Oxide	High Iron Powder	Deep
EXX28	F & H/V-FILLET	A.C. & D.C. + High Iron Powder	Basic Hydrogen Controlled,	Medium
EXX46	F, V, OH, H V-DOWN	A.C. & D.C. +	Basic, Hydrogen Controlled	Medium
EXX48	F, V, OH, H V-DOWN	A.C. & D.C. +	Basic Hydrogen Controlled, Low Iron Powder	Medium
EXX99	As Specified by the Manufacturer	As Specified by the Manufacturer	As Described by the Manufacturer	As Specified

* Legend to Abbreviations:

F = Flat
V = Vertical
H = Horizontal

OH = Overhead
H/V-FILLET = Horizontal-Vertical Fillet
V-DOWN = Vertical-Down

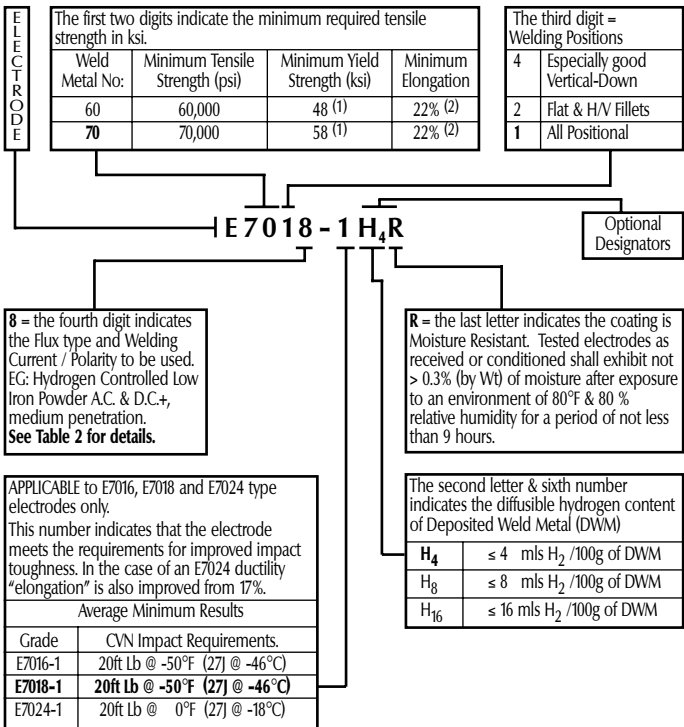
CONSUMABLES CLASSIFICATION TABLES

AWS A5.1-91 Carbon Steel Electrodes for Shielded Metal Arc Welding

AWS A5.1-91 classifies Shielded Metal Arc Welding (SMAW / MMAW) electrodes by using a series of letters and digits broken into two alpha numeric groups separated by a hyphen.

eg: E7018 H4R. NB. The alpha numeric group after the four digit number (or five in the case of E7018-1) is optional. ie. H4R is optional.

The following layout outlines this classification system in part only. For full details CIGWELD recommend you refer to the current published version of AWS A5.1 obtainable from the American Welding Society, 550 N.W. Lejeune Road, Miami, Florida 33126, USA.



(1) Yield on E6022 electrodes is not specified and E7018M may have a range of 53-72 ksi for all diameters other than 3/32s (2.4mm) which is 53-77 ksi. (2) Minimum elongation for E6012, E6013, E7014 and E7024 types is 17%. Elongation on E6022 electrodes is not specified, and E7018M types are required to meet 24%.

CONSUMABLES CLASSIFICATION TABLES

AWS A5.1-91 Carbon Steel Electrodes for Shielded Metal Arc Welding cont.

AWS A5.1 Electrode Classification Summary - Table 2

Electrode Classification	Welding Positions	Type of Current and Polarity	Type of Flux Covering and Slag Type or "Use"	Penetration
E6010	F, V, OH, H	D.C. +	High Cellulose Sodium <i>Thin Friable Slag</i>	Deep
E6011	F, V, OH, H	A.C. & D.C. +	High Cellulose Potassium <i>Thin Friable Slag</i>	Deep
E6012	F, V, OH, H	A.C. & D.C. + or -	High Titania Sodium, <i>Dense Slag</i>	Medium
E6013	F, V, OH, H	A.C. & D.C. + or -	High Titania Potassium, <i>Dense-Fluid Slag</i>	Medium
E7014	F, V, OH, H	A.C. & D.C. + or -	Low Iron Powder, Titania <i>Self Removing Slag</i>	Low
E7015	F, V, OH, H	D.C. +	Low Hydrogen Sodium <i>Basic Slag Heavy & Friable</i>	Medium
E7016	F, V, OH, H	A.C. & D.C. +	Low Hydrogen Potassium <i>Basic Slag Heavy & Friable</i>	Medium
E7018	F, V, OH, H	A.C. & D.C. +	Low Hydrogen Potassium Iron Powder	Medium
E7018M	F, V, OH, H	D.C. +	Low Hydrogen Iron Powder <i>"Military Hydrogen Controlled"</i>	Medium
E6019	F, V, OH, H	A.C. & D.C. + or -	Iron Oxide Titania Potassium <i>Fluid Slag</i>	Medium
E6020	F & H/V-FILLET	A.C. & D.C. + or -	High Iron Oxide <i>Easily Removable Slag</i>	Medium to Deep
E6022	F & H/V-FILLET	A.C. & D.C. -	High Iron Oxide <i>"Single-Pass Welds Only"</i>	Deep
E7024	F & H/V-FILLET	A.C. & D.C. + or -	Iron Powder, Titania <i>"High Deposition Efficiency"</i>	Low
E6027	F & H/V-FILLET	A.C. & D.C. + or -	High Iron Oxide Iron Powder <i>Heavy Honeycombed Slag</i>	Medium
E7027	F & H/V-FILLET	A.C. & D.C. + or -	High Iron Oxide Iron Powder <i>Heavy Honeycombed Slag</i>	Medium
E7028	F & H/V-FILLET	A.C. & D.C. +	Low Hydrogen Potassium, Iron Powder	Medium
E7048	F, V, OH, H V-DOWN	A.C. & D.C. +	Low Hydrogen Potassium, Iron Powder	Medium

* Legend to Abbreviations: F = Flat OH = Overhead V = Vertical
H = Horizontal V-DOWN = Vertical-Down H/V-FILLET = Horizontal-Vertical Fillet

E7018M type electrodes are intended to meet most military requirements and have greater toughness, lower coating moisture content, both as-received and after exposure, and also conform to mandatory diffusible hydrogen limits for deposited weld metal.

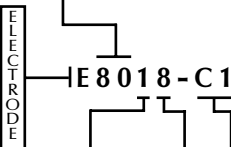
CONSUMABLES CLASSIFICATION TABLES

AWS A5.5-96 Low Alloy Steel Covered Arc Welding Electrodes

AWS A5.5-96 classifies Shielded Metal Arc Welding (SMAW / MMAW) electrodes by using a series of letters and digits broken into two alpha numeric groups separated by a hyphen. eg: E7010-A1 or E8010-P1. NB. The alpha numeric group after the four digit number indicates chemical analysis requirements. The following layout outlines this classification system in part only. For full details CIGWELD recommend you refer to the current published version of AWS A5.5 obtainable from the American Welding Society, 550 N.W. LeJeune Road, Miami, Florida 33126, USA.

Weld Metal No:	Min. Tensile Strength (psi)	Yield Strength ⁽¹⁾ (ksi)	Weld Metal No:	Min. Tensile Strength (psi)	Yield Strength (ksi)
7010-P1	70,000	60	100	100,000	87
70	70,000	57	10018-M	100,000	88-100
70xx-B2L	75,000	57	110	110,000	97
80	80,000	67	11018M	110,000	98-110
80xx-C3	80,000	68-80	120	120,000	107
90	90,000	77	12018M	120,000	108-120
9018M	90,000	78-90	12018M1	120,000	108-120

80 = the first two digits indicate the minimum required tensile strength in ksi.



The third digit =
Welding Positions

1	All Positional
2	Flat & H/V Fillets
4	Especially good Vertical-Down

8 = the fourth digit indicates the Flux type and Welding Current / Polarity to be used.
EG: Hydrogen Controlled Low Iron Powder A.C. & D.C.+, medium penetration.
See Table 3 for details.

Classification Suffixes by Major Chemical Analysis (%)						
Type	C	Mn	Ni	Cr	Mo	V
Carbon-Molybdenum Steel Electrodes						
A1	0.12	0.60-1.00	---	---	0.40-0.65	---
Chromium-Molybdenum Steel Electrodes						
B1	0.05-0.12	0.90	---	0.40-0.65	0.40-0.65	---
B2	0.05-0.12	0.90	---	1.00-1.50	0.40-0.65	---
B2L	0.05	0.90	---	1.00-1.50	0.40-0.65	---
B3	0.05-0.12	0.90	---	2.00-2.50	0.90-1.20	---
B3L	0.05	0.90	---	2.00-2.50	0.90-1.20	---
B4L	0.05	0.90	---	1.75-2.25	0.40-0.65	---
B5	0.07-0.15	0.40-0.70	---	0.40-0.60	1.00-1.25	0.05
B6	0.05-0.10	1.00	---	4.00-6.00	0.45-0.65	---
B6L	0.05	1.00	---	4.00-6.00	0.45-0.65	---
B7	0.05-0.10	1.00	---	6.00-8.00	0.45-0.65	---
B7L	0.05	1.00	---	6.00-8.00	0.45-0.65	---
B8	0.05-0.10	1.00	---	8.00-10.50	0.85-1.20	---
B8L	0.05	1.00	---	8.00-10.50	0.85-1.20	0.05
B9	0.08-0.13	1.25	---	8.00-10.50	0.85-1.20	0.15-0.30
Nickel Steel Electrodes						
C1	0.12	1.25	2.00-2.75	---	---	---
C1L	0.05	1.25	2.00-2.75	---	---	---
C2	0.12	1.25	3.00-3.75	---	---	---
C2L	0.05	1.25	3.00-3.75	---	---	---
C3	0.12	0.40-1.25	0.80-1.10	0.15	0.35	0.05
C3L	0.08	0.40-1.40	0.80-1.10	0.15	0.35	0.05
C4	0.10	1.25	1.10-2.00	---	---	---
C5L	0.05	0.40-1.00	6.00-7.25	---	---	---
Nickel-Molybdenum Steel Electrodes						
NM	0.10	0.80-1.25	0.80-1.10	0.10	0.40-0.65	0.02
Manganese-Molybdenum Steel Electrodes						
D1	0.12	1.00-1.75	0.90	---	0.25-0.45	---
D2	0.15	1.65-2.00	0.90	---	0.25-0.45	---
D3	0.12	1.00-1.80	0.90	---	0.40-0.65	---
Pipeline Electrodes						
P1	0.20	1.20	1.00	0.30	0.50	0.10
G = General and M = Military						
G*	---	1.00 min	0.50 min	0.30 min	0.20 min	0.10 min
M#	0.10	0.60-2.25	1.25-2.50	0.15-1.50	0.25-0.55	0.05
M1	0.10	0.80-1.60	3.00-3.80	0.65	0.20-0.30	0.05

Notes:
 (1) Yield on E7010-P1 and E7018-W1 is required to be 60 ksi (415MPa).
 (2) *G classifications require the weld deposit to exhibit only a minimum of one (1) element listed.
 (3) #M classification chemical limits can vary widely in the case of Mn, Ni, Cr and Mo, refer to page 5 of AWS A5.5-96 for details. EX018-M electrodes are intended to meet most military requirements and have greater toughness, lower coating moisture content, both as-received and after exposure, and also conform to mandatory diffusible hydrogen limits for deposited weld metal.

CONSUMABLES CLASSIFICATION TABLES

AWS A5.5-96 Low Alloy Steel Covered Arc Welding Electrodes cont.

AWS A5.5 Electrode Classification Summary - Table 3

Electrode Classification	Welding Positions	Type of Current and Polarity	Type of Flux Covering and Slag Type or "Use"	Penetration
E70 Series, 70,000 psi (480 MPa)				
E7010-X	F, V, OH, H	D.C. +	High Cellulose Sodium	Deep
E7011-X	F, V, OH, H	A.C. & D.C. +	High Cellulose Potassium	Deep
E7015-X	F, V, OH, H	D.C. +	Low Hydrogen Sodium	Medium
E7016-X	F, V, OH, H	A.C. & D.C. +	Low Hydrogen Potassium	Medium
E7018-X	F, V, OH, H	A.C. & D.C. +	Iron Powder, Low Hydrogen	Medium
E7020-X	F & HV-FILLET	A.C. & D.C. + or -	High Iron Oxide	Medium to Deep
E7027-X	F & HV-FILLET	A.C. & D.C. + or -	High Iron Oxide, Iron Powder	Medium
E80 Series, 80,000 psi (550 MPa)				
E8010-X	F, V, OH, H	D.C. +	High Cellulose Sodium	Deep
E8011-G	F, V, OH, H	A.C. & D.C. +	High Cellulose Potassium	Deep
E8013-G	F, V, OH, H	A.C. & D.C. + or -	High Titania Potassium,	Medium
E8015-X	F, V, OH, H	D.C. +	Low Hydrogen Sodium	Medium
E8016-X	F, V, OH, H	A.C. & D.C. +	Low Hydrogen Potassium	Medium
E8018-X	F, V, OH, H	A.C. & D.C. +	Low Hydrogen, Iron Powder	Medium
E90 Series, 90,000 psi (620 MPa)				
E9010-G	F, V, OH, H	D.C. +	High Cellulose Sodium	Deep
E9011-G	F, V, OH, H	A.C. & D.C. +	High Cellulose Potassium	Deep
E9013-G	F, V, OH, H	A.C. & D.C. + or -	High Titania Potassium,	Medium
E9015-X	F, V, OH, H	D.C. +	Low Hydrogen Sodium	Medium
E9016-X	F, V, OH, H	A.C. & D.C. +	Low Hydrogen Potassium	Medium
E9018-X	F, V, OH, H	A.C. & D.C. +	Low Hydrogen, Iron Powder	Medium
E9018M	F, V, OH, H	D.C. +	Low Hydrogen, Iron Powder	Medium
E100 Series, 100,000 psi (690 MPa)				
E10010-G	F, V, OH, H	D.C. +	High Cellulose Sodium	Deep
E10011-G	F, V, OH, H	A.C. & D.C. +	High Cellulose Potassium	Deep
E10013-G	F, V, OH, H	A.C. & D.C. + or -	High Titania Potassium,	Medium
E10015-X	F, V, OH, H	D.C. +	Low Hydrogen Sodium	Medium
E10016-X	F, V, OH, H	A.C. & D.C. +	Low Hydrogen Potassium	Medium
E10018-X	F, V, OH, H	A.C. & D.C. +	Low Hydrogen, Iron Powder	Medium
E10018M	F, V, OH, H	D.C. +	Low Hydrogen, Iron Powder	Medium
E110 Series, 110,000 psi (760 MPa) and E120 Series, 120,000 psi (830 MPa)				
E11010-G	F, V, OH, H	D.C. +	High Cellulose Sodium	Deep
E11011-G	F, V, OH, H	A.C. & D.C. +	High Cellulose Potassium	Deep
E11013-G	F, V, OH, H	A.C. & D.C. + or -	High Titania Potassium,	Medium
E11015-G	F, V, OH, H	D.C. +	Low Hydrogen Sodium	Medium
E11016-G	F, V, OH, H	A.C. & D.C. +	Low Hydrogen Potassium	Medium
E11018-G	F, V, OH, H	A.C. & D.C. +	Low Hydrogen, Iron Powder	Medium
E11018M	F, V, OH, H	D.C. +	Low Hydrogen, Iron Powder	Medium
E12010-G	F, V, OH, H	D.C. +	High Cellulose Sodium	Deep
E12011-G	F, V, OH, H	A.C. & D.C. +	High Cellulose Potassium	Deep
E12013-G	F, V, OH, H	A.C. & D.C. + or -	High Titania Potassium,	Medium
E12015-G	F, V, OH, H	D.C. +	Low Hydrogen Sodium	Medium
E12016-G	F, V, OH, H	A.C. & D.C. +	Low Hydrogen Potassium	Medium
E12018-G	F, V, OH, H	A.C. & D.C. +	Low Hydrogen, Iron Powder	Medium
E12016M	F, V, OH, H	A.C. & D.C. +	Low Hydrogen Potassium	Medium
E12018M1	F, V, OH, H	A.C. & D.C. +	Low Hydrogen, Iron Powder	Medium

Legend to Abbreviations: F = Flat, V = Vertical, H = Horizontal, OH = Overhead, HV-FILLET = Horizontal-Vertical Fillet

CONSUMABLES CLASSIFICATION TABLES

AS/NZS 2717 Part 1-1996 Ferritic Steel Electrodes For Gas Metal Arc Welding

AS/NZS 2717 classifies Gas Metal Arc Welding (GMAW / MIG) wires by using a series of letters and digits broken into three (3) alpha numeric groups separated by hyphens. e.g: E54-GM-W503AH. The following table outlines this classification system in part only. For full details CIGWELD recommends that you refer to the current published version of AS/NZS 2717 Part 1. obtainable from the Standards Association of Australia or Standards New Zealand.

Weld metal properties.			
The first two digits indicate approximately 1/10th the tensile strength of the weld metal in MPa.			
Weld Metal Classification	Minimum Tensile	Minimum Yield	Minimum Elongation
W41	420 MPa	not applicable	20%
W50	500 MPa	360 MPa	22%
W55	550 MPa	470 MPa	19%
W62	620 MPa	540 MPa	17%
W69	690 MPa	610-700 MPa	16%
W76	760 MPa	660-740 MPa	15%
W83	830 MPa	730-840 MPa	14%

The third digit indicates Impact energy grade No:	
Impact energy grade No:	Min. average CVN impacts
Z	Not required.
A	47J @ +20°C
0	47J @ 0°C
2	47J @ -20°C
3	47J @ -30°C
4	47J @ -40°C
5	47J @ -50°C
6	47J @ -60°C
W559XH-Ni1	27J @ -45°C
W559XH-Ni2	27J @ -60°C
W559XH-Ni3	27J @ -73°C
W559XH-D2	27J @ -30°C
W699XH-M2	68J @ -50°C
W769XH-M3	68J @ -50°C
W839XH-M4	68J @ -50°C
W699XH-M5	68J @ -50°C

ES6 - GC / M - W503AH

Type of external shielding.
G = Gas followed by either of these listed:
C = Carbon dioxide.
M = Mixed shielding gas eg Argoshield 51.
I = Inert shielding gas.

Indicating the applicable heat treatment condition.
A = as-welded condition.
P = postwelded heat treatment.
H = hydrogen controlled weld metal. ≤ 15 mls of H ₂ / 100gms of deposited weld metal.

E = Electrode, S = Solid Wire followed by a number or letter which defines the chemical composition of the wire.				
Wire Classification	Carbon (C)	Manganese (Mn)	Silicon (Si)	Other Elements Nominal Range %
ES2	0.07	0.90-1.40	0.40-0.70	0.25Cu / 0.10Ti / 0.07Zr / 0.10Al
ES3	0.06-0.15	0.90-1.40	0.45-0.75	0.25Cu
ES4	0.07-0.15	1.00-1.50	0.60-0.85	0.25Cu
ES5	0.07-0.19	0.90-1.40	0.30-0.60	0.70Al
ES6	0.06-0.15	1.40-1.85	0.80-1.15	0.25Cu
ES7	0.07-0.15	1.50-2.00	0.50-0.80	0.25Cu
ESB2	0.07-0.12	0.40-1.2	0.40-0.70	1.25Cr / 0.50Mo / 0.17Cu
ESB2L	0.05	0.40-1.2	0.40-0.70	1.25Cr / 0.50Mo / 0.17Cu
ESB3	0.07-0.12	0.40-1.2	0.40-0.70	2.50Cr / 1.05Mo / 0.17Cu
ESB3L	0.05	0.40-1.2	0.40-0.70	2.50Cr / 1.05Mo / 0.17Cu
ES5Cr	0.10	1.00	0.90	0.20Ni / 5.25Cr / 0.55Mo / 0.37Cu
ES7Cr	0.10	1.00	0.90	0.20Ni / 7.00Cr / 0.55Mo / 0.37Cu
ES9Cr	0.10	1.00	0.90	0.20Ni / 9.25Cr / 1.02Mo / 0.37Cu
ESNi1	0.12	1.25	0.40-0.80	0.95Ni / 0.07Cr / 0.17Mo / 0.02V / 0.17Cu
ESNi2	0.12	1.25	0.40-0.80	2.37Ni / 0.17Cu
ESNi3	0.12	1.25	0.40-0.80	3.37Ni / 0.17Cu
ESD2	0.07-0.12	1.60-2.10	0.50-0.80	0.07Ni / 0.50Mo / 0.25Cu
ESM2	0.08	1.25-1.80	0.20-0.50	1.75Ni / 0.15Cr / 0.40Mo / 0.02V / 0.12Cu / 0.05ea, Ti / Zr / Al
ESM3	0.09	1.25-1.80	0.20-0.55	2.25Ni / 0.25Cr / 0.20Mo / 0.02V / 0.12Cu / 0.05ea, Ti / Zr / Al
ESM4	0.10	1.25-1.80	0.20-2.60	4.80Ni / 0.30Cr / 0.95Mo / 0.01V / 0.12Cu / 0.05ea, Ti / Zr / Al
ESM5	0.12	1.25-1.80	0.20-2.60	4.80Ni / 0.30Cr / 0.95Mo / 0.01V / 0.12Cu / 0.05ea, Ti / Zr / Al

ESMG = General, composition is agreed between the supplier & customer

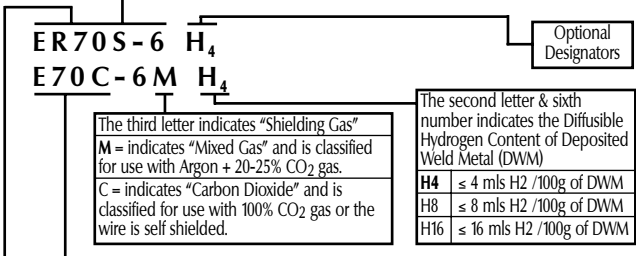
CONSUMABLES CLASSIFICATION TABLES

AWS A5.18-1993 Carbon Steel Electrodes and Rods for Gas Shielded Arc Welding

AWS A5.18-93 classifies Gas Metal Arc Welding (GMAW / MIG) wires by using a series of letters and digits broken into two (2) alpha numeric groups separated by a hyphen. e.g.: ER70S-6 and E70C-6M

The following layout outlines this classification system in part only. For full details CIGWELD recommend you refer to the current published version of AWS A5.18 obtainable from the American Welding Society, 550 N.W. LeJeune Road, Miami, Florida 33126, USA.

As Welded Mechanical Properties						
AWS Class.	Tensile Strength		Yield Strength		% Elong.	Charpy-V-Notch (CVN) Impact Requirements
	psi	MPa	psi	MPa		
ER70S-2	70,000	480	58,000	400	22	20ft Lb @ -20°F (27J @ -29°C)
ER70S-3	70,000	480	58,000	400	22	20ft Lb @ 0°F (27J @ -18°C)
ER70S-4	70,000	480	58,000	400	22	Not Required
ER70S-5	70,000	480	58,000	400	22	Not Required
ER70S-6	70,000	480	58,000	400	22	20ft Lb @ -20°F (27J @ -29°C)
ER70S-7	70,000	480	58,000	400	22	20ft Lb @ -20°F (27J @ -29°C)
ER70S-G	70,000	480	58,000	400	22	As agreed between supplier & purchaser
E70C-3X	70,000	480	58,000	400	22	20ft Lb @ 0°F (27J @ -18°C)
E70C-6X	70,000	480	58,000	400	22	20ft Lb @ -20°F (27J @ -29°C)
E70C-G(X)	70,000	480	58,000	400	22	As agreed between supplier & purchaser
E70C-GS (X)	70,000	480	Not Specified			Not Required



E = Electrode, **R** = Rod, **S** = Solid Wire, **C** = Composite Metal Cored Wire, followed by a hyphen then a number or letter which defines the chemical composition of the wire.

Wire Classification	Carbon (C)	Manganese (Mn)	Silicon (Si)	Other Elements Allowable % Range
ER70S-2	0.07	0.90-1.40	0.40-0.70	0.05-0.15Ti / 0.02-0.12Zr / 0.05-0.15Al
ER70S-3	0.06-0.15	0.90-1.40	0.45-0.75	0.50Cu
ER70S-4	0.07-0.15	1.00-1.50	0.60-0.85	0.50Cu
ER70S-5	0.07-0.19	0.90-1.40	0.30-0.60	0.50Cu / 0.50-0.90 Al
ER70S-6	0.06-0.15	1.40-1.85	0.80-1.15	0.50Cu
ER70S-7	0.07-0.15	1.50-2.00	0.50-0.80	0.50Cu
ER70S-G	G = General, composition is not specified and is agreed between the supplier and the customer.			
ER70C-3X	0.12	1.75	0.90	0.50Cu
ER70C-6X	0.12	1.75	0.90	0.50Cu
ER70C-G(X)	G = General, composition is not specified and is agreed between the supplier and the customer.			
ER70C-GS(X)	G = General, Single Pass Only, composition is agreed between the supplier and the customer.			

Single values are maximum. X represents shielding gas indicators e.g. "C" indicates CO₂ shielding gas and "M" indicates mixed shielding gases in the Argon + 20-25% CO₂. (X) is optional for these classifications.

CONSUMABLES CLASSIFICATION TABLES

AS 2203 Part 1-1990 Cored Electrodes for Arc Welding Ferritic Steel Electrodes

AS 2203.1 classifies Flux Cored Arc Welding (FCAW / cored) wires by using a series of letters and digits broken into four alpha numeric groups separated by hyphens and the last group separated by a full stop.

e.g. ETP-GCp-W504A.CM1 H10.

The following layout outlines this classification system in part only. For full details CIGWELD recommend you refer to the current published version of AS 2203 Part 1, obtainable from the Standards Association of Australia.

Group 1,	
E	Electrode
T	Tubular
Welding Positions:	
P	All Positional
D	Flat & H/V Fillets
S	Single run only

Group 3, the first two digits indicate approximately 1/10th of the minimum tensile strength in MPa.			
Weld Metal No:	Tensile Strength Range (MPa)	Min. Proof Stress at 0.2% offset (MPa)	Minimum Elongation
W40	430 - 550	310	22%
W50	490 - 650	360	22%
W55	550 - 690	470	19%
W62	620 - 760	540	16%
W69	690 - 830	610	15%
W76	760 - 900	680	14%
W83	830 - 970	750	13%

Condition of Weld Metal.	
A	As welded condition
P	Postweld heat treatment

ETP-GCp-W504A.CM1 H10

Group 4,	
indicates the Weld Metal Chemistry.	
See Table 4 for details.	

Indicates the Diffusible Hydrogen Content of Deposited Weld Metal (DWM).	
H5	≤ 5 mls H ₂ /100g of DWM
H10	≤ 10 mls H ₂ /100g of DWM
H15	≤ 15 mls H ₂ /100g of DWM

Group 2,	
G = Gas Shielding:	
C	carbon dioxide CO ₂
M	mixed gas
N	no external shielding gas
Welding Current:	
p	direct current positive DC+
n	direct current negative DC-
a	AC current

The third digit indicates the Impact energy grade number:			
Impact energy grade No:	Minimum average CVN impact values	Impact energy grade No:	Minimum average CVN impact values
0	Not required.	9AK1	27J @ -40°C
1	47J @ + 20°C	508AK2	27J @ -20°C
2	47J @ 0°C	509AK2	27J @ -30°C
3	47J @ -20°C	559AK2	27J @ -30°C
4	47J @ -40°C	628AK2	27J @ -20°C
5	47J @ -60°C	629AK2	27J @ -50°C
9ANi1	27J @ -30°C	698AK3	27J @ -20°C
9PNi1	27J @ -50°C	699AK3	27J @ -50°C
9PNi2	27J @ -60°C	768AK3	27J @ -20°C
9ANi2	27J @ -40°C	769AK3	27J @ -50°C
9ANi3	27J @ -73°C	769AK4	27J @ -50°C
9AD1	27J @ -40°C	9AK6	27J @ -30°C
629PD2	27J @ -50°C	9AK7	27J @ -50°C
699PD2	27J @ -40°C	9AW	27J @ -30°C
9AD3	27J @ -30°C	X.G	Not Specified

CONSUMABLES CLASSIFICATION TABLES

AS 2203 Part 1-1990 Cored Electrodes for Arc Welding Ferritic Steel Electrodes cont.

AS 2203.1 Weld Metal Chemistry Wt% Summary - Table 4

Weld Metal No:	Carbon (C)	Manganese (Mn)	Silicon (Si)	Nickel (Ni)	Chromium (Cr)	Molybdenum (Mo)	Other Elements
Carbon Steel Cored Wires							
CM1	0.20	1.75	0.90	0.50	0.20	0.30	0.08V / 1.8Al
CM2	> 0.20	1.75	0.90	0.50	0.20	0.30	0.08V / 1.8Al
Carbon-Molybdenum Steel Cored Wires							
A1	0.12	1.25	0.80			0.40-0.65	
Chromium-Molybdenum Steel Cored Wires							
B1	0.12	1.25	0.80		0.40-0.65	0.40-0.65	
B2L	0.05	1.25	0.80		1.00-1.50	0.40-0.65	
B2	0.12	1.25	0.80		1.00-1.50	0.40-0.65	
B2C	0.10-0.15	1.25	0.80		1.00-1.50	0.40-0.65	
B3L	0.05	1.25	0.80		2.00-2.50	0.90-1.20	
B3	0.12	1.25	0.80		2.00-2.50	0.90-1.20	
B3C	0.10-0.15	1.25	0.80		2.00-2.50	0.90-1.20	
5Cr	0.10	1.50	1.00	0.40	4.00-6.00	0.45-0.65	0.50Cu
7Cr	0.10	1.50	1.00	0.40	6.00-8.00	0.45-0.65	0.50Cu
9Cr	0.10	1.50	1.00	0.40	8.00-10.50	0.85-1.20	0.50Cu
Nickel Steel Cored Wires							
Ni1	0.12	1.50	0.08	0.80-1.10	0.15	0.35	0.05V / 1.8Al
Ni2	0.12	1.50	0.08	1.75-2.75			0.05V / 1.8Al
Ni3	0.12	1.50	0.08	2.75-3.75			
Manganese-Molybdenum Steel Cored Wires							
9XD1	0.12	1.25-2.00	0.80			0.25-0.55	
9XD2	0.15	1.65-2.25	0.80			0.25-0.55	
9XD3	0.12	1.00-1.75	0.80			0.40-0.65	
Other Low Alloy Steel Cored Wires							
9XK1	0.15	0.80-1.40	0.80	0.80-1.10	0.15	0.20-0.65	0.05V
9XK2	0.15	0.50-1.75	0.80	1.00-2.00	0.15	0.35	0.05V / 1.8Al
9XK3	0.15	0.75-2.25	0.80	1.25-2.60	0.15	0.25-0.65	0.05V
9XK4	0.15	1.20-2.25	0.80	1.75-2.60	0.20-0.60	0.30-0.65	0.05V
9XK5	0.10-0.25	0.60-1.60	0.80	0.75-2.00	0.20-0.70	0.15-0.55	0.05V
9XK6	0.15	0.50-1.50	0.80	0.40-1.10	0.15	0.15	0.05V / 1.8Al
9XK7	0.15	1.00-1.75	0.08	2.00-2.75			
G		1.00 min.	0.80 min.	0.50 min.	0.30 min.	0.20 min.	0.10 min. / 1.8Al
9X.W	0.12	0.50-1.30	0.35-0.80	0.40-0.80	0.45-0.70		0.30-0.75Cu

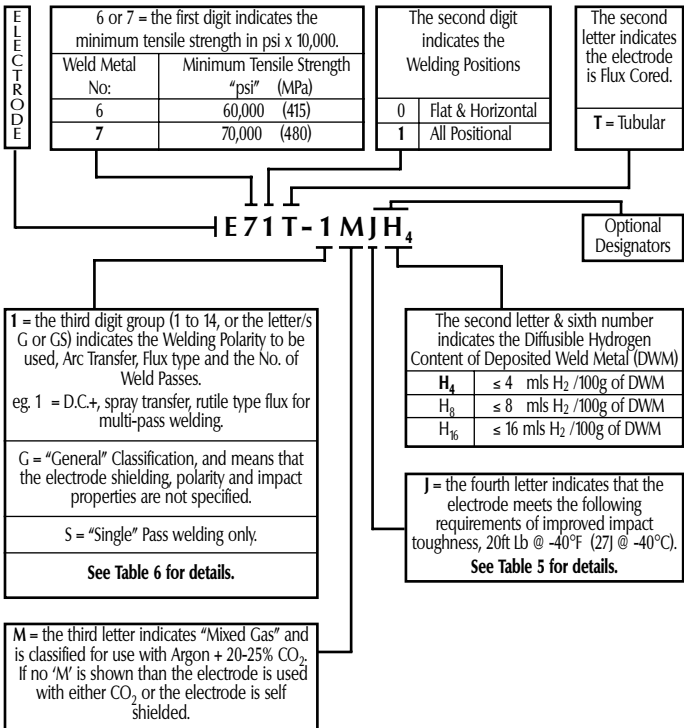
Single values shown are maximum.

CONSUMABLES CLASSIFICATION TABLES

AWS A5.20-95 Carbon Steel Electrodes for Flux Cored Arc Welding

AWS A5.20-95 classifies Flux Cored Arc Welding (FCAW / cored) wires by using a series of letters and digits broken into two alpha numeric groups separated by a hyphen. eg: E70T-1 or E71T-1M J H₄.

The following layout outlines this classification system in part only. For full details CIGWELD recommend you refer to the current published version of AWS A5.20 obtainable from the American Welding Society, 550 N.W. Lejeune Road, Miami, Florida 33126, USA.



CONSUMABLES CLASSIFICATION TABLES

AWS A5.20-95 Carbon Steel Electrodes for Flux Cored Arc Welding cont.

Shielding Gas Types

E7XT-1 These electrodes are designed primarily for use with CO₂ shielding gas. Argon based gases may be used to improve out-of-position characteristics.

Warning: *By using Argon based gas mixtures with these electrode types the following problems may occur;*

- 1) *deoxidiser levels in weld deposits may increase,*
- 2) *weld deposit hardness levels may increase,*
- 3) *weld deposit manganese and silicon levels may increase which will raise yield and tensile strength, and may degrade impact properties.*

E7XT-1M These electrodes are designed primarily for use with Argon + 20-25% CO₂ shielding gases.

Warning: *Higher levels of CO₂ above those recommended, in Ar / CO₂ gases or the use of 100% CO₂ gas with these types of electrodes may result in the following;*

- 1) *deterioration of arc and out-of-position characteristics,*
- 2) *resultant weld deposits may show decreased levels of manganese and silicon which will reduce yield and tensile strength and may degrade impact properties.*

As Welded Mechanical Properties - Table 5

AWS Class.	Tensile Strength		Yield Strength		% Elong.	Charpy-V-Notch (CVN) Impact Requirements
	ksi	MPa	ksi	MPa		
T-1/1M	70	480	58	400	22	20ft Lb @ 0°F (27) @ -18°C
T-2/2M	70	480	n.s.	n.s.	n.s.	not specified
T-3*	70	480	n.s.	n.s.	n.s.	not specified
T-4*	70	480	58	400	22	not specified
T-5/5M	70	480	58	400	22	20ft Lb @ -20°F (27) @ -29°C
T-6*	70	480	58	400	22	20ft Lb @ -20°F (27) @ -29°C
T-7*	70	480	58	400	22	not specified
T-8*	70	480	58	400	22	20ft Lb @ -20°F (27) @ -29°C
T-9/9M	70	480	58	400	22	20ft Lb @ -20°F (27) @ -29°C
T-10*	70	480	n.s.	n.s.	n.s.	not specified
T-11*	70	480	58	400	20	not specified
T-12/12M	70-90	480-620	58	400	22	20ft Lb @ -20°F (27) @ -29°C
T-13*	60	415	n.s.	n.s.	n.s.	not specified
T-13*	70	480	n.s.	n.s.	n.s.	not specified
T-14*	70	480	n.s.	n.s.	n.s.	not specified
T-G	60	415	48	330	22	not specified
T-G	70	480	58	400	22	not specified
T-GS	60	415	n.s.	n.s.	n.s.	not specified
T-GS	70	480	n.s.	n.s.	n.s.	not specified

The above designations may be classified with the 'J' indicator provided the lower CVN Impact requirements of 20ft Lb @ -40°F (27) @ -40°C, are met for T-1/1M, T-5/5M, T-6, T-8, T-9/M and T-12/12M types.

** Self Shielded wire types.*

CONSUMABLES CLASSIFICATION TABLES

AWS A5.20-95 Carbon Steel Electrodes for Flux Cored Arc Welding cont.

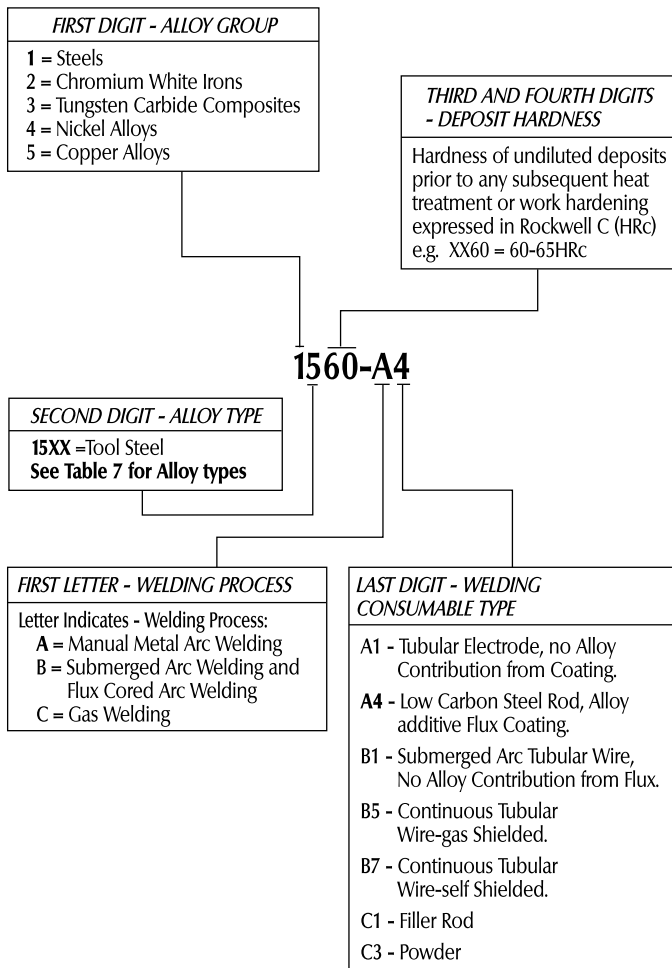
AWS A5.20 Electrode Classification Summary - Table 6

AWS A5.20 Class	Polarity	Arc Transfer Type	Slag Base	No. of Weld Passes	Discernible Features and Applications
T-1 and T-1M	DC +	Spray	Rutile	Multiple	Larger diameters (2mm [5/64"] & larger) are used for flat & H/V welding only. Very smooth / quiet arc with low spatter loss, flat to slightly convex weld bead contour, full covering easy removed slag, and high deposition rates.
T-2 and T-2M	DC +	Spray	Rutile	Single	Essentially the same as T-1 / T-1M types, but with higher manganese or silicon or both. Higher levels of deoxidisers allow welding of heavily oxidised steels such as, rimmed, rusty and mill scaled steels. SINGLE pass only.
T-3*	DC +	Spray	Rutile Fluoride	Single	# High speed gasless welding in flat & H/V and 20° down inclined positions on sheet metal. Limited mech. props.
T-4*	DC +	Globular	Alumina Fluoride	Multiple	Very low Sulphur weld deposits (resistant to hot cracking) & very high deposition rates. Bridging of poor fit-up joints.
T-5 and T-5M	DC + / -	Globular	Basic	Multiple	Larger diameters (>2mm) are used for flat & H/V welding. Good mechanical properties (eg. impacts 27J @ -29°C / 20ft Lb @ -20°F) Slightly convex weld bead contour, easy removed thin slag, resistant to hot & cold cracking.
T-6*	DC +	Spray	Rutile Basic	Multiple	Good low temperature impact properties (eg. 27J @ -29°C / 20ft Lb @ -20°F). Excellent slag removal in deep groove joints. Good root run penetration. Flat & H/V only.
T-7*	DC -	Spray	Alumina Fluoride	Multiple	Dia. (>2mm) used for flat & H/V welding. High deposition rates and very low sulphur weld metal resistant to cracking.
T-8*	DC -	Spray	Alumina Fluoride	Multiple	Very good low temperature strength, notch toughness and crack resistance (eg. 27J @ -29°C / 20ft Lb @ -20°F).
T-9 and T-9M	DC +	Spray	Rutile	Multiple	Essentially the same as T-1 / T-1M types, but deposit weld metal with improved impact properties (eg. 27J @ -29°C / 20ft Lb @ -20°F). To obtain X-Ray quality, joints are to be relatively clean and free of oil, excessive oxide & mill-scale.
T-10*	DC -	small droplet Globular	---	Single	High speed gasless welding in flat & H/V and 20° vertical inclined positions on larger thickness than the T-3 class.
T-11*	DC -	Spray	---	Multiple	General purpose wire for use on material less than 20mm (3/4) unless preheat & interpass temp's are maintained.
T-12 and T-12M	DC +	Spray	Rutile	Multiple	Essentially the same as T-1 / T-1M types, but modified to increase impact properties and to meet lower manganese requirements of the ASME Boiler and Pressure Vessel code section IX, A-1 analysis group of 1.6% Mn.
T-13*	DC -	Short arc	---	Single	Root pass welding only on circumferential pipe welds.
T-14*	DC -	Spray	---	Single	# High speed all positional welding of sheet metal such as, galvanised, zinc and other coated steels ≤ 6mm (1/4).
T-G	DC + / -	not specified	N.S.	Multiple	For electrodes not covered by any present classification. The wire must meet the chemical requirements to ensure a carbon steel deposit and the specified tensile strength.
T-GS	DC + / -	not specified	N.S.	Single	For single pass electrodes not covered by any present classification. The wire must meet the specified tensile strength requirements. No other requirements are specified.

* Self shielded wire types. # Suitable only for material thickness below 6mm (1/4")

CONSUMABLES CLASSIFICATION TABLES

AS/NZS 2576. 1996 - Classifies Welding Consumables as used for Build-up and wear resistance. The following layout outlines this classification, however for the complete classification CIGWELD recommends that users refer to the current version of the standard. The publication is available from the Standards Association of Australia or Standards New Zealand.



CONSUMABLES CLASSIFICATION TABLES (Table 7)

<i>Group 1 - Steels</i>	<i>Alloy Type</i>	<i>AS/NZS class.</i>
Cobalarc Mangcraft	Austenitic manganese steel	1215-A4
Cobaarc Mang. Nickel-O		1215-B1
Cobalarc Austex	Austenitic stainless steel	1315-A4
Shieldchrome 309LT		1315-B5
Cobalarc 350	Low carbon martensitic steel	1435-A4
Cobalarc 350-G/O		1435-B5/7
Cobalarc Toolcraft	Tool steel	1560-A4
Cobalarc 650	High carbon martensitic steel	1855-A4
Cobalarc 750		1860-A4
Cobalarc 650-G/O		1855-B5/B7
Cobalarc 850-O		1865-B7
<i>Group 2 - Cr White Irons</i>	<i>Alloy Type</i>	<i>AS/NZS class</i>
Cobalarc CR70	Austenitic chromium carbide iron	2355-A4
Cobalarc Coarseclad-G/O		2360-B5/B7
Cobalarc 9	Complex chromium carbide iron	2460-A1
Cobalarc Borochrome	Martensitic chromium carbide iron	2560-A4
Cobalarc Fineclad-O		2565-B7
<i>Group 3 - Tungsten Carbide Comp.</i>	<i>Alloy Type</i>	<i>AS/NZS class</i>
Cobalarc 4	Tungsten carbide granules in an iron rich matrix	3460-A1
<i>Group 4 - Copper Alloys</i>	<i>Alloy Type</i>	<i>AS/NZS class</i>
Bronzecraft AC-DC	Phosphor bronze (7-9% Sn)	6200-A2
Comweld Manganese Bronze	High tensile brass	6300-C1
Comweld Comcoat C		6300-C1
Comweld Nickel Bronze	Nickel bronze (9-13% Ni)	6400-C1
Comweld Comcoat N		6400-C1