



HYUNDAI WELDING CONSUMABLES



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S-4303.T	-	Z3211 E4303	ISO 2560-A-E38 0 RA 1 2	18
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S-6011.D	A5.1/ ASME SFA5.1 E6011	Z3211 E4311	ISO 2560-A-E38 0 C 1 1	20
S-6013.LF	A5.1/ ASME SFA5.1 E6013	Z3211 E4313	ISO 2560-A-E38 0 R 1 2	21
S-6013.V	A5.1/ ASME SFA5.1 E6013	Z3211 E4313	ISO 2560-A-E38 0 RC 1 1	22
S-6027.LF	A5.1/ ASME SFA5.1 E6027	Z3211 E4327	ISO 2560-A-E38 0 R 1 4	23
S-7014.F	A5.1/ ASME SFA5.1 E7014	-	ISO 2560-A-E42 0 R 1 2	24
S-7024.F	A5.1/ ASME SFA5.1 E7024	Z3211 E4924	ISO 2560-A-E42 0 RR 7 4	25
S-7016.O	A5.1/ ASME SFA5.1 E7016	Z3211 E4316	ISO 2560-A-E42 2 B 1 2	26
S-7016.M	A5.1/ ASME SFA5.1 E7016	Z3211 E4316	ISO 2560-A-E42 2 B 1 2	27
S-7010.P1	A5.5/ ASME SFA5.5 E7010-P1	-	-	28

High tensile steels				
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S-7016.HR	A5.1/ ASME SFA5.1 E7016 H4R	Z3211 E4916 H5	ISO 2560-A-E42 3 B 1 2 H5	30
S-7016.LF	A5.1/ ASME SFA5.1 E7016	Z3211 E4916	ISO 2560-A-E42 3 B 1 2	32
S-7016.G	A5.1/ ASME SFA5.1 E7016	Z3211 E4916	ISO 2560-A-E42 3 B 1 2	33
S-7018.G	A5.1/ ASME SFA5.1 E7018	Z3211 E4918	ISO 2560-A-E42 3 B 1 2	34
S-7018.GH	A5.1/ ASME SFA5.1 E7018	Z3211 E4918 H5	ISO 2560-A-E42 3 B 3 2 H5	35
S-7028.F	A5.1/ ASME SFA5.1 E7028	Z3211 E4928	ISO 2560-A-E42 2 B 7 4	37
S-7048.V	A5.1/ ASME SFA5.1 E7048	Z3211 E4948	ISO 2560-A-E42 3 B 3 5	38
S-8016.G	A5.5/ ASME SFA5.5 E8016-G	Z3211 E5516	ISO 2560-A-E46 3 1 Ni B 1 2	39
S-8018.G	A5.5/ ASME SFA5.5 E8018-G	Z3211 E5518	ISO 2560-A-E46 2 1 Ni B 3 2	40
S-9016.G	A5.5/ ASME SFA5.5 E9016-G	Z3211 E5716	ISO 2560-A E50 2 B 1 2	41
S-10016.G	A5.5/ ASME SFA5.5 E10016-G	Z3211 E6916-N4CM1 U	757 E55 0 B 1 2	42
S-10018.D2	A5.5/ ASME SFA5.5 E10018-D2 H4R	-	-	43
S-11016.G	A5.5/ ASME SFA5.5 E11016-G	-	757 E62 2 Mn2NiMo B 1 2	45
S-9018.M	A5.5/ ASME SFA5.5 E9018-M	-	757 E50 4 B 4 2	46
S-11018.M	A5.5/ ASME SFA5.5 E11018-M	-	757 E62 4 B 4 2	47

Weather proof steels

Product	AWS	JIS	EN	Page
S-7018.W	A5.5/ ASME SFA5.5 E7018-W1	Z3214 DA5026G	ISO 2560-A-E42 2 B 3 2	48
S-8018.W	A5.5/ ASME SFA5.5 E8018-W2	Z3214 DA5826W	ISO 2560-A-E50 2 B 3 2	49

Low-temperature service steels

Product	AWS	JIS	EN	Page
S-7018.1	A5.1/ ASME SFA5.1 E7018-1	Z3211 E4918	ISO 2560-A-E42 4 B 3 2	50
S-7018.1H	A5.1/ ASME SFA5.1 E7018-1 H4R	Z3211 E4918 H5	ISO 2560-A-E42 4 B 3 2 H5	51
S-76LTH	A5.5/ ASME SFA5.5 E7016-G	Z3211 E4916-N1 AP L	ISO 2560-A-E42 6 Z B H5	53
S-78LTH	A5.5/ ASME SFA5.5 E7018-G	-	ISO 2560-A-E46 5 1Ni B 3 2 H5	55
S-7016.LS	A5.5/ ASME SFA5.5 E7016-G H4R	Z3211 E4916-N1 AP L	ISO 2560-A-E46 6 1Ni B 1 2	57
S-86LTH	A5.5/ ASME SFA5.5 E8016-G	-	-	59
S-8016.C1	A5.5/ ASME SFA5.5 E8016-C1	Z3211 E5516-N5 AP L	ISO 2560-A-E46 5 2Ni B 1 2	61
S-8016.C2	A5.5/ ASME SFA5.5 E8016-C2	Z3211 E5516-N7 AP L	ISO 2560-A-E46 6 3Ni B 1 2	62
S-8016.C3	A5.5/ ASME SFA5.5 E8016-C3	Z3211 E5516-N2	ISO 2560-A-E46 4 1Ni B 1 2	63
S-8018.C1	A5.5/ ASME SFA5.5 E8018-C1	Z3211 E5518-N5 AP L	ISO 2560-A-E46 5 2Ni B 3 2	64
S-8018.C3	A5.5/ ASME SFA5.5 E8018-C3	Z3211 E5518-N2	ISO 2560-A-E46 4 1Ni B 3 2	65

Heat-resistant, Low alloy steels

Product	AWS	JIS	EN	Page
S-7010.A1	A5.5/ ASME SFA5.5 E7010-A1	-	ISO 2560-A-E42 0 Mo C 1 5	66
S-7016.A1	A5.5/ ASME SFA5.5 E7016-A1	Z3223 E4916-1M3	1599 - EMo B 1 2	67
S-7018.A1	A5.5/ ASME SFA5.5 E7018-A1	Z3223 E4918-1M3	1599 - EMo B 3 2	68
S-8016.B1	A5.5/ ASME SFA5.5 E8016-B1	-	1599 - ECrMo0.5 B 1 2	69
S-8016.B2	A5.5/ ASME SFA5.5 E8016-B2	Z3223 E5516-1CM	1599 - ECrMo1 B 1 2	70
S-8016.B2R	A5.5/ ASME SFA5.5 E8016-B2	Z3223 E5516-1CM	1599 - ECrMo1 B 1 2 H5	71
S-8018.B2	A5.5/ ASME SFA5.5 E8018-B2	Z3223 E5518-1CM	1599 - ECrMo1 B 3 2	73
S-8018.B2R	A5.5/ ASME SFA5.5 E8018-B2	Z3223 E5518-1CM	1599 - ECrMo1 B 3 2 H5	74
S-9016.B3	A5.5/ ASME SFA5.5 E9016-B3	Z3223 E6216-2C1M	1599 - ECrMo2 B 1 2	76
S-9016.B3R	A5.5/ ASME SFA5.5 E9016-B3	Z3223 E6216-2C1M	1599 - ECrMo2 B 1 2 H5	77
S-9018.B3	A5.5/ ASME SFA5.5 E9018-B3	Z3223 E6218-2C1M	1599 - ECrMo2 B 3 2	79
S-9018.B3R	A5.5/ ASME SFA5.5 E9018-B3	Z3223 E6218-2C1M	1599 - ECrMo2 B 3 2 H5	80

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S-8016.B5	A5.5/ ASME SFA5.5 E8016-B5	-	1599 - ECrMo5 B 1 2	82
S-8016.B6	A5.5/ ASME SFA5.5 E8016-B6	Z3223 DT2516	1599 - ECrMo5 B 1 2	83
S-8015.B8	A5.5/ ASME SFA5.5 E8015-B8		1599 - ECrMo9 B 3 2 H5	85
S-9015.B9	A5.5/ ASME SFA5.5 E9015-B91	Z3223 E6215-9C1MV	1599 - ECrMo91 B 4 2 H5	87
S-9016.B9	A5.5/ ASME SFA5.5 E9016-B91	Z3223 E6216-9C1MV	1599 - ECrMo91 B 3 2 H5	89

Hardfacing applications

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S-240A.R	-	Z3251 DF2A-250-R	-	91
S-350A.R	-	Z3251 DF2A-350-R	-	92
S-260A.B	-	Z3251 DF2A-300-B	-	93
S-350B.B	-	Z3251 DF2A-400-B	-	94
S-450B.B	-	Z3251 DF2A-450-B	-	95
S-500B.B	-	Z3251 DF2B-500-B	-	96
S-600B.B	-	Z3251 DF2B-600-B	-	97
S-700B.B	-	Z3251 DF3C-600-B	-	98
S-711	-	Z3251 DFCrA-600-BR	-	99
S-13MN.B	-	Z3251 DFMA-250-B	-	100

Stainless steels

Product	AWS	JIS	EN	Page
S-307.16	-	-	ISO 3581-A E 18 8 Mn R 1 2	101
S-308L.15	A5.4/ ASME SFA5.4 E308L-15	-	ISO 3581-A-E 19 9 L B	102
S-308.16N	A5.4/ ASME SFA5.4 E308-16	Z3221 ES308-16	ISO 3581-A-E 19 9 R	103
S-308H.16	A5.4/ ASME SFA5.4 E308H-16	Z3221 ES308H-16	ISO 3581-A-E 19 9 H 3 2	104
S-308L.16N[17]	A5.4/ ASME SFA5.4 E308L-16	Z3221 ES308L-16	ISO 3581-A-E 19 9 L R	105
	A5.4/ ASME SFA5.4 E308L-17	Z3221 ES308L-17	ISO 3581-A-E 19 9 L R	
S-308Mo.16	A5.4/ ASME SFA5.4 E308Mo-16	Z3221 ES308Mo-16	ISO 3581-A-E 20 10 3	107
S-308LT.16	A5.4/ ASME SFA5.4 E308L-16	Z3221 ES308L-16	ISO 3581-A-E 19 9 L R	108
S-309L.15	A5.4/ ASME SFA5.4 E309L-15	Z3221 ES309L-15	ISO 3581-A-E 23 12 L B	109
S-309.16N	A5.4/ ASME SFA5.4 E309-16	Z3221 ES309-16	ISO 3581-A-E 23 12 R	110
S-309L.16[17]	AWS A5.4/ ASME SFA5.4 E309L-16	Z3221 ES309L-16	ISO 3581-A-E 23 12 L R	111
	AWS A5.4/ ASME SFA5.4 E309L-17	Z3221 ES309L-17	ISO 3581-A-E 23 12 L R	
S-309Mo.16	A5.4/ ASME SFA5.4 E309Mo-16	Z3221 ES309Mo-16	ISO 3581-A-E 23 12 2 R	113

S-309MoL.16	A5.4/ ASME SFA5.4 E309LMo-16	Z3221 ES309LMo-16	ISO 3581-A-E 23 12 2 L R	114
S-310.15	A5.4/ ASME SFA5.4 E310-15	Z3221 ES310-15	ISO 3581-A-E 25 20 B	115
S-310.16	A5.4/ ASME SFA5.4 E310-16	Z3221 ES310-16	ISO 3581-A-E 25 20 R	116
S-312.16	A5.4/ ASME SFA5.4 E312-16	Z3221 ES312-16	ISO 3581-A-E 29 9 R	117
S-316.16N	A5.4/ ASME SFA5.4 E316-16	Z3221 ES316-16	ISO 3581-A-E 19 12 3 R	118
S-316L.16N[17]	A5.4/ ASME SFA5.4 E316L-16	Z3221 ES316L-16	ISO 3581-A-E 19 12 3 L R	119
	A5.4/ ASME SFA5.4 E316L-17	Z3221 ES316L-17	ISO 3581-A-E 19 12 3 L R	
S-316LT.16	A5.4/ ASME SFA5.4 E316L-16	Z3221 ES316L-16	ISO 3581-A-E 19 12 3 L R	121
S-317.16	A5.4/ ASME SFA5.4 E317-16	Z3221 ES317-16	-	122
S-347.16	A5.4/ ASME SFA5.4 E347-16	Z3221 ES347-16	ISO 3581-A-E 19 9 Nb R	123
S-2209.16	A5.4/ ASME SFA5.4 E2209-16	Z3221 ES2209-16	ISO 3581-A-E 22 9 3 N L	124
S-2594.16	A5.4/ ASME SFA5.4 E2594-16	-	ISO 3581-A-E 25 9 4 N L	125

Cast iron

Product	AWS	JIS	EN	Page
S-NCI	A5.15/ ASME SFA5.15 ENi-CI	Z3252 DFCNi	ISO 1071 - E C Ni-CI 1	126
S-NFC	A5.15/ ASME SFA5.15 ENiFe-CI	Z3252 DFCNiFe	ISO 1071 - E C NiFe-CI 1	127
S-FCF	A5.15/ ASME SFA5.15 ESt	Z3252 DFCFe	ISO 1071 - E Z 1	128

SAW [Wire/Flux Combination]

Product	AWS	JIS	EN	Page
S-777MX × H-14	A5.17/ ASME SFA5.17 F7A0-EH14	Z3352 SA AR1	ISO 14174-S A AR 1 / 14171-A-S4	130
S-777MXT × H-14 [M-12K]	A5.17/ ASME SFA5.17 F7A0-EH14	Z3352 SA AR1	ISO 14174-S A AR 1 / 14171-A-S4	132
	A5.17/ ASME SFA5.17 F7A(P)2-EM12K	Z3352 SA AR1	ISO 14174-S A AR 1 / 14171-A-S2Si	
S-777MXT × A-2 [B-2]	A5.23/ ASME SFA5.23 F8PZ-EA2-A2	Z3352 SA AR1	ISO 14174-S A AR 1 / 14171-A-S2Mo	134
	A5.23/ ASME SFA5.23 F8PZ-EB2-B2	Z3352 SA AR1	ISO 14174-S A AR 1 / 14171-A-S2CrMo1	
S-777MXH × H-14	A5.17/ ASME SFA5.17 F7A(P)2-EH14	Z3352 SA AB1	ISO 14174-S A AB 1 / 14171-A-S4	136
S-777MXH × A-3	A5.23/ ASME SFA5.23 F8A4-EA3-A3	Z3352 SA AB1	ISO 14174-S A AB 1 / 14171-A-S4Mo	138
S-727 × L-8 [L-12]	A5.17/ ASME SFA5.17 F7A2-EL8(EL12)	Z3352 SA AB1	ISO 14174-S A AB 1 / 14171-A-S1	140
S-707 × L-8	A5.17/ ASME SFA5.17 F7A4-EL8	Z3352 SA AB1	ISO 14174-S A AB 1 / 14171-A-S1	142
S-737 × H-14	A5.17/ ASME SFA5.17 F7A(P)4-EH14	Z3352 SA AB1	ISO 14174-S A AB 1 / 14171-A-S4	144

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S-717 × M-12K [A-2]	A5.17/ ASME SFA5.17 F7A(P)6-EM12K A5.23/ ASME SFA5.23 F8A0-EA2-A4	Z3352 SA AB1 Z3352 SA AB1	ISO 14174-S A AB 1 / 14171-A-S2Si ISO 14174-S A AB 1 / 14171-A-S2Mo	146
S-777Q × M-12K	A5.17/ ASME SFA5.17 F7A2-EM12K	Z3352 SA AR1	ISO 14174-S A AR 1 / 14171-A-S2Si	148
S-707T × H-14	A5.17/ ASME SFA5.17 F7A(P)6-EH14	Z3352 SA AB1	ISO 14174-S A AB 1 / 14171-A-S4	150
S-787TB × H-14	A5.17/ ASME SFA5.17 F7A(P)8-EH14	Z3352 SA FB1	ISO 14174-S A FB 1 / 14171-A-S4	152
Superflux55ULT × H-14	A5.17/ ASME SFA5.17 F7A(P)8-EH14	Z3352 SA FB1	ISO 14174-S A FB 1 / 14171-A-S4	154
Superflux787 × H-12K	A5.17/ ASME SFA5.17 F7A(P)8-EH12K	Z3352 SA FB1	ISO 14174-S A FB 1 / 14171-A-S3Si	156
Superflux787 × H-14	A5.17/ ASME SFA5.17 F7A(P)8-EH14	Z3352 SA FB1	ISO 14174-S A FB 1 / 14171-A-S4	158
Superflux800T × M-12K [A-2]	A5.17/ ASME SFA5.17 F7A8-EM12K A5.23/ ASME SFA5.23 F8A4-EA2-A3	Z3352 SA FB1 Z3352 SA FB1	ISO 14174-S A AB 1 / 14171-A-S2Si ISO 14174-S A AB 1 / 14171-A-S2Mo	160
S-800WT × M-12K	A5.17/ ASME SFA5.17 F7A8-EM12K	Z3352 SA FB1	ISO 14174-S A FB 1 / 14171-A-S2Si	162
Superflux600 × H-14 [A-3]	A5.17/ ASME SFA5.17 F7A(P)6-EH14 A5.23/ ASME SFA5.23 F8A(P)4-EA3-G	Z3183 S502-H Z3352 SA FB1	ISO 14174-S A AB 1 / 14171-A-S4 ISO 14174-S A AB 1 / 14171-A-S4Mo	164
S-800MX × A-G [A-3]	A5.23/ ASME SFA5.23 F8A0-EG-G A5.23/ ASME SFA5.23 F8AZ-EA3-G	Z3183 S502-H Z3352 SA AR1	ISO 14174-S A AR 1 / 14171-A-S4 ISO 14174-S A AR 1 / 14171-A-S4Mo	166
S-800CM × B-2	A5.23/ ASME SFA5.23 F8P2-EB2-B2	Z3352 SA FB1	ISO 14174-S A FB 1 / 14171-A-S2CrMo1	168
S-800SP × M-12K [A-2]	A5.17/ ASME SFA5.17 F7A4-EM12K A5.23/ ASME SFA5.23 F9TA4G-A2/F8A2-EA2-G	Z3183 S502-H Z3352 SA AB1	ISO 14174-S A AB 1 / 14171-A-S2Si ISO 14174-S A AB 1 / 14171-A-S2Mo	170
S-900SP × M-12K [A-2]	A5.17/ ASME SFA5.17 F7A4(P2)-EM12K A5.23/ ASME SFA5.23 F9A2-EA2-G	Z3352 SA CS1 Z3352 SA CS1	ISO 14174-S A CS 1 / 14171-A-S2Si ISO 14174-S A CS 1 / 14171-A-S2Mo	172
S-950S x M-12K [A-2, A-2TiB]	A5.17/ ASME SFA5.17 F7A4(P8)-EM12K A5.23/ ASME SFA5.23 F8A(P)5-EA2-EA3 A5.23/ ASME SFA5.23 F8TA(P)8-EA2 [TiB]	-	-	174
S-460Y × H-14	A5.23/ ASME SFA5.23 F8A8-EH14-G	Z3352 SA FB1	ISO 14174-S A FB 1 / 14171-A-S4	176
S-100 × F-3 [M-4]	A5.23/ ASME SFA5.23 F9A(P)8-EF3-F3 A5.23/ ASME SFA5.23 F11A(P)8-EG-M4	-	ISO 14174-S A FB 1 / 14171-A-S3Ni1Mo ISO 14174-S A FB 1 / 14171-A-S3Ni1Mo	178
S-705EF × H-14	-	Z3352 S A CG-11	ISO 14174-S A CG-11 / 14171-A-S4	180
S-705HF × H-14	-	Z3352 S A CG-11	ISO 14174-S A CG-11 / 14171-A-S4	182
S-401HF × SC-414S [SC-423S, SC-420S, SC-420SG]	-	-	ISO 14174-S A AB 3	184

Stainless steel

Product	AWS	JIS	EN	Page
Superflux300S × YS-308L [YS-309L, YS-316L]	-	Z3352 SA AB2	ISO 14174-S A AB 2	185
S-300B × YS-308L, [YS-309L, YS-316L, YS-347]	-	Z3352 SA AF2	ISO 14174-S A AF 2	187
Superflux209 × YS-2209	-	-	ISO 14174-S A AF 2	189
S-300EM × Flux for ESW	-	-	ISO 14174-S A AF 2	190

GMAW [Solid Wire & Stainless MIG Wire]

Mild steel & 490MPa high tensile steels				
Product	AWS	JIS	EN	Page
SM-70	A5.18/ ASME SFA5.18 ER70S-6	Z3312 YGW12	ISO 14341-A G 42 2 C1 3Si1 ISO 14341-A G 42 4 M21 3Si1	192
SM-70EN	A5.18/ ASME SFA5.18 ER70S-6	Z3312 YGW12	ISO 14341-A G 42 2 C1 4Si1 ISO 14341-A G 46 4 M21 4Si1	194
SM-70G	A5.18/ ASME SFA5.18 ER70S-G	Z3312 YGW11	ISO 14341-A G3Si1	196
SM-70S	A5.18/ ASME SFA5.18 ER70S-3	Z3312 YGW16	ISO 14341-A G2Si	198
SM-70GS	A5.18/ ASME SFA5.18 ER70S-G	Z3312 YGW15	ISO 14341-A G2Si	200

High tensile steels				
Product	AWS	JIS	EN	Page
SM-55H	-	Z3312 YGW18	ISO 14341-B G S18	202
SM-80G	A5.28/ ASME SFA5.28 ER80S-G	Z3312 G 59J A 1 U C 3M1T	ISO 14341-B G S3M1T	204
SM-80D2	A5.28/ ASME SFA5.28 ER80S-D2	-	-	206
SM-100	A5.28/ ASME SFA5.28 ER100S-G	-	-	208
SM-110	A5.28/ ASME SFA5.28 ER110S-G	-	-	210
SM-80CM	A5.28/ ASME SFA5.28 ER80S-G	Z3317 YG1CM-A	ISO 14341-B G S2M3	212

MIG Wire for Stainless steels				
Product	AWS	JIS	EN	Page
SM-307Si	-	-	ISO 14343-A G 18 8 Mn	214
SM-308	A5.9/ ASME SFA5.9 ER308	Z3321 YS308	ISO 14343-A G 19 9	216
SM-308L	A5.9/ ASME SFA5.9 ER308L	Z3321 YS308L	ISO 14343-A G 19 9L	218
SM-308LSi	A5.9/ ASME SFA5.9 ER308LSi	Z3321 YS308LSi	ISO 14343-A G 19 9L Si	220
SM-309	A5.9/ ASME SFA5.9 ER309	Z3321 YS309	ISO 14343-A G 23 12	222
SM-309L	A5.9/ ASME SFA5.9 ER309L	Z3321 YS309L	ISO 14343-A G 23 12L	224
SM-309LSi	A5.9/ ASME SFA5.9 ER309LSi	Z3321 YS309LSi	ISO 14343-A G 23 12L Si	226
SM-309MoL	A5.9/ ASME SFA5.9 ER309LMo	Z3321 YS309LMo	ISO 14343-A G 23 12 2L	228
SM-310	A5.9/ ASME SFA5.9 ER310	Z3321 YS310	ISO 14343-A G 25 20	230
SM-312	A5.9/ ASME SFA5.9 ER312	Z3321 YS312	ISO 14343-A G 25 20	232
SM-316	A5.9/ ASME SFA5.9 ER316	Z3321 YS316	ISO 14343-A G 19 12 3	234

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SM-316L	A5.9/ ASME SFA5.9 ER316L	Z3321 YS316L	ISO 14343-A G 19 12 3L	236
SM-316LSi	A5.9/ ASME SFA5.9 ER316LSi	Z3321 YS316LSi	ISO 14343-A G 19 12 3L Si	238
SM-347	A5.9/ ASME SFA5.9 ER347	Z3321 YS347	ISO 14343-A G 19 9 Nb	240
SM-2209	A5.9/ ASME SFA5.9 ER2209	Z3321 YS2209	ISO 14343-A G 22 9 3N L	242
SM-410	A5.9/ ASME SFA5.9 ER410	Z3321 YS410	ISO 14343-A G 13	244
SM-430LNb	-	Z3321 YS430LNb	ISO 14343-A G 18LNb	246

GTAW [TIG Rod]

Mild steel & 490MPa high tensile steels				
Product	AWS	JIS	EN	Page
ST-50G	A5.18/ ASME SFA5.18 ER70S-G	Z3316 YGT50	ISO 636-A-W3Si1	250
ST-50.6	A5.18/ ASME SFA5.18 ER70S-6	Z3316 YGT50	ISO 636-A-W3Si1	251
ST-50.3	A5.18/ ASME SFA5.18 ER70S-3	-	ISO 636-A-W2Si	252
ST-72	A5.18/ ASME SFA5.18 ER70S-2	Z3316 YGT50	-	253
SM-1N / ST-1N	A5.28/ ASME SFA5.28 ER80S-Ni1	-	-	254
ST-80CM	A5.28/ ASME SFA5.28 ER80S-G	Z3317 YG1CM-A Z3316 YGT1CM	ISO 14341-B S2M3	255

Stainless steels				
Product	AWS	JIS	EN	Page
ST-308	A5.9/ ASME SFA5.9 ER308	Z3321 YS308	ISO 14343-A W 19 9	257
ST-308L	A5.9/ ASME SFA5.9 ER308L	Z3321 YS308L	ISO 14343-A W 19 9L	258
ST-309	A5.9/ ASME SFA5.9 ER309	Z3321 YS309	ISO 14343-A W 23 12	259
ST-309L	A5.9/ ASME SFA5.9 ER309L	Z3321 YS309L	ISO 14343-A W 23 12L	260
ST-309MoL	A5.9/ ASME SFA5.9 ER309LMo	Z3321 YS309LMo	ISO 14343-A W 23 12 2L	261
ST-310	A5.9/ ASME SFA5.9 ER310	Z3321 YS310	ISO 14343-A W 25 20	262
ST-312	A5.9/ ASME SFA5.9 ER312	Z3321 YS312	ISO 14343-A W 29 9	263
ST-316	A5.9/ ASME SFA5.9 ER316	Z3321 YS316	ISO 14343-A W 19 12 3	264
ST-316L	A5.9/ ASME SFA5.9 ER316L	Z3321 YS316L	ISO 14343-A W 19 12 3L	265
ST-347	A5.9/ ASME SFA5.9 ER347	Z3321 YS347	ISO 14343-A W 19 9 Nb	266
SMT-2594	A5.9/ ASME SFA5.9 ER2594	-	ISO 14343-A G 25 9 4 NL	267
ST-2209	A5.9/ ASME SFA5.9 ER2209	Z3321 YS2209	ISO 14343-A W 22 9 3N L	269

SMT-904L	A5.9/ ASME SFA5.9 ER385	Z3321 YS385	ISO 14343-A G(W) 20 25 5 Cu L	270
ST-410	A5.9/ ASME SFA5.9 ER410	Z3321 YS410	ISO 14343-A W 13	272
SM-90B3 / ST-90B3	A5.28/ ASME SFA5.28 ER90S-B3	-	-	273
ST-91B9	A5.28/ ASME SFA5.28 ER90S-B9	-	ISO 21952-A W CrMo91	274
ST-92B9	A5.28/ ASME SFA5.28 ER90S-G	-	-	275

FCAW [Flux Cored Wire]

Mild steel & 490MPa high tensile steels				
Product	AWS	JIS	EN	Page
SF-71	A5.36/ ASME SFA5.36 E71T1-C1A0-CS1	Z3313 T49J 0 T1-1 C A-U H10	ISO 17632-A-T 42 0 P C1 1	278
SF-71LF	A5.36/ ASME SFA5.36 E71T1-C1A0-CS1	Z3313 T49J 0 T1-1 C A-U H10	-	280
Supercored 71	A5.36/ ASME SFA5.36 E71T1-C1A0-CS1	Z3313 T49 2 T1-1 C A H10	IISO 17632-A-T 42 2 P C1 1	282
SC-71LH	A5.36/ ASME SFA5.36 E71T1-C1A2-CS1	Z3313 T49 3 T1-1 C A-U H5	ISO 17632-A-T 42 2 P C1 1 H5	284
Supercored 71H	A5.36/ ASME SFA5.36 E71T1-C1A4-CS1	Z3313 T49 4 T1-1 C A H5	ISO 17632-A-T 42 4 P C1 1 H5	286
SC-71HJ	A5.36/ ASME SFA5.36 E71T1-C1A4-CS1	Z3313 T49 4 T1-1 C A	ISO 17632-A-T 42 4 P C1 1	288
Supercored 71MAG	A5.36/ ASME SFA5.36 E71T1-M21A2-CS1	Z3313 T49 3 T1-1 M A-U H10	ISO 17632-A-T 42 3 P M21 1	290
SC-71LHM Cored	A5.36/ ASME SFA5.36 E71T1-M21A2-CS1	Z3313 T49 3 T1-1 M A-U H5	ISO 17632-A-T 46 3 P M21 1 H5	292
SF-71MC	A5.36/ ASME SFA5.36 E71T1-C1A2-CS2	-	ISO 17632-A-T 46 3 P M21 1	294
	A5.36/ ASME SFA5.36 E71T1-M21A2-CS2		ISO 17632-A-T 46 2 P C1 1	
SC-420MC	A5.36/ ASME SFA5.36 E71T1-C1A0-CS1 H4	-	ISO 17632-A-T 42 2 P C1 1 H5	296
	A5.36/ ASME SFA5.36 E71T1-M21A0-CS1 H8		ISO 17632-A-T 42 2 P M21 1 H5	
SC-71MJ	A5.36/ ASME SFA5.36 E71T1-M21A4-CS1	Z3313 T49 4 T1-1 M A-U H5	ISO 17632-A-T 46 4 P M21 1 H5	298
SF-70MX	A5.36/ ASME SFA5.36 E70T1-C1A0-CS1	Z3313 T49 J 0 T1-0 C A-U H10	ISO 17632-A-T 42 0 R C1 3	300
SC-70H Cored	A5.36/ ASME SFA5.36 E70T1-C1A2-CS1	Z3313 T49 3 T1-0 C A H10	ISO 17632-A-T 42 2 R C1 3	302
Supercored 70MXH	A5.36/ ASME SFA5.36 E70T1-C1A2-CS1	Z3313 T49 J 2 T1-0 C A-U H5	ISO 17632-A-T 42 2 R C1 H5	304
SC-70T Cored	A5.36/ ASME SFA5.36 E70T15-C1A0-CS1	Z3313 T 49 2 T15-1 CA	ISO 17632-A-T 42 2 M C1 1	306
	A5.36/ ASME SFA5.36 E70T15-M21A2-CS1	Z3313 T 49 3 T15-1 MA	ISO 17632-A-T 46 2 M M21 1 H5	
SC-70Z Cored	A5.36M/ ASME SFA5.36M E490T15-C1A0-G	-	ISO 17632-A-T 46 Z M C1 3	308
	A5.36M/ ASME SFA5.36M E490T15-M21A0-G		ISO 17632-A-T 46 Z M M21 3	
Supercored 70NS	A5.36/ ASME SFA5.36 E70T15-M21A2-CS1	Z3313 T49 3 T15 0 M A H5	ISO 17632-A-T 42 3 M M 21 3 H5	310
SC-70A	A5.36/ ASME SFA5.36 E70T15-C1A0-CS1	-	ISO 17632-A-T 42 2 M C1 1 H5	312
	A5.36/ ASME SFA5.36 E70T15-M21A2-CS1		ISO 17632-A-T 46 2 M M21 1 H5	

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Supercored 70B	A5.36/ ASME SFA5.36 E71T5-M21A4-CS1 H4	Z3313 T49 4 T5-1 M A-U H5	ISO 17632-A-T 42 4 B M21 3 H5	314
Supercored 70SB	A5.36/ ASME SFA5.36 E71T5-C1A2-CS1 H4	Z3313 T49 4 T5-1 M A-U H5	ISO 17632-A-T 42 3 B C1 2 H5	316
SC-EG2 Cored	A5.26/ ASME SFA5.26 EG70T-2C	Z3319 YFEG-22C	-	318
SC-EG3	A5.26/ ASME SFA5.26 EG82T-NM2	-	-	319

High tensile steels				
Product	AWS	JIS	EN	Page
SC-55 Cored	A5.36/ ASME SFA5.36 E81T1-C1A0-G	Z3313 T55 2 T1-1 C A-U H10	-	320
SC-55F Cored	A5.36/ ASME SFA5.36 E80T1-C1A0-G	Z3313 T55 2 T15-0 C A-N1-U H10	-	322
Supercored 81	A5.36/ ASME SFA5.36 E81T1-C1A2-Ni1	Z3313 T55 3 T1-1 C A-N2-U H10	ISO 17632-A-T 46 2 1Ni P C 1	324
SF-80MX	A5.36/ ASME SFA5.36 E80T1-C1A2-G	Z3313 T55 2 T15-0 C A-N2 H10	ISO 17632-A-T 46 2 1Ni R C1 3	326
SC-80M	A5.36/ ASME SFA5.36 E80T15-M21A4-G	-	ISO 17632-A-T 46 4 M M21 3 H5	328
SC-90M	A5.36/ ASME SFA5.36 E90T15-M21A6-G	-	ISO 18276-A-T 55 2 Z M M21 1 H5	330
SC-91	A5.36M/ ASME SFA5.36M E62T1-C1A0-G	Z3313 T57 2 T1-1 C A-N1 H10	ISO 17632-A-T 50 2 1Ni P C 1	332
SC-90	A5.36M/ ASME SFA5.36M E620T1-C1A0-G	Z3313 T62 2 T1-0 C A- H10	ISO 17632-A-T 50 2 R C1 3	334
SC-91LP	A5.36/ ASME SFA5.36 E91T1-M21A4-G	-	ISO 17632-A-T 50 4 1Ni P M21 1 H5	336
SC-91P	A5.36M/ ASME SFA5.36M E62T1-M21A0-G	-	ISO 18276-A-T 55 0 Z P M21 1	337
SC-91K2 Cored	A5.36/ ASME SFA5.36 E81T1-C1A4-K2	Z3313 T57 4 T1-1 C A-N3 H10	ISO 17632-A-T 50 4 1.5Ni P C 1	338
SC-91LT	A5.36/ ASME SFA5.36 E91T1-C1A8-Ni2	Z3313 T59 6 T1-1 C A-N5 H5	ISO 17632-A-T 50 6 Z P C 1 2 H5	340
Supercored 110	A5.36/ ASME SFA5.36 E111T1-C1A4-G H4	-	ISO 18276-A-T 69 4 ZMn2.5NiMo P C1 1	342
SC-110M Cored	A5.36/ ASME SFA5.36 E110T15-M21A6-G	-	ISO 18276-A-T 69 4 Mn2NiMo M M21 3 H5	344

Weather proof steels				
Product	AWS	JIS	EN	Page
SF-70W	A5.36/ ASME SFA5.36 E71T1-C1A0-G(W)	Z3320 YFA-50W	-	346
SF-80W	A5.36/ ASME SFA5.36 E81T1-C1A2-W2	Z3320 YFA-58W	-	348
SC-81WM	A5.36/ ASME SFA5.36 E81T1-M21A2-W2	-	-	350

Low-temperature service steels				
Product	AWS	JIS	EN	Page
SF-71R	A5.36/ ASME SFA5.36 E71T1-C1A0-CS1 H4 A5.36/ ASME SFA5.36 E71T1-C1P0-CS1 H4	Z3313 T49 2 T1-1 C AP H5	ISO 17632-A-T 46 2 P C1 1 H5	352
SF-71P	A5.36/ ASME SFA5.36 E71T1-C1A4-CS1 H4 A5.36/ ASME SFA5.36 E71T1-C1P4-CS1 H4	Z3313 T49 4 T1-1 C AP H5	ISO 17632-A-T 46 4 P C1 1 H5	354
SC-71SR	A5.36/ ASME SFA5.36 E71T1-C1A6-CS2 H4 A5.36/ ASME SFA5.36 E71T1-C1P6-CS2 H4	Z3313 T49 4 T1-1 C AP H5	ISO 17632-A-T 42 4 P C1 1 H5	356

SC-71MSR	A5.36/ ASME SFA5.36 E71T1-M21A5-CS2 - E71T1-M21P5-CS2		ISO 17632-A-T46 4 P M21 1 H5	358
SC-70ML	A5.36/ ASME SFA5.36 E70T15-M21A4-CS1	Z3313 T49 4 T15-1 M A-U H5	ISO 17632-A-T 46 4 M M21 2 H5	360
SC-80MR	A5.36/ ASME SFA5.36 E80T15-M21A8-G -		IISO 17632-A-T 50 6 1.5Ni M M21 2 H5	362
SC-81M	A5.36/ ASME SFA5.36 E81T1-M21 A8-Ni1 H4 -		ISO 17632-A-T 50 6 1Ni P M21 1 H5	364
Supercored 81MAG	A5.36/ ASME SFA5.36 E81T1-M21A8-Ni1 H4 - A5.36/ ASME SFA5.36 E81T1-M21P5-Ni1 H4		ISO 17632-A-T46 6 1Ni P M21 2 H5	366
Supercored 81-K2	A5.36/ ASME SFA5.36 E81T1-C1A8-K2 H4	Z3313 T55 6 T1-1 C A-N3 H5	ISO 17632-A-T46 6 1.5Ni P C 1 H5	368
SC-460	A5.36/ ASME SFA5.36 E81T1-C1A6-K2	Z3313 T55 6 T1-1 C A-N3 H5	ISO 17632-A-T46 6 1.5Ni P C 1 H5	370
SC-81LT	A5.36/ ASME SFA5.36 E81T1-C1A6-K2	Z3313 T55 6 T1-1 C A-N3 H5	ISO 17632-A-T46 6 1.5Ni P C 1 H5	372
SC-81SR	A5.36/ ASME SFA5.36 E81T1-C1A(P)8-K2	Z3313 T55 6 T1-1 C A-N3-U H5	ISO 17632-A-T46 6 1.5Ni P C 1 H5	374
SC-81Ni2	A5.36/ ASME SFA5.36 E81T1-C1A8-Ni2	Z3313 T55 6 T1-1 C A-N5 H5	ISO 17632-A-T46 6 2Ni P C 1 H5	376
SC-81Ni2M	A5.36/ ASME SFA5.36 E81T1-M21A8-Ni2	Z3313 T55 6 T1-1 M A-N5 H5	ISO 17632-A-T46 6 2Ni P M21 2 H5	378
Supercored 81-K2MAG	A5.36/ ASME SFA5.36 E81T1-M21A8-K2	Z3313 T55 6 T1-1 M A-N3 H5	ISO 17632-A-T46 6 1.5Ni P M21 2 H5	380
SC-80K2	A5.36/ ASME SFA5.36 E80T1-C1A8-K2 H4	Z3313 T55 6 T15-0 C A-N3 H5	ISO 17632-A-T 46 6 1.5Ni R C 1 H5	382

Heat-resistant, Low alloy steels

Product	AWS	JIS	EN	Page
SC-81B2	A5.36/ ASME SFA5.36 E81T1-C1PZ-B2 -		ISO 17632-A-T CrMo1 P C1 2	384
SC-91B3	A5.36/ ASME SFA5.36E91T1-C1PZ-B3 -		ISO 17632-A-T CrMo2 P C1 2	386
SC-91B9	A5.36/ ASME SFA5.36 E91T1-C1PZ-B91 H4 - A5.36/ ASME SFA5.36 E91T1-M21PZ-B91 H4		ISO 17634-B-T 69T1-1M21/C1- 9C1MV	388
SC-80D2	A5.36/ ASME SFA5.36 E80T15-M21A0-G	Z3318 YFM-G	ISO 17632-A-T 46 0 MnMo M M21 3	390
Supercored 1CM	A5.36/ ASME SFA5.36 E80T15-M21PZ-G(B2)	Z3318 YF1CM-G	ISO 17634-A-T CrMo1 M M21 3	392

Self-shielded

Product	AWS	JIS	EN	Page
Supershield 11	A5.36/ ASME SFA5.36 E71T11-AZ-CS3	Z3313 T49 T14-1 N A	ISO 17632-A-T 42 Y Z Z NO 1	394
Supershield 71GS	A5.36/ ASME SFA5.36 E71TGS	Z3313 T49 T14-1 N S	ISO 17632-A-T 42 Z Z V NO 1	395
Supershield 4	A5.36/ ASME SFA5.36 E70T4-AZ-CS3 -		ISO 17632-A-T 42 Z Z W NO 3	396
Supershield 7	A5.36/ ASME SFA5.36 E70T7-AZ-CS3 -		ISO 17632-A-T 46 Z Z W NO 3	397
Supershield 71-T8	A5.36 / ASME SFA5.36 E71T8-AZ-CS3 H8		ISO 17632-A-T 42 3 Y NO 2 H10	398
Supershield EG-72T	A5.26/ ASME SFA5.26 EG72T-1	-	-	400
Supershield EG-82T	A5.26/ ASME SFA5.26 EG82T-G	-	-	401

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Stainless steels				
Product	AWS	JIS	EN	Page
SW-307NS Cored	-	-	ISO 17633-A-T 18 8 Mn M M13/11	402
SW-307 Cored			ISO 17633-A-T 18 8 Mn P M21/C1 2	403
SW-308L Cored	A5.22/ ASME SFA5.22 E308LT1-1/-4	Z3323 TS308L-FB1	ISO 17633-A-T 19 9 L P M21/C1 2	405
SW-308LT	A5.22/ ASME SFA5.22 E308LT1-1/-4	Z3323 TS308L-FB1	ISO 17633-A-T 19 9 L P M21/C1 2	407
SW-309L Cored	A5.22/ ASME SFA5.22 E309LT1-1/-4	Z3323 TS309L-FB1	ISO 17633-A-T 23 12 L P M21/C1 2	409
SW-309LNS Cored	A5.9/ ASME SFA5.9 EC309L	Z3323 TS309L-MA0	ISO 17633-A-T 23 12 L M M21/11	411
SW-309MoL Cored	A5.22/ ASME SFA5.22 E309LMoT1-1/-4	Z3323 TS309LMo-FB1	ISO 17633-A-T 23 12 2 L P M21/C1 2	412
SW-316L Cored	A5.22/ ASME SFA5.22 E316LT1-1/-4	Z3323 TS316L-FB1	ISO 17633-A-T 19 12 3 L P M21/C1 2	414
SW-316LT	A5.22/ ASME SFA5.22 E316LT1-1/-4	Z3323 TS316L-FB1	ISO 17633-A-T 19 12 3 L P M21/C1 2	416
SW-317L Cored	A5.22/ ASME SFA5.22 E317LT1-1/-4	Z3323 TS317L-FB1	-	418
SW-347 Cored	A5.22/ ASME SFA5.22 E347T1-1/-4	Z3323 TS347-FB1	ISO 17633-A-T 19 9 Nb P M21/C1 2	420
SW-308HBF	A5.22/ ASME SFA5.22 E308HT1-1/-4	-	-	422
SW-309HBF	A5.22/ ASME SFA5.22 E309HT1-1/-4	-	-	424
SW-316HBF	A5.22/ ASME SFA5.22 E316HT1-1/-4	-	-	426
SW-410 Cored	A5.22/ ASME SFA5.22 E410T1-1/-4	Z3323 TS410-FB1	-	428
SW-410NiMo Cored	A5.22/ ASME SFA5.22 E410NiMoT1-1/-4	Z3323 TS410NiMo-FB1	ISO 17633-A-T 13 4 P M21/C1 2	430
SW-2209 Cored	A5.22/ ASME SFA5.22 E2209T1-1/-4	Z3323 TS2209-FB1	ISO 17633-A-T 22 9 3 N L M21/C1 2	432
SW-2594 Cored	A5.22/ASME SFA 5.22 E2594T1-1/-4	-	-	434
Supercored 308L	A5.22/ ASME SFA5.22 E308LT0-1/-4	Z3323 TS308L-FB0	ISO 17633-A-T 19 9 L R M21/C1 3	436
Supercored 309L	A5.22/ ASME SFA5.22 E309LT0-1/-4	Z3323 TS309L-FB0	ISO 17633-A-T 23 12 L R M21/C1 3	438
Supercored 309MoL	A5.22/ ASME SFA5.22 E309LMoT0-1/-4	Z3323 TS309LMo-FB0	ISO 17633-A-T 23 12 2 L R M21/C1 3	440
Supercored 316L	A5.22/ ASME SFA5.22 E316LT0-1/-4	Z3323 TS316L-FB0	ISO 17633-A-T 19 12 3 L R M21/C1 3	442
SF-409Ti	A5.9/ ASME SFA5.9 EC409	Z3323 TS409-MA0	-	444
SF-430	A5.9/ ASME SFA5.9 EC430	Z3323 TS430-MA0	-	445
SF-430Nb	-	Z3323 TS430Nb-MA0	12072 G Z 17 L Nb	446
SF-436	-	-	-	447
SC-439Ti Cored	A5.22/ ASME SFA5.22 EC439	-	-	448

Hardfacing application

Product	AWS	JIS	EN	Page
Supershield CrC	-	-	-	449
Supershield CrCW	-	-	-	451
Supershield CrCH	-	-	-	453
Supershield CrCNb5	-	-	-	454
Supershield CrCNb	-	-	-	455
Supershield CrCMo	-	-	-	457
Supershield CrCV1	-	-	-	458
Supershield CrCB	-	-	-	459
Supershield AP-O	-	-	-	460
Supershield 16Mn-O	-	-	-	462
Supershield 309L-O	-	-	-	464
SC-BU Cored	-	-	-	465
Supershield 430-O	-	-	-	467
Supershield 410NiMo-O	-	-	-	468
SC-410NiMoS	-	-	-	469
SC-414S	-	-	-	470
SC-420S	-	-	-	471
SC-420SG	-	-	-	472
SC-423S	-	-	-	473
SC-430S	-	-	-	474
SC-30S	-	-	-	475
SC-45S	-	-	-	476
SC-55S	-	-	-	477
SC-A4S	A5.23/ ASME SFA5.23 F8P2 ECA4-A4	-	-	478
SC-250H	-	Z3326 YF2A-C-250	-	479
SC-350H	-	Z3326 YF2A-C-350	-	480
SC-450H	-	Z3326 YF2A-C-450	-	481
SC-600H	-	Z3326 YF3B-C-600	-	482
SC-600HM	-	-	-	483
SC-700H	-	Z3326 YF3B-C-700	-	484

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Non-ferrous metal Welding Consumables

Nickel Based Alloys				
Product	AWS	JIS	EN	Page
SR-133	A5.11/ ASME SFA5.11 ENiCrFe-2	Z3224 DNiCrFe-2	ISO 14172 Ni 6092	486
SR-182	A5.11/ ASME SFA5.11 ENiCrFe-3	Z3224 DNiCrFe-3	ISO 14172 Ni 6182	487
SR-134	A5.11/ ASME SFA5.11 ENiCrFe-4	Z3225 D9Ni-1	-	488
SR-08	A5.11/ ASME SFA5.11 ENiMo-8	-	-	489
SR-625	A5.11/ ASME SFA5.11 ENiCrMo-3	Z3224 DNiCrMo-3	ISO 14172 Ni 6625 (NiCr22Mo9Nb)	490
Superflux300 x SA-625 -	-	-	-	491
SMT-625	A5.14/ ASME SFA5.14 ERNiCrMo-3	Z3334 SNi6625 (NiCr22Mo9Nb)	ISO 18274 Ni 6625 (NiCr22Mo9Nb)	492
SMT-686	A5.14/ ASME SFA5.14 ERNiCrMo-14	-	-	494
SMT-617	A5.14/ ASME SFA5.14 ERNiCrCoMo-1	Z3334 SNi6617(NiCr22Co12Mo19)	ISO 18274 S Ni 6617 (NiCr22Co12Mo9)	495
SW-625	A5.34/ ASME SFA5.34 ENiCrMo3T1-4 -	-	ISO 12153 T Ni 6625 P M 2	496
SW-82 Cored	A5.34/ ASME SFA5.34 ENiCr3T1-1/-4 -	-	ISO 12153 T Ni 6082 P M/C 2	497
SW-182 Cored	A5.34/ ASME SFA5.34 ENiCrFe3T1-1/-4 -	-	ISO 12153 T Ni 6182 P M/C 2	498
SMT-08	A5.14/ ASME SFA5.14 ERNiMo-8	Z3334 SNi1008 (NiMo19WCr)	-	499
SMT-825	A5.14/ ASME SFA5.14 ERNiFeCr-1	Z3334 SNi8065 (NiFe30Cr21Mo3)	ISO 18274 S Ni 8065	500
SM-455 / ST-455	A5.14/ ASME SFA5.14 ERNiCrMo-7	Z3334 SNi6455 (NiCr16Mo16Ti)	-	501
SMT-22	A5.14/ ASME SFA5.14 ERNiCrMo-10	Z 3324 S Ni6022 (NiCr21Mo13Fe4W3)	ISO 18274 S Ni 6022	502
SM-82 / ST-82	A5.14/ ASME SFA5.14 ERNiCr-3	Z3334 SNi6082 (NiCr20Mn3Nb)	ISO 18274 S Ni 6082	503
SMT-276	A5.14/ ASME SFA5.14 ERNiCrMo-4	Z3334 SNi6276 (NiCr15Mo16Fe6W4)	ISO 18274 S Ni 6276	504
SM-400 / ST-400	A5.14/ ASME SFA5.14 ERNiCu-7	Z3334 SNi4060 (NiCu30Mn3Ti)	ISO 18274 S Ni 4060	505
SM-718 / ST-718	A5.14/ ASME SFA5.14 ERNiFeCr-2	Z3334 SNi7718 (NiCr19Fe19Nb5Mo3)	ISO 18274 S Ni 7718	506
SM-60 / ST-60	A5.14/ ASME SFA5.14 ERNi-1	Z3334 SNi2061 (NiTi3)	ISO 18274 S Ni 2061	507
SMT-7030	A5.7/ ASME SFA5.7 ERCuNi	Z3341 YCuNi-3	-	508
ST-80B6	A5.28/ ASME SFA5.28 ER80S-B6	-	ISO 21952-A W CrMo5Si	509
ST-80B8	A5.28/ ASME SFA5.28 ER80S-B8	-	ISO 21952-A W CrMo9	510
ST-80B2R	A5.28/ ASME SFA5.28 ER80S-B2	-	-	511
ST-90B3R	A5.28/ ASME SFA5.28 ER90S-B3	-	-	512
ST-70A1	A5.28/ ASME SFA5.28 ER70S-A1	-	-	513
ST-80D2	A5.28/ ASME SFA5.28 R80S-D2	-	-	514
SM-9010 / ST-9010	-	Z3341 YCuNi-1	-	515
Superflux300 x SA-82 -	-	-	-	516
S-Ni2 x SA-08	-	-	-	517
SW-625 Cored	A5.34/ ASME SFA5.34 ENiCrMo3T1-1/-4 -	-	ISO 12153 T Ni 6625 P M/C 2	518
SM-CuSi A	A5.7/ ASME SFA5.7 ERCuSi-A	-	-	519
Titanium Gr2	A5.16/ ASME SFA5.16 ERTi-2	-	-	520
SMT-5356(H)	A5.10/ ASME SFA5.10 ER5356	-	ISO 18273 S Al 5356 (AlMg5Cr(A))	521
SMT-5183(H)	A5.10/ ASME SFA5.10 ER5183	-	ISO 18273 S Al 5183 (AlMg4.5Mn0.7(A))	522
SMT-4043(H)	A5.10/ ASME SFA5.10 ER4043	-	ISO 18273 S Al 4043 (AlSi5)	523

SMAW

Stick Electrodes



S-4301.I

Type : Ilmenite

Conformances

AWS A5.1/ ASME SFA5.1 E6019

JIS Z3211 E4319

EN ISO 2560-A-E35 2 RA 1 2

KR 3

ABS 3

LR 3

BV 3

DNV-GL 3

NK KMW3

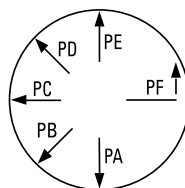
Applications

- General fabrication
- Shipbuilding
- Suitable for High impact value required parts

Features

- Suitable for butt and fillet welding of thin and medium-thick plates (up to 20mm)
- Good crack resistance, pitting resistance
- Good X-ray performance

Welding Position



Current

AC or DC ±

Redrying Conditions

70~100°C (158~212°F) X 0.5~1hr

Diameter / Packaging

Diameter mm (in)	Length mm (in)	Standard	
		packet 5kg(11lbs)	carton 20kg(44lbs)
2.6 (3/32)	350 (14)	✓	
3.2 (1/8)	350 (14)	✓	
4.0 (5/32)	400 (16)	✓	
	450 (18)	✓	
4.5 (11/64)	400 (16)	✓	
	400 (16)	✓	
	450 (18)	✓	
6.0 (15/64)	450 (18)	✓	

Typical Chemical Composition of All-Weld Metal (%)

C	Si	Mn	P	S
0.05	0.10	0.37	0.021	0.014

Typical Mechanical Properties of All-Weld Metal

YS MPa(lbs/in²)	TS MPa(lbs/in²)	EL (%)	Temp °C(°F)	CVN-Impact Value J (ft-lbs)
382 (55,500)	437 (63,500)	31.2	0 (32) -20 (-4)	88 (65) 56 (42)

Typical Welding Parameters / Amp.(A)

Diameter mm (in)	2.6 (3/32)	3.2 (1/8)	4.0 (5/32)	4.5 (11/64)	5.0 (3/16)	6.0 (15/64)
Length mm (in)	350 (14)	350 (14)	400 (16) 450 (18)	400 (16)	400 (16) 450 (18)	450 (18)
F & HF	50~85	80~130	120~180	145~200	170~250	240~310
V-up, OH	45~70	60~110	110~150	120~180	130~200	-

S-4303.V

Type : Lime-Titania

Conformances

JIS Z3211 E4303
 EN ISO 2560-A-E38 2 RA 1 2
 KR 3
 ABS 3
 LR 3
 BV 3
 DNV-GL 3
 NK KMW3

Applications

- General fabrication
- Shipbuilding
- Automotive, Bridges & Construction

Features

- Suitable for butt and fillet welding of thin plates
- Good at vertical down
- Good at vertical up
- Good mechanical properties

Typical Chemical Composition of All-Weld Metal(%)

C	Si	Mn	P	S
0.06	0.15	0.47	0.021	0.012

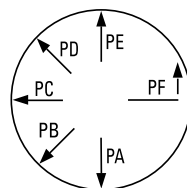
Typical Mechanical Properties of All-Weld Metal

YS MPa(lbs/in ²)	TS MPa(lbs/in ²)	EL (%)	Temp °C(°F)	CVN-Impact Value J (ft·lbs)
422 (61,190)	454 (65,830)	33.6	0 (32) -20 (-4)	110 (81) 72 (53)

Typical Welding Parameters / Amp.(A)

Diameter mm (in)	2.6 (3/32)	3.2 (1/8)	4.0 (5/32)	5.0 (3/16)	6.0 (15/64)
Length mm (in)	350 (14)	350 (14)	400 (16)	400 (16)	450 (18)
F & HF	65~100	100~140	140~190	200~260	250~330
V-up, OH	50~90	80~130	110~170	140~210	-

Welding Position



Current

AC or DC ±

Redrying Conditions

70~100°C (158~212°F) X 0.5~1hr

Diameter / Packaging

Diameter mm (in)	Length mm (in)	Standard	
		packet 5kg(11lbs)	carton 20kg(44lbs)
2.6 (3/32)	350 (14)	✓	
3.2 (1/8)	350 (14)	✓	
4.0 (5/32)	400 (16)	✓	
5.0 (3/16)	400 (16)	✓	
6.0 (15/64)	450 (18)	✓	

SMW

SAW

GMW

GTAW

FCAW

Non-FERROUS

APPENDIX

S-4303.T

Type : Lime-Titania

Conformances

JIS Z3211 E4303

EN ISO 2560-A-E38 0 RA 1 2

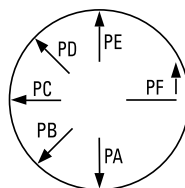
Applications

- General fabrication
- Automotive
- Machinery
- Bridges & Construction

Features

- Suitable for butt and fillet welding of thin plates
- Good restriking properties and high welding efficiency
- Suitable for tack welding
- Good mechanical properties

Welding Position



Current

AC or DC ±

Redrying Conditions

70~100°C (158~212°F) X 0.5~1hr

Diameter / Packaging

Diameter mm (in)	Length mm (in)	Standard	
		packet 5kg(11lbs)	carton 20kg(44lbs)
2.6 (3/32)	350 (14)	✓	
3.2 (1/8)	350 (14)	✓	
4.0 (5/32)	400 (16)	✓	
5.0 (3/16)	400 (16)	✓	
6.0 (15/64)	450 (18)	✓	

Typical Chemical Composition of All-Weld Metal (%)

C	Si	Mn	P	S
0.06	0.16	0.48	0.019	0.014

Typical Mechanical Properties of All-Weld Metal

YS MPa(lbs/in²)	TS MPa(lbs/in²)	EL (%)	Temp °C(°F)	CVN-Impact Value J (ft-lbs)
436 (63,300)	489 (71,000)	28.9	0 (32)	98 (73)

Typical Welding Parameters / Amp.(A)

Diameter mm (in)	2.6 (3/32)	3.2 (1/8)	4.0 (5/32)	5.0 (3/16)	6.0 (15/64)
Length mm (in)	350 (14)	350 (14)	400 (16)	400 (16)	450 (18)
F & HF	65~100	100~140	140~190	200~250	250~330
V-up, OH	50~90	80~130	110~170	140~210	-

S-6010.D

Type : Cellulosic



Conformances

AWS A5.1/ ASME SFA5.1 E6010
JIS Z3211 E4310
EN ISO 2560-A-E38 0 C 2 1
KR 2
ABS 2, AWS A5.1 E6010
LR 2
BV 2
DNV-GL 2
NK KMW2
TÜV EN ISO 2560-A-E 38 0 C 2 1
DB EN ISO 2560-A-E 38 0 C 2 1
CWB CSA W48 E4310
CE

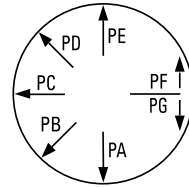
Applications

- Pipe line
- General fabrication

Features

- Standard in the pipe welding industry
- Deep penetration
- High ductility (root pass)

Welding Position



Current

DC +

Redrying Conditions

70~100°C (158~212°F) X 0.5~1hr

Diameter / Packaging

Diameter mm (in)	Length mm (in)	Standard	
		packet 5kg(11lbs)	carton 20kg(44lbs)
2.6 (3/32)	350 (14)	✓	
3.2 (1/8)	350 (14)	✓	
4.0 (5/32)	400 (16)	✓	
5.0 (3/16)	400 (16)	✓	

Typical Chemical Composition of All-Weld Metal (%)

C	Si	Mn	P	S
0.10	0.17	0.42	0.015	0.017

Typical Mechanical Properties of All-Weld Metal

YS MPa(lbs/in ²)	TS MPa(lbs/in ²)	EL (%)	Temp °C(°F)	CVN-Impact Value J (ft.-lbs)
447 (64,900)	517 (75,000)	32.3	-30 (-22)	62 (46)

Typical Welding Parameters / Amp.(A)

Diameter mm (in)	2.6 (3/32)	3.2 (1/8)	4.0 (5/32)	5.0 (3/16)
Length mm (in)	300 (12)	350 (14)	350 (14)	350 (14)
F & HF	50~75	75~125	90~165	140~220
V-up, OH	50~75	75~125	90~165	140~220

SMW

SAW

GMW

GTAW

FCAW

Non-FERROUS

APPENDIX

S-6011.D

Type : Cellulosic

Conformances

AWS A5.1/ ASME SFA5.1 E6011

JIS Z3211 E4311

EN ISO 2560-A-E38 0 C 1 1

KR 2

ABS 2

LR 2

BV 2

DNV-GL 2

NK KMW2

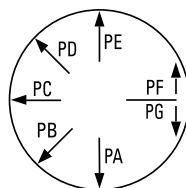
Applications

- Pipe line
- General fabrication
- Shipbuilding

Features

- Standard in the pipe welding industry
- Deep penetration
- High ductility (root pass)
- AC and DC welding

Welding Position



Current

AC or DC +

Redrying Conditions

70~100°C (158~212°F) X 0.5~1hr

Diameter / Packaging

Diameter mm (in)	Length mm (in)	Standard	
		packet 5kg(11lbs)	carton 20kg(44lbs)
2.6 (3/32)	350 (14)	✓	
3.2 (1/8)	350 (14)	✓	
4.0 (5/32)	400 (16)	✓	
5.0 (3/16)	400 (16)	✓	

Typical Chemical Composition of All-Weld Metal (%)

C	Si	Mn	P	S
0.11	0.16	0.51	0.015	0.012

Typical Mechanical Properties of All-Weld Metal

YS MPa(lbs/in ²)	TS MPa(lbs/in ²)	EL (%)	Temp °C(°F)	CVN-Impact Value J (ft-lbs)
468 (68,000)	558 (81,000)	29.7	-30 (-22)	51 (38)

Typical Welding Parameters / Amp.(A)

Diameter mm (in)	2.6 (3/32)	3.2 (1/8)	4.0 (5/32)	5.0 (3/16)
Length mm (in)	300 (12)	350 (14)	350 (14)	350 (14)
F & HF	50~75	75~125	90~165	140~220
V-up, OH	50~75	75~125	90~165	140~220

S-6013.LF

Type : Rutile



Conformances

AWS A5.1/ ASME SFA5.1 E6013
JIS Z3211 E4313
EN ISO 2560-A-E38 0 R 1 2
KR 2
ABS 2
LR 2
BV 2
DNV·GL 2
NK KMW2
CE

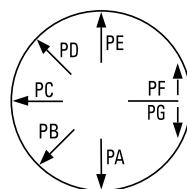
Applications

- General fabrication

Features

- Suitable for butt and fillet welding of thin plates
- Good restriking
- Good bead appearance
- Easy to remove slag
- Smooth arc and low fume
- AC welding with low ocv

Welding Position



Current

AC or DC +

Redrying Conditions

70~100°C (158~212°F) X 0.5~1hr

Diameter / Packaging

Diameter mm (in)	Length mm (in)	Standard	
		packet 5kg(11lbs)	carton 20kg(44lbs)
2.6 (3/32)	350 (14)	✓	
3.2 (1/8)	350 (14)	✓	
4.0 (5/32)	400 (16)	✓	
4.0 (5/32)	450 (18)	✓	
5.0 (3/16)	400 (16)	✓	
5.0 (3/16)	450 (18)	✓	
6.0 (15/64)	450 (18)	✓	

Typical Chemical Composition of All-Weld Metal (%)

C	Si	Mn	P	S
0.05	0.23	0.35	0.022	0.017

Typical Mechanical Properties of All-Weld Metal

YS MPa(lbs/in ²)	TS MPa(lbs/in ²)	EL (%)	Temp °C(°F)	CVN-Impact Value J (ft·lbs)
439 (63,700)	488 (70,900)	26.8	0 (32)	67 (50)

Typical Welding Parameters / Amp.(A)

Diameter mm (in)	2.6 (3/32)	3.2 (1/8)	4.0 (5/32)	5.0 (3/16)	6.0 (15/64)
Length mm (in)	350 (14)	350 (14)	400 (16) 450 (18)	400 (16) 450 (18)	450 (18)
F & HF	50~95	80~130	120~180	160~230	220~300
V-up, OH	45~90	60~120	100~160	120~220	-

SMW

SAW

GMW

GTAW

FCAW

Non-FERROUS

APPENDIX

S-6013.V

Type : Rutile-Cellulosic



Conformances

AWS A5.1/ ASME SFA5.1 E6013

JIS Z3211 E4313

EN ISO 2560-A-E38 0 RC 1 1

KR 2

ABS 2

LR 2

NK KMW2

TÜV EN ISO 2560-A-E38 0 RC 1 1

DB EN ISO 2560-A-E38 0 RC 1 1

CWB CSA W48 E4313

CE

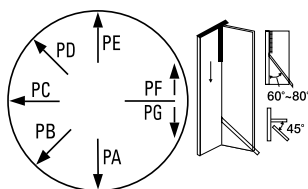
Applications

- General fabrication

Features

- Suitable for butt and fillet welding of thin plates
- Good at vertical down
- Good restriking
- Good bead appearance
- Easy to remove slag

Welding Position



Current

AC or DC ±

Redrying Conditions

70~100°C (158~212°F) X 0.5~1hr

Diameter / Packaging

Diameter mm (in)	Length mm (in)	Standard	
		packet 5kg(11lbs)	carton 20kg(44lbs)
2.6 (3/32)	350 (14)	✓	
3.2 (1/8)	350 (14)	✓	
4.0 (5/32)	400 (16)	✓	
5.0 (3/16)	400 (16)	✓	

Typical Chemical Composition of All-Weld Metal (%)

C	Si	Mn	P	S
0.09	0.32	0.48	0.017	0.012

Typical Mechanical Properties of All-Weld Metal

YS MPa(lbs/in²)	TS MPa(lbs/in²)	EL (%)	Temp °C(°F)	CVN-Impact Value J (ft-lbs)
451 (65,395)	497 (72,065)	27.5	0 (32)	65 (48)

Typical Welding Parameters / Amp.(A)

Diameter mm (in)	2.6 (3/32)	3.2 (1/8)	4.0 (5/32)	5.0 (3/16)
Length mm (in)	350 (14)	350 (14)	400 (16)	400 (16)
F & HF	60~100	100~140	140~190	190~240
V-up, OH	45~90	60~120	100~160	120~220

S-6027.LF

Type : High recovery Rutile

Conformances

AWS A5.1/ ASME SFA5.1 E6027

JIS Z3211 E4327

EN ISO 2560-A-E38 0 R 1 4

KR 3

ABS 3

LR 3,3G

BV 3

DNV-GL 3

NK KMW3

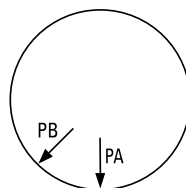
Applications

- General fabrication

Features

- High efficient fillet welding
- Low fume
- Good welding performance in manual and gravity welding

Welding Position



Current

AC or DC ±

Redrying Conditions

70~100°C (158~212°F) X 0.5~1hr

Diameter / Packaging

Diameter mm (in)	Length mm (in)	Standard	
		packet 5kg(11lbs)	carton 20kg(44lbs)
4.0 (5/32)	550 (22)	✓	
4.5 (11/64)	700 (28)	✓	
5.0 (3/16)	700 (28)	✓	
5.5 (7/32)	700 (28)	✓	
6.0 (15/64)	700 (28)	✓	
6.4 (1/4)	700 (28)	✓	
7.0 (9/32)	700 (28)	✓	

Typical Chemical Composition of All-Weld Metal (%)

C	Si	Mn	P	S
0.07	0.32	0.76	0.023	0.013

Typical Mechanical Properties of All-Weld Metal

YS MPa(lbs/in ²)	TS MPa(lbs/in ²)	EL (%)	Temp °C(°F)	CVN-Impact Value J (ft-lbs)
448 (65,100)	499 (72,500)	32.0	-30 (-22)	47 (35)

Typical Welding Parameters / Amp.(A)

Diameter mm (in)	4.0 (5/32)	4.5 (11/64)	5.0 (3/16)	5.5 (7/32)	6.0 (15/64)	6.4 (1/4)	7.0 (9/32)
Length mm (in)	550 (22)	550 (22) 700 (28)	700 (28)	700 (28)	700 (28)	700 (28)	700 (28)
F	140~180	170~210	180~230	210~250	240~290	260~310	280~330

SMW

SAW

GMW

GTAW

FCAW

Non-FERROUS

APPENDIX

S-7014.F

Type : High recovery Rutile

Conformances

AWS A5.1/ ASME SFA5.1 E7014

EN ISO 2560-A-E42 0 R 1 2

KR 2, 2Y

ABS 2Y

LR 2, 2Y

BV 2, 2Y

DNV-GL 2, 2Y

NK KMW52

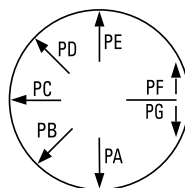
Applications

- General fabrication

Features

- High welding speed
- Easy horizontal fillet and groove welding

Welding Position



Current

AC or DC ±

Redrying Conditions

70~100°C (158~212°F) X 0.5~1hr

Diameter / Packaging

Diameter mm (in)	Length mm (in)	Standard	
		packet 5kg(11lbs)	carton 20kg(44lbs)
3.2 (1/8)	350 (14)	✓	
4.0 (5/32)	400 (16)	✓	
5.0 (3/16)	400 (16)	✓	
6.0 (15/64)	450 (18)	✓	

Typical Chemical Composition of All-Weld Metal (%)

C	Si	Mn	P	S
0.07	0.30	0.66	0.022	0.015

Typical Mechanical Properties of All-Weld Metal

YS MPa(lbs/in²)	TS MPa(lbs/in²)	EL (%)	Temp °C(°F)	CVN-Impact Value J (ft-lbs)
449 (65,200)	510 (74,100)	30.9	0 (32)	83 (61)

Typical Welding Parameters / Amp.(A)

Diameter mm (in)	3.2 (1/8)	4.0 (5/32)	5.0 (3/16)	6.0 (15/64)
Length mm (in)	400 (16)	400 (16)	400 (16)	450 (18)
F	95~140	140~200	180~250	240~310

S-7024.F

Type : High recovery Rutile

Conformances

AWS A5.1/ ASME SFA5.1 E7024

JIS Z3211 E4924

EN ISO 2560-A-E42 0 RR 7 4

ABS 2

LR 2, 2Y, 2YG

DNV 2 (25 t)

NK KMW2, KMW52

CWB CSA W48 E4924

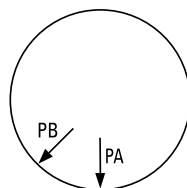
Applications

- Heavy steel fabrication
- Shipbuilding

Features

- Highly efficient fillet welding
- High welding speed
- Good bead appearance
- Easy to remove slag

Welding Position



Current

AC or DC ±

Redrying Conditions

70~100°C (158~212°F) X 0.5~1hr

Diameter / Packaging

Diameter mm (in)	Length mm (in)	Standard	
		packet 5kg(11lbs)	carton 20kg(44lbs)
3.2 (1/8)	400 (16)	✓	
4.0 (5/32)	450 (18)	✓	
4.5(11/64)	450 (18)	✓	
4.5(11/64)	700 (28)	✓	
5.0 (3/16)	450 (18)	✓	
5.0 (3/16)	700 (28)	✓	
6.0 (15/64)	450 (18)	✓	
6.0 (15/64)	700 (28)	✓	

Typical Chemical Composition of All-Weld Metal (%)

C	Si	Mn	P	S
0.08	0.42	0.82	0.022	0.014

Typical Mechanical Properties of All-Weld Metal

YS MPa(lbs/in ²)	TS MPa(lbs/in ²)	EL (%)	Temp °C(°F)	CVN-Impact Value J (ft-lbs)
513 (74,400)	561 (81,400)	23.4	0 (32)	61 (45)

Typical Welding Parameters / Amp.(A)

Diameter mm (in)	3.2 (1/8)	4.0 (5/32)	4.5 (11/64)	5.0 (3/16)	6.0 (15/64)
Length mm (in)	400 (16)	450 (18)	450 (18) 700 (28)	450 (18) 700 (28)	450 (18) 700 (28)
F	100~150	140~200	180~230	200~250	260~300

SMW

SAW

GMW

GTAW

FCAW

Non-FERROUS

APPENDIX

S-7016.0

Type : Basic

Conformances

AWS A5.1/ ASME SFA5.1 E7016

JIS Z3211 E4316

EN ISO 2560-A-E42 2 B 1 2

KR 3H10, 3YH10

ABS 3H10, 3Y

LR 3YH15

DNV 3YH10

NK KMW53HH

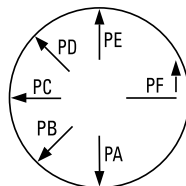
Applications

- Pipe line

Features

- Suitable for one side welding of pipe
- Stable arc
- Relatively low current

Welding Position



Current

AC or DC +

Redrying Conditions

300~350°C (572~662°F) X

0.5~1hr

Diameter / Packaging

Diameter mm (in)	Length mm (in)	Standard	
		packet 5kg(11lbs)	carton 20kg(44lbs)
2.6 (3/32)	350 (14)	✓	
3.2 (1/8)	350 (14)	✓	
4.0 (5/32)	400 (16)	✓	
5.0 (3/16)	400 (16)	✓	

Typical Chemical Composition of All-Weld Metal (%)

C	Si	Mn	P	S
0.07	0.45	1.10	0.015	0.007

Typical Mechanical Properties of All-Weld Metal

YS MPa(lbs/in ²)	TS MPa(lbs/in ²)	EL (%)	Temp °C(°F)	CVN-Impact Value J (ft.lbs)
489 (70,905)	566 (82,070)	29.6	-30 (-22)	109 (80)

Typical Welding Parameters / Amp.(A)

Diameter mm (in)	2.6 (3/32)	3.2 (1/8)	4.0 (5/32)	5.0 (3/16)
Length mm (in)	350 (14)	400 (16)	400 (16)	400 (16)
F	60~90	90~130	130~190	180~240
FV-up, OH	50~80	80~120	110~180	150~210
Root pass	30~65	60~110	90~150	130~180

S-7016.M

Type : Basic

Conformances

AWS A5.1/ ASME SFA5.1 E7016

JIS Z3211 E4316

EN ISO 2560-A-E42 2 B 1 2

KR 3H10, 3YH10

ABS 3H10, 3Y

NK KMW53HH

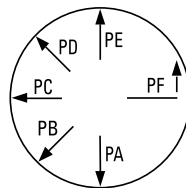
Applications

- Heavy steel fabrication
- Shipbuilding
- Pressure vessels

Features

- Suitable for butt and fillet welding of heavy structure
- Good X-ray performance
- Good mechanical properties

Welding Position



Current

AC or DC +

Redrying Conditions

300~350°C (572~662°F) X

0.5~1hr

Diameter / Packaging

Diameter mm (in)	Length mm (in)	Standard	
		packet 5kg(11lbs)	carton 20kg(44lbs)
2.6 (3/32)	350 (14)	✓	
3.2 (1/8)	350 (14)	✓	
4.0 (5/32)	400 (16)	✓	
5.0 (3/16)	400 (16)	✓	
6.0 (15/64)	450 (18)	✓	

Typical Chemical Composition of All-Weld Metal (%)

C	Si	Mn	P	S
0.08	0.64	1.18	0.018	0.009

Typical Mechanical Properties of All-Weld Metal

YS MPa(lbs/in ²)	TS MPa(lbs/in ²)	EL (%)	Temp °C(°F)	CVN-Impact Value J (ft.-lbs)
539 (78,300)	617 (89,600)	26.5	-20 (-4)	73 (54)

Typical Welding Parameters / Amp.(A)

Diameter mm (in)	2.6 (3/32)	3.2 (1/8)	4.0 (5/32)	5.0 (3/16)	6.0 (15/64)
Length mm (in)	350 (14)	350 (14)	400 (16)	400 (16)	450 (18)
F	55~85	90~140	140~190	190~250	250~320
V-up, OH	50~80	80~130	110~170	160~210	-

SAW

SAW

GMW

GTAW

FCW

Non-FERROUS

APPENDIX

S-7010.P1

Type : Cellulosic

Conformances

AWS A5.5/ ASME SFA5.1 E7010-P1

CWB CSA W48 E4910-P1

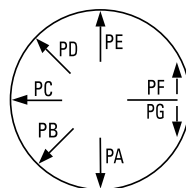
Applications

- Root pass welding for Pipe line
- General fabrication
- Vertical down welding

Features

- Standard in the pipe welding industry
- Deep penetration High ductility (root pass)

Welding Position



Current

DC +

Redrying Conditions

70~100°C (158~212°F) X 0.5~1hr

Diameter / Packaging

Diameter	Length	Steel can	
		packet	carton
mm (in)	mm (in)	5kg(11lbs)	20kg(44lbs)
2.6 (3/32)	300 (12)		✓
3.2 (1/8)	350 (14)		✓
4.0 (5/32)	350 (14)		✓
5.0 (3/16)	350 (14)		✓

Typical Chemical Composition of All-Weld Metal (%)

C	Si	Mn	P	S	Cr	Ni	Mo
0.127	0.24	0.45	0.017	0.006	0.017	0.023	0.162

Typical Mechanical Properties of All-Weld Metal

YS MPa(lbs/in ²)	TS MPa(lbs/in ²)	EL (%)	Temp °C(°F)	CVN-Impact Value J (ft-lbs)
480 (69,600)	565 (82,000)	28.8	-45 (-49)	47 (35)

Typical Welding Parameters / Amp.(A)

Diameter mm (in)	2.6 (3/32)	3.2 (1/8)	4.0 (5/32)	5.0 (3/16)
Length mm (in)	300 (12)	350 (14)	350 (14)	350 (14)
F	50~75	75~1325	90~165	140~220
V-up, OH	40~70	65~115	90~145	125~185

S-7016.H

Type : Basic



Conformances

AWS A5.1/ ASME SFA5.1 E7016
 JIS Z3211 E4916
 EN ISO 2560-A-E42 2 B 1 2
 KR 3H10, 3YH10
 ABS 3H10, 3Y
 LR 3YH15
 BV 3YHH
 DNV-GL 3YH10
 NK KMW53HH
 RS 3Y H10
 CWB CSA W48 E4916
 CE

Applications

- Heavy steel fabrication
- Shipbuilding
- Pressure vessels

Features

- Suitable for butt and fillet welding of heavy structure
- Good crack resistance and X-ray performance
- Good mechanical properties

Typical Chemical Composition of All-Weld Metal (%)

C	Si	Mn	P	S
0.08	0.62	1.22	0.017	0.011

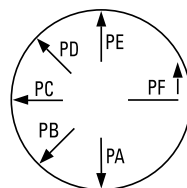
Typical Mechanical Properties of All-Weld Metal

YS MPa(lbs/in ²)	TS MPa(lbs/in ²)	EL (%)	Temp °C(°F)	CVN-Impact Value J (ft.-lbs)
560 (81,300)	620 (90,700)	28.5	-30 (-22)	80 (59)

Typical Welding Parameters / Amp.(A)

Diameter mm (in)	2.6 (3/32)	3.2 (1/8)	4.0 (5/32)	5.0 (3/16)	6.0 (15/64)
Length mm (in)	350 (14)	350 (14)	400 (16)	400 (16)	450 (18)
F	55~85	90~130	130~180	180~240	250~310
V-up, OH	50~80	80~120	110~170	150~200	-

Welding Position



Current

AC or DC +

Redrying Conditions

300~350°C (572~662°F) X
 0.5~1hr

Diameter / Packaging

Diameter mm (in)	Length mm (in)	Standard	
		packet 5kg(11lbs)	carton 20kg(44lbs)
2.6 (3/32)	350 (14)	✓	
3.2 (1/8)	350 (14)	✓	
4.0 (5/32)	400 (16)	✓	
5.0 (3/16)	400 (16)	✓	
6.0 (15/64)	450 (18)	✓	

SMW

SAW

GMW

GTAW

FCAW

Non-FERROUS

APPENDIX

S-7016.HR

Type : Basic

Conformances

AWS A5.1/ ASME SFA5.1 E7016 H4R
JIS Z3211 E4916 H5
EN ISO 2560-A-E42 3 B 1 2 H5

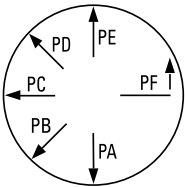
Applications

- Heavy steel fabrication
- Shipbuilding
- Pressure vessels

Features

- Extra low hydrogen electrode
- Good mechanical properties
- Vacuum sealed package available ($HDM \leq 4\text{ml}/100\text{g}$)

Welding Position



Current

AC or DC +

Redrying Conditions

350~400°C (662~752°F) X
0.5~1hr

Diameter / Packaging

Diameter	Length	Standard		Vacuum				P.V.C	
		packet	carton	packet	carton	packet	carton	packet	carton
mm (in)	mm (in)	5kg(11lbs)	20kg(44lbs)	1.5kg(3.3lbs)	15kg(3.3lbs)	5kg(11lbs)	20kg(44lbs)	5kg(11lbs)	20kg(44lbs)
2.6 (3/32)	350 (14)	✓		✓		✓		✓	
3.2 (1/8)	350 (14)	✓		✓		✓		✓	
4.0 (5/32)	400 (16)	✓		✓		✓		✓	
5.0 (3/16)	400 (16)	✓		✓		✓		✓	

Typical Chemical Composition of All-Weld Metal (%)

C	Si	Mn	P	S
0.064	0.56	1.00	0.012	0.005

Typical Mechanical Properties of All-Weld Metal

YS MPa(lbs/in ²)	TS MPa(lbs/in ²)	EL (%)	Temp °C(°F)	CVN-Impact Value J (ft-lbs)
493 (71,500)	561 (81,400)	30.4	-30 (-22)	173 (128)

Typical Welding Parameters / Amp.(A)

Diameter mm (in)	2.6 (3/32)	3.2 (1/8)	4.0 (5/32)	5.0 (3/16)
Length mm (in)	350 (14)	350 (14)	400 (16) 450 (18)	400 (16) 450 (18)
F & HF	50~95	90~140	130~180	180~240
V-up, OH	50~95	90~130	120~160	150~200

S-7016.LF

Type : Basic

Conformances

AWS A5.1/ ASME SFA5.1 E7016

JIS Z3211 E4916

EN ISO 2560-A-E42 3 B 1 2

KR 3H10, 3Y H10

ABS 3H10, 3Y

LR 3YH15

BV 3, 3YHH

DNV-GL 3YH10

NK KMW53HH

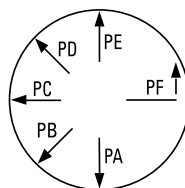
Applications

- Heavy steel fabrication
- Shipbuilding
- Pressure vessels

Features

- Suitable for butt and fillet welding of heavy structure
- Good crack resistance and X-ray performance
- Good mechanical properties
- Low fume

Welding Position



Current

AC or DC +

Redrying Conditions

300~350°C (572~662°F) X

0.5~1hr

Diameter / Packaging

Diameter mm (in)	Length mm (in)	Standard	
		packet 5kg(11lbs)	carton 20kg(44lbs)
2.6 (3/32)	350 (14)	✓	
3.2 (1/8)	350 (14)	✓	
4.0 (5/32)	400 (16)	✓	
5.0 (3/16)	400 (16)	✓	
6.0 (15/64)	450 (18)	✓	

Typical Chemical Composition of All-Weld Metal (%)

C	Si	Mn	P	S
0.08	0.62	1.29	0.016	0.011

Typical Mechanical Properties of All-Weld Metal

YS MPa(lbs/in²)	TS MPa(lbs/in²)	EL (%)	Temp °C(°F)	CVN-Impact Value J (ft-lbs)
550 (79,900)	605 (87,800)	29.0	-30 (-22)	75 (56)

Typical Welding Parameters / Amp.(A)

Diameter mm (in)	2.6 (3/32)	3.2 (1/8)	4.0 (5/32)	5.0 (3/16)	6.0 (15/64)
Length mm (in)	350 (14)	350 (14)	400 (16)	400 (16)	450 (18)
F	55~85	90~130	130~180	180~240	250~310
V-up, OH	50~80	80~130	110~170	150~200	-

S-7016.G

Type : Basic

Conformances

AWS A5.1/ ASME SFA5.1 E7016

JIS Z3211 E4916

EN ISO 2560-A-E42 3 B 1 2

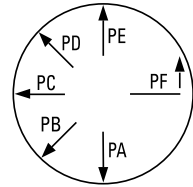
Applications

- Heavy steel fabrication
- Shipbuilding
- Pressure vessels

Features

- Suitable for butt and fillet welding of heavy structure
- Good crack resistance and X-ray performance
- Good mechanical properties

Welding Position



Current

AC or DC +

Redrying Conditions

300~350°C (572~662°F) X

0.5~1hr

Diameter / Packaging

Diameter	Length	Standard	
		packet	carton
mm (in)	mm (in)	5kg(11lbs)	20kg(44lbs)
2.6 (3/32)	350 (14)		✓
3.2 (1/8)	350 (14)		✓
4.0 (5/32)	400 (16)		✓
5.0 (3/16)	400 (16)		✓
6.0 (15/64)	450 (18)		✓

SMW

SAW

GMW

GTAW

FCAW

Non-FERROUS

APPENDIX

S-7018.G

Type : Basic



Conformances

AWS A5.1/ ASME SFA5.1 E7018

JIS Z3211 E4918

EN ISO 2560-A-E42 3 B 1 2

KR 3H10, 3Y H10

ABS 3H10, 3Y

LR 3YH15

BV 3YHH

DNV-GL 3YH10

NK KMW53HH

TÜV EN ISO 2560-A-E 42 3 B 1 2 H5

DB EN ISO 2560-A-E 42 3 B 1 2 H5

CWB CSA W48 E4918-H8

CE

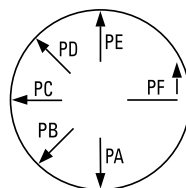
Applications

- Heavy steel fabrication
- Shipbuilding
- Pressure vessels

Features

- Suitable for butt and fillet welding of heavy structure
- Good crack resistance and X-ray performance
- Good mechanical properties
- Iron powder and low hydrogen type electrode (high efficiency)

Welding Position



Current

AC or DC +

Redrying Conditions

300~350°C (572~662°F) X 0.5~1hr

Diameter / Packaging

Diameter mm (in)	Length mm (in)	Standard / Vacuum	
		packet 5kg(11lbs)	carton 20kg(44lbs)
2.6 (3/32)	350 (14)	✓	
3.2 (1/8)	350 (14)	✓	
4.0 (5/32)	400 (16)	✓	
5.0 (3/16)	400 (16)	✓	
5.5 (7/32)	450 (18)	✓	
6.0 (15/64)	450 (18)	✓	

Typical Chemical Composition of All-Weld Metal (%)

C	Si	Mn	P	S
0.06	0.50	1.20	0.017	0.011

Typical Mechanical Properties of All-Weld Metal

YS MPa(lbs/in ²)	TS MPa(lbs/in ²)	EL (%)	Temp °C(°F)	CVN-Impact Value J (ft-lbs)
504 (73,200)	572 (83,100)	29.8	-30 (-22)	111 (82)

Typical Welding Parameters / Amp.(A)

Diameter mm (in)	2.6 (3/32)	3.2 (1/8)	4.0 (5/32)	5.0 (3/16)	5.5 (7/32)	6.0 (15/64)
Length mm (in)	350 (14)	350 (14)	400 (16)	400 (16)	450 (18)	450 (18)
	-	400 (16)	450 (18)	450 (18)		
F	60~90	90~140	130~190	180~240	220~260	250~300
V-up, OH	50~80	80~120	120~170	150~200	-	-

S-7018.GH

Type : Basic

Conformances

AWS A5.1/ ASME SFA5.1 E7018

JIS Z3211 E4918 H5

EN ISO 2560-A-E42 3 B 3 2 H5

CWB CSA W48 E4918-H8

CWB CSA W48 E4918

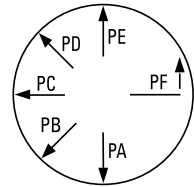
Applications

- Heavy steel fabrication
- Shipbuilding
- Pressure vessels

Features

- Low hydrogen electrode
- Iron powder and low hydrogen type electrode (high efficiency)
- Good mechanical properties
- Vacuum sealed package available (HDM ≤ 5ml/100g)

Welding Position



Current

AC or DC +

Redrying Conditions

350~400°C (662~752°F) X

0.5~1hr

Diameter / Packaging

Diameter mm (in)	Length mm (in)	Standard		Vacuum				P.V.C	
		packet 5kg(11lbs)	carton 20kg(44lbs)	packet 1.5kg(3.3lbs)	carton 15kg(3.3lbs)	packet 5kg(11lbs)	carton 20kg(44lbs)	packet 5kg(11lbs)	carton 20kg(44lbs)
2.6 (3/32)	350 (14)	✓		✓		✓		✓	
3.2 (1/8)	350 (14)	✓		✓		✓		✓	
4.0 (5/32)	400 (16)	✓		✓		✓		✓	
5.0 (3/16)	400 (16)	✓		✓		✓		✓	
6.0 (15/64)	450 (18)	✓		✓		✓		✓	

SWAW

SAW

GMW

GTAW

FCW

Non-FERROUS

APPENDIX

Typical Chemical Composition of All-Weld Metal (%)

C	Si	Mn	P	S
0.07	0.42	1.21	0.018	0.006

Typical Mechanical Properties of All-Weld Metal

YS MPa(lbs/in ²)	TS MPa(lbs/in ²)	EL (%)	Temp °C(°F)	CVN-Impact Value J (ft·lbs)
488 (70,800)	566 (82,100)	27.4	-30 (-22)	126 (93)

Typical Welding Parameters / Amp.(A)

Diameter mm (in)	2.6 (3/32)	3.2 (1/8)	4.0 (5/32)	5.0 (3/16)	6.0 (15/64)
Length mm (in)	350 (14) -	350 (14) 400 (16)	400 (16) 450 (18)	400 (16) 450 (18)	450 (18)
F	60~90	90~140	130~190	180~240	250~300
V-up, OH	50~80	80~120	120~170	150~200	-

S-7028.F

Type : High recovery Basic

Conformances

AWS A5.1/ ASME SFA5.1 E7028

JIS Z3211 E4928

EN ISO 2560-A-E42 2 B 7 4

KR 3Y

ABS 3, 3Y

LR 3YG

BV 3, 3Y

DNV-GL 3 (25 t)

NK KMW3, KMW53

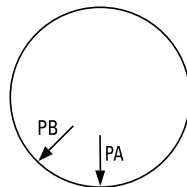
Applications

- Heavy steel fabrication

Features

- Heavy iron powder type electrode
- High deposition rate
- Easy to remove slag

Welding Position



Current

AC or DC +

Redrying Conditions

300~350°C (572~662°F) X

0.5~1hr

Diameter / Packaging

Diameter	Length	Standard	
		packet	carton
		5kg(11lbs)	20kg(44lbs)
4.0 (5/32)	550 (22)	✓	
4.5 (11/64)	550 (22)	✓	
4.5 (11/64)	700 (28)	✓	
5.5 (7/32)	700 (28)	✓	
6.0 (15/64)	700 (28)	✓	
6.4 (1/4)	700 (28)	✓	
7.0 (9/32)	700 (28)	✓	

Typical Chemical Composition of All-Weld Metal (%)

C	Si	Mn	P	S
0.07	0.29	1.08	0.027	0.015

Typical Mechanical Properties of All-Weld Metal

YS MPa(lbs/in ²)	TS MPa(lbs/in ²)	EL (%)	Temp °C(°F)	CVN-Impact Value J (ft.-lbs)
478 (69,400)	546 (79,300)	32.0	-20 (-4)	63 (47)

Typical Welding Parameters / Amp.(A)

Diameter mm (in)	4.0 (5/32)	4.5 (11/64)	5.0 (3/16)	5.5 (7/32)	6.0 (15/64)	6.4 (1/4)	7.0 (9/32)
Length mm (in)	550 (22)	550 (22) 700 (28)	700 (28)	700 (28)	700 (28)	700 (28)	700 (28)
F	150~220	170~220	190~250	220~280	260~320	270~340	330~360

SMW

SAW

GMW

GTAW

FCAW

Non-FERROUS

APPENDIX

S-7048.V

Type : Basic

Conformances

AWS A5.1/ ASME SFA5.1 E7048

JIS Z3211 E4948

EN ISO 2560-A-E42 3 B 3 5

KR 3H10, 3YH10

ABS 3H10, 3Y

LR 3, 3YH15

BV 3, 3YHH

DNV-GL 3YH10

NK KMW53HH

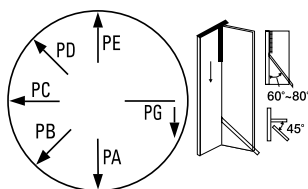
Applications

- Heavy steel fabrication
- Automotive
- Machinery

Features

- Suitable for tack welding
- Good at vertical down
- Good restriking
- Good bead appearance
- Easy to remove slag

Welding Position



Current

AC or DC +

Redrying Conditions

300~350°C (572~662°F) X

0.5~1hr

Diameter / Packaging

Diameter	Length	Standard	
		packet	carton
mm (in)	mm (in)	5kg(11lbs)	20kg(44lbs)
2.6 (3/32)	350 (14)	✓	
3.2 (1/8)	350 (14)	✓	
4.0 (5/32)	400 (16)	✓	
5.0 (3/16)	400 (16)	✓	

Typical Chemical Composition of All-Weld Metal (%)

C	Si	Mn	P	S
0.06	0.54	1.05	0.011	0.009

Typical Mechanical Properties of All-Weld Metal

YS MPa(lbs/in²)	TS MPa(lbs/in²)	EL (%)	Temp °C(°F)	CVN-Impact Value J (ft-lbs)
473 (68,700)	564 (81,900)	30.8	-30 (-22)	68 (50)

Typical Welding Parameters / Amp.(A)

Diameter mm (in)	3.2 (1/8)	4.0 (5/32)	4.5 (11/64)	5.0 (3/16)
Length mm (in)	400 (16)	450 (18)	450 (18)	450 (18)
F, V-down	100~160	140~210	180~240	220~270

S-8016.G

Type : Basic

Conformances

AWS A5.5/ ASME SFA5.5 E8016-G

JIS Z3211 E5516

EN ISO 2560-A-E46 3 1Ni B 1 2

ABS AWS A5.5 E8016-G

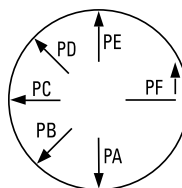
Applications

- Heavy steel fabrication
- Shipbuilding
- Offshore structure

Features

- Good bead appearance
- Good crack resistance
- Good X-ray performance
- Good mechanical properties

Welding Position



Current

AC or DC +

Redrying Conditions

300~350°C (572~662°F) X

0.5~1hr

Diameter / Packaging

Diameter mm (in)	Length mm (in)	Standard	
		packet 5kg(11lbs)	carton 20kg(44lbs)
2.6 (3/32)	350 (14)		✓
3.2 (1/8)	350 (14)		✓
4.0 (5/32)	400 (16)		✓
5.0 (3/16)	400 (16)		✓
6.0 (15/64)	450 (18)		✓

Typical Chemical Composition of All-Weld Metal (%)

C	Si	Mn	P	S	Ni
0.08	0.34	1.44	0.011	0.009	0.94

Typical Mechanical Properties of All-Weld Metal

YS MPa(lbs/in ²)	TS MPa(lbs/in ²)	EL (%)	Temp °C(°F)	CVN-Impact Value J (ft.-lbs)
519 (75,400)	613 (89,000)	28.8	-20 (-4)	160 (119)
			-30 (-22)	141 (104)

Typical Welding Parameters / Amp.(A)

Diameter mm (in)	2.6 (3/32)	3.2 (1/8)	4.0 (5/32)	5.0 (3/16)	6.0 (15/64)
Length mm (in)	350 (14)	350 (14)	400 (16)	400 (16)	450 (18)
F	55~90	90~130	130~180	180~240	250~310
V-up, OH	50~80	85~120	110~170	150~200	-

SMW

SAW

GMW

GTAW

FCAW

Non-FERROUS

APPENDIX

S-8018.G

Type : Basic

Conformances

AWS A5.5/ ASME SFA5.5 E8018-G

JIS Z3211 E5518

EN ISO 2560-A-E46 2 1Ni B 3 2

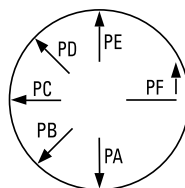
Applications

- Heavy steel fabrication
- Shipbuilding
- Offshore structure

Features

- Good bead appearance
- Good crack resistance
- Good X-ray performance
- Good mechanical properties
- Iron powder and low hydrogen type electrode (high efficiency)

Welding Position



Current

AC or DC +

Redrying Conditions

300~350°C (572~662°F) X

0.5~1hr

Diameter / Packaging

Diameter mm (in)	Length mm (in)	Standard	
		packet 5kg(11lbs)	carton 20kg(44lbs)
2.6 (3/32)	350 (14)	✓	
3.2 (1/8)	350 (14)	✓	
4.0 (5/32)	400 (16)	✓	
5.0 (3/16)	400 (16)	✓	
6.0 (15/64)	450 (18)	✓	

Typical Chemical Composition of All-Weld Metal (%)

C	Si	Mn	P	S	Ni
0.07	0.61	1.29	0.016	0.012	0.83

Typical Mechanical Properties of All-Weld Metal

YS MPa(lbs/in ²)	TS MPa(lbs/in ²)	EL (%)	Temp °C(°F)	CVN-Impact Value J (ft.-lbs)
542 (78,700)	622 (90,300)	30.2	0 (32) -20 (-4)	147 (109) 103 (76)

Typical Welding Parameters / Amp.(A)

Diameter mm (in)	2.6 (3/32)	3.2 (1/8)	4.0 (5/32)	5.0 (3/16)	6.0 (15/64)
Length mm (in)	350 (14)	350 (14)	400 (16)	400 (16)	450 (18)
F	60~90	90~140	130~190	180~240	250~300
V-up, OH	50~80	80~120	120~170	150~200	-

S-9016.G

Type : Basic

Conformances

AWS A5.5/ ASME SFA5.5 E9016-G

JIS Z3211 E5716

EN ISO 2560-A-E50 2 B 1 2

ABS AWS A5.5 E9016-G

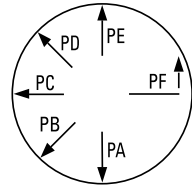
Applications

- Heavy steel fabrication
- Shipbuilding
- Offshore structure

Features

- Good bead appearance
- Good crack resistance
- Good X-ray performance
- Good mechanical properties

Welding Position



Current

AC or DC +

Redrying Conditions

300~350°C (572~662°F) X

0.5~1hr

Diameter / Packaging

Diameter	Length	Standard	
		packet	carton
mm (in)	mm (in)	5kg (11lbs)	20kg (44lbs)
2.6 (3/32)	350 (14)		✓
3.2 (1/8)	350 (14)		✓
4.0 (5/32)	400 (16)		✓
5.0 (3/16)	400 (16)		✓
6.0 (15/64)	450 (18)		✓

Typical Chemical Composition of All-Weld Metal (%)

C	Si	Mn	P	S	Ni	Mo
0.06	0.52	1.09	0.016	0.010	0.56	0.23

Typical Mechanical Properties of All-Weld Metal

YS MPa(lbs/in ²)	TS MPa(lbs/in ²)	EL (%)	Temp °C(°F)	CVN-Impact Value J (ft·lbs)
570 (82,800)	655 (95,100)	27.2	0 (32) -20 (-4)	125 (93) 78 (58)

Typical Welding Parameters / Amp.(A)

Diameter mm (in)	2.6 (3/32)	3.2 (1/8)	4.0 (5/32)	5.0 (3/16)	6.0 (15/64)
Length mm (in)	350 (14)	350 (14)	400 (16)	400 (16)	450 (18)
F	55~90	90~130	130~180	180~240	250~310
V-up, OH	50~80	85~120	110~170	150~200	-

SMW

SAW

GMW

GTAW

FCAW

Non-FERROUS

APPENDIX

S-10016.G

Type : Basic

Conformances

AWS A5.5/ ASME SFA5.5 E10016-G

JIS Z3211 E6916-N4CM1 U

EN 757 E55 0 B 1 2

ABS AWS A5.5 E10016-G

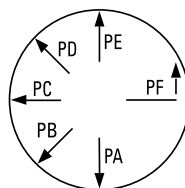
Applications

- Heavy steel fabrication
- Pressure vessels
- Power plant

Features

- Good crack resistance
- Good X-ray performance
- Good mechanical properties

Welding Position



Current

AC or DC +

Redrying Conditions

300~350°C (572~662°F) X

0.5~1hr

Diameter / Packaging

Diameter	Length	Standard	
		packet	carton
mm (in)	mm (in)	5kg(11lbs)	20kg(44lbs)
2.6 (3/32)	350 (14)		✓
3.2 (1/8)	350 (14)		✓
4.0 (5/32)	400 (16)		✓
5.0 (3/16)	400 (16)		✓
6.0 (15/64)	450 (18)		✓

Typical Chemical Composition of All-Weld Metal (%)

C	Si	Mn	P	S	Ni	Mo
0.07	0.69	1.41	0.013	0.012	1.49	0.12

Typical Mechanical Properties of All-Weld Metal

YS MPa(lbs/in ²)	TS MPa(lbs/in ²)	EL (%)	Temp °C(°F)	CVN-Impact Value J (ft-lbs)
710 (103,130)	762 (110,680)	24.0	0 (32)	110 (81)

Typical Welding Parameters / Amp.(A)

Diameter mm (in)	2.6 (3/32)	3.2 (1/8)	4.0 (5/32)	5.0 (3/16)	6.0 (15/64)
Length mm (in)	350 (14)	350 (14)	400 (16)	400 (16)	450 (18)
F	55~90	90~130	130~180	170~240	250~310
V-up, OH	50~80	85~120	110~170	150~200	-

S-10018.D2

Type : Basic

Conformances

AWS A5.5/ ASME SFA5.5 E10018-D2 H4R

ABS AWS A5.5 E10018-D2 H4R

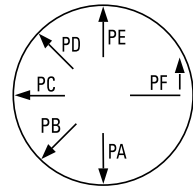
Applications

- Carbon-Manganese and Chromium-Molybdenum steel Pipng (AISI 4130, 4140)

Features

- Low hydrogen electrode
- Welding 690MPa class Low alloy steel

Welding Position



Current

AC or DC +

Redrying Conditions

350~400°C (662~752°F) X

0.5~1hr

Diameter / Packaging

Diameter	Length	Standard		Vacuum	
		packet	carton	packet	carton
mm (in)	mm (in)	5kg(11lbs)	20kg(44lbs)	5kg(11lbs)	20kg(44lbs)
3.2 (1/8)	350 (14)	✓		✓	
4.0 (5/32)	400 (16)	✓		✓	
5.0 (3/16)	400 (16)	✓		✓	

SWAW

SAW

GMAW

GTAW

FCAW

Non-FERROUS

APPENDIX

Typical Chemical Composition of All-Weld Metal (%)

C	Si	Mn	P	S	Ni	Mo
0.08	0.35	1.075	0.015	0.005	0.78	0.29

Typical Mechanical Properties of All-Weld Metal

YS MPa(lbs/in ²)	TS MPa(lbs/in ²)	EL (%)	Temp °C(°F)	CVN Impact Test J J (ft-lbs)	Heat Treatment
625 (90,700)	705 (102,300)	26	-50 (-58)	45 (33)	620°C(1148°F) X 1hr

Typical Welding Parameters / Amp.(A)

Diameter mm (in)	3.2 (1/8)	4.0 (5/32)	5.0 (3/16)
Length mm (in)	350 (14)	400 (16)	400 (16)
F &HF	90~130	130~180	180~240
V-up, OH	85~120	110~170	-

S-11016.G

Type : Basic

Conformances

AWS A5.5/ ASME SFA5.5 E11016-G

EN 757 E62 2 Mn2NiMo B 1 2

ABS AWS A5.5 E11016-G

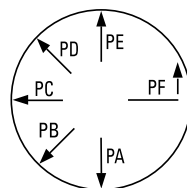
Applications

- Heavy steel fabrication
- Pressure vessels
- Power plant

Features

- Good crack resistance
- Good mechanical properties

Welding Position



Current

AC or DC +

Redrying Conditions

300~350°C (572~662°F) X

0.5~1hr

Diameter / Packaging

Diameter mm (in)	Length mm (in)	Standard	
		packet 5kg(11lbs)	carton 20kg(44lbs)
2.6 (3/32)	350 (14)	✓	
3.2 (1/8)	350 (14)	✓	
4.0 (5/32)	400 (16)	✓	
5.0 (3/16)	400 (16)	✓	
6.0 (15/64)	450 (18)	✓	

Typical Chemical Composition of All-Weld Metal (%)

C	Si	Mn	P	S	Cr	Ni	Mo
0.07	0.45	1.56	0.017	0.013	0.20	2.25	0.40

Typical Mechanical Properties of All-Weld Metal

YS MPa(lbs/in ²)	TS MPa(lbs/in ²)	EL (%)	Temp °C(°F)	CVN-Impact Value J (ft·lbs)
760 (110,300)	790 (114,600)	24.0	-20 (-4)	130 (96)

Typical Welding Parameters / Amp.(A)

Diameter mm (in)	2.6 (3/32)	3.2 (1/8)	4.0 (5/32)	5.0 (3/16)	6.0 (15/64)
Length mm (in)	350 (14)	350 (14)	400 (16)	400 (16)	450 (18)
F	60~90	90~130	130~180	180~240	250~310
V-up, OH	50~80	85~120	110~170	150~200	-

SMW

SAW

GMW

GTAW

FCAW

Non-FERROUS

APPENDIX

S-9018.M

Type : Basic

Conformances

AWS A5.5/ ASME SFA5.5 E9018-M

EN 757 E50 4 B 4 2

ABS AWS A5.5 E9018-M

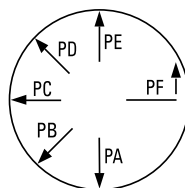
Applications

- Heavy steel fabrication
- Pressure vessels

Features

- Good crack resistance
- Good X-ray performance
- Good impact value at -50°C
- Iron powder and low hydrogen type electrode (high efficiency)

Welding Position



Current

AC or DC +

Redrying Conditions

300~350°C (572~662°F) X

0.5~1hr

Diameter / Packaging

Diameter mm (in)	Length mm (in)	Standard	
		packet 5kg(11lbs)	carton 20kg(44lbs)
2.6 (3/32)	350 (14)		✓
3.2 (1/8)	350 (14)		✓
4.0 (5/32)	400 (16)		✓
5.0 (3/16)	400 (16)		✓
6.0 (15/64)	450 (18)		✓

Typical Chemical Composition of All-Weld Metal (%)

C	Si	Mn	P	S	Ni	Mo
0.05	0.46	1.21	0.017	0.011	1.47	0.22

Typical Mechanical Properties of All-Weld Metal

YS MPa(lbs/in ²)	TS MPa(lbs/in ²)	EL (%)	Temp °C(°F)	CVN-Impact Value J (ft-lbs)
585 (85,000)	646 (93,800)	27.6	-50 (-58)	89 (66)

Typical Welding Parameters / Amp.(A)

Diameter mm (in)	2.6 (3/32)	3.2 (1/8)	4.0 (5/32)	5.0 (3/16)	6.0 (15/64)
Length mm (in)	350 (14)	350 (14)	400 (16)	400 (16)	450 (18)
F	70~100	90~140	130~190	180~240	250~300
V-up, OH	60~80	80~120	120~170	150~200	-

S-11018.M

Type : Basic

Conformances

AWS A5.5/ ASME SFA5.5 E11018-M

EN 757 E62 4 B 4 2

ABS AWS A5.5 E11018-M

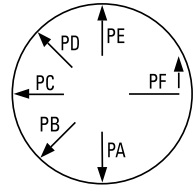
Applications

- Low alloy high tensile steels

Features

- Iron powder and low hydrogen type electrode (high efficiency)
- Good crack resistance
- Good X-ray performance
- Good impact value at -50°C

Welding Position



Current

AC or DC +

Redrying Conditions

300~350°C (572~662°F) X

0.5~1hr

Diameter / Packaging

Diameter mm (in)	Length mm (in)	Standard	
		packet 5kg(11lbs)	carton 20kg(44lbs)
2.6 (3/32)	350 (14)	✓	
3.2 (1/8)	350 (14)	✓	
4.0 (5/32)	400 (16)	✓	
5.0 (3/16)	400 (16)	✓	
6.0 (15/64)	450 (18)	✓	

Typical Chemical Composition of All-Weld Metal (%)

C	Si	Mn	P	S	Cr	Ni	Mo
0.07	0.48	1.62	0.023	0.012	0.21	2.04	0.35

Typical Mechanical Properties of All-Weld Metal

YS MPa(lbs/in ²)	TS MPa(lbs/in ²)	EL (%)	Temp °C(°F)	CVN-Impact Value J (ft.-lbs)
722 (104,900)	796 (115,600)	21.6	-50 (-58)	50 (37)

Typical Welding Parameters / Amp.(A)

Diameter mm (in)	2.6 (3/32)	3.2 (1/8)	4.0 (5/32)	5.0 (3/16)	6.0 (15/64)
Length mm (in)	350 (14)	350 (14)	400 (16)	400 (16)	450 (18)
F	55~90	90~130	130~190	190~240	250~300
V-up, OH	50~80	80~120	120~170	150~200	-

SMW

SAW

GMW

GTAW

FCAW

Non-FERROUS

APPENDIX

S-7018.W

Type : Basic

Conformances

AWS A5.5/ ASME SFA5.5 E7018-W1

JIS Z3214 DA5026G

EN ISO 2560-A-E42 2 B 3 2

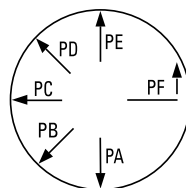
Applications

- High tensile weathering steel

Features

- Suitable for off- and on-shore construction
- High resistance to corrosion caused by seawater or combinations of oil, gas and seawater
- Contains Cu, Ni and Cr (All-weld metal)

Welding Position



Current

AC or DC +

Redrying Conditions

300~350°C (572~662°F) X

0.5~1hr

Diameter / Packaging

Diameter mm (in)	Length mm (in)	Standard	
		packet 5kg(11lbs)	carton 20kg(44lbs)
2.6 (3/32)	350 (14)		✓
3.2 (1/8)	350 (14)		✓
4.0 (5/32)	400 (16)		✓
5.0 (3/16)	400 (16)		✓
6.0 (15/64)	450 (18)		✓

Typical Chemical Composition of All-Weld Metal (%)

C	Si	Mn	P	S	Cr	Ni	Cu
0.05	0.56	0.62	0.015	0.013	0.24	0.23	0.37

Typical Mechanical Properties of All-Weld Metal

YS MPa(lbs/in ²)	TS MPa(lbs/in ²)	EL (%)	Temp °C(°F)	CVN-Impact Value J (ft-lbs)
505 (73,300)	573 (83,200)	31.3	-20 (-4)	100 (74)

Typical Welding Parameters / Amp.(A)

Diameter mm (in)	2.6 (3/32)	3.2 (1/8)	4.0 (5/32)	5.0 (3/16)	6.0 (15/64)
Length mm (in)	350 (14)	350 (14)	400 (16)	400 (16)	450 (18)
F	60~90	90~140	130~190	180~240	250~300
V-up, OH	50~80	80~120	120~170	150~200	-

S-8018.W

Type : Basic

Conformances

AWS A5.5/ ASME SFA5.5 E8018-W2

JIS Z3214 DA5826W

EN ISO 2560-A-E50 2 B 3 2

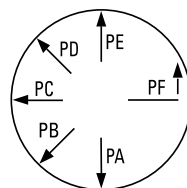
Applications

- High tensile weathering steel

Features

- Suitable for off- and on-shore construction
- High resistance to corrosion caused by seawater or combinations of oil, gas and seawater
- Contains Cu, Ni and Cr (All-weld metal)

Welding Position



Current

AC or DC +

Redrying Conditions

300~350°C (572~662°F) X

0.5~1hr

Diameter / Packaging

Diameter mm (in)	Length mm (in)	Standard	
		packet 5kg(11lbs)	carton 20kg(44lbs)
2.6 (3/32)	350 (14)	✓	
3.2 (1/8)	350 (14)	✓	
4.0 (5/32)	400 (16)	✓	
5.0 (3/16)	400 (16)	✓	
6.0 (15/64)	450 (18)	✓	

Typical Chemical Composition of All-Weld Metal (%)

C	Si	Mn	P	S	Cr	Ni	Cu
0.06	0.54	0.95	0.014	0.011	0.56	0.57	0.38

Typical Mechanical Properties of All-Weld Metal

YS MPa(lbs/in ²)	TS MPa(lbs/in ²)	EL (%)	Temp °C(°F)	CVN-Impact Value J (ft·lbs)
604 (87,700)	648 (94,100)	27.4	-20 (-4)	117 (87)

Typical Welding Parameters / Amp.(A)

Diameter mm (in)	2.6 (3/32)	3.2 (1/8)	4.0 (5/32)	5.0 (3/16)	6.0 (15/64)
Length mm (in)	350 (14)	350 (14)	400 (16)	400 (16)	450 (18)
F	60~90	90~140	130~190	180~240	250~300
V-up, OH	50~80	80~120	120~170	150~200	-

SMW

SAW

GMW

GTAW

FCAW

Non-FERROUS

APPENDIX

S-7018.1

Type : Basic

Conformances

AWS A5.1/ ASME SFA5.1 E7018-1

JIS Z3211 E4918

EN ISO 2560-A-E42 4 B 3 2

ABS 3H10, 3Y

BV 3Y HH

LR 3Y H15

DNV-GL 3Y H10

RINA 3Y H10

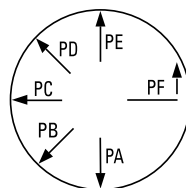
Applications

- Heavy steel fabrication
- Low temperature strength steel
- Offshore structure

Features

- Suitable for butt and fillet welding of thin and medium-thick plates (up to 20mm)
- Iron powder and low hydrogen type electrode (high efficiency)
- Good impact value at -45°C

Welding Position



Current

AC or DC +

Redrying Conditions

300~350°C (572~662°F) X

0.5~1hr

Diameter / Packaging

Diameter mm (in)	Length mm (in)	Standard / P.V.C	
		packet 5kg(11lbs)	carton 20kg(44lbs)
2.6 (3/32)	350 (14)	✓	
3.2 (1/8)	350 (14)	✓	
4.0 (5/32)	400 (16)	✓	
5.0 (3/16)	400 (16)	✓	
6.0 (15/64)	450 (18)	✓	

Typical Chemical Composition of All-Weld Metal (%)

C	Si	Mn	P	S
0.06	0.25	1.25	0.017	0.012

Typical Mechanical Properties of All-Weld Metal

YS MPa(lbs/in ²)	TS MPa(lbs/in ²)	EL (%)	Temp °C(°F)	CVN-Impact Value J (ft-lbs)
480 (69,700)	550 (79,800)	30.2	-45 (-49)	94 (70)

Typical Welding Parameters / Amp.(A)

Diameter mm (in)	2.6 (3/32)	3.2 (1/8)	4.0 (5/32)	5.0 (3/16)	6.0 (15/64)
Length mm (in)	350 (14)	350 (14)	400 (16)	400 (16)	450 (18)
F	60~90	90~140	130~190	180~240	250~300
V-up, OH	50~80	80~120	120~170	150~200	-

S-7018.1H

Type : Basic



Conformances

AWS A5.1/ ASME SFA5.1 E7018-1 H4R

JIS Z3211 E4918 H5

EN ISO 2560-A-E42 4 B 3 2 H5

ABS 4Y H5

LR 4Y H5

BV 4Y HHH

DNV-GL 4YH5

CWB CSA W48 E4918-1 H4

CE

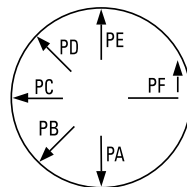
Applications

- Heavy steel fabrication
- Low temperature strength steel
- Offshore structure

Features

- Extra low hydrogen electrode
- Good impact value at -45°C
- Vacuum sealed package available (HDM ≤ 4ml/100g)

Welding Position



Current

AC or DC +

Redrying Conditions

350~400°C (662~752°F) X

0.5~1hr

Diameter / Packaging

Diameter mm (in)	Length mm (in)	Standard		Vacuum				P.V.C	
		packet 5kg(11lbs)	carton 20kg(44lbs)	packet 1.5kg(3.3lbs)	carton 15kg(3.3lbs)	packet 5kg(11lbs)	carton 20kg(44lbs)	packet 5kg(11lbs)	carton 20kg(44lbs)
2.6 (3/32)	350 (14)	✓		✓		✓		✓	
3.2 (1/8)	350 (14)	✓		✓		✓		✓	
4.0 (5/32)	400 (16)	✓		✓		✓		✓	
5.0 (3/16)	400 (16)	✓		✓		✓		✓	

SAW

SAW

GMAW

GTAW

FCAW

Non-FERROUS

APPENDIX

Typical Chemical Composition of All-Weld Metal (%)

C	Si	Mn	P	S
0.06	0.25	1.35	0.014	0.005

Typical Mechanical Properties of All-Weld Metal

YS MPa(lbs/in ²)	TS MPa(lbs/in ²)	EL (%)	Temp °C(°F)	CVN-Impact Value J (ft·lbs)
493 (71,500)	566 (82,100)	30.8	-45 (-49)	152 (112)

Typical Welding Parameters / Amp.(A)

Diameter mm (in)	2.6 (3/32)	3.2 (1/8)	4.0 (5/32)	5.0 (3/16)
Length mm (in)	350 (14)	400 (16)	450 (18)	450 (18)
F	60~90	90~140	130~190	180~240
V-up, OH	50~80	80~120	120~170	150~200

S-76LTH

Type : Basic



Conformances

AWS A5.5/ ASME SFA5.5 E7016-G

JIS Z3211 E4916-N1 AP L

EN ISO 2560-A-E42 6 Z B H5

ABS 5Y, 5Y400 H5

LR 5Y40 H5

DNV-GL 5Y40 H5

CE

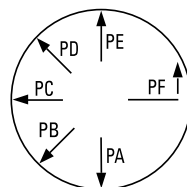
Applications

- Low temperature strength steel
- Offshore structure
- LPG, LNG storage tank

Features

- Low hydrogen electrode (HDM $\leq$ 5ml/100g)
- Good impact value at -60°C
- CTOD properties at -40°C (-40°F) temperature

Welding Position



Current

AC or DC +

Redrying Conditions

350~400°C (662~752°F) X

0.5~1hr

Diameter / Packaging

Diameter	Length	Standard		Vacuum				P.V.C	
		packet	carton	packet	carton	packet	carton	packet	carton
mm (in)	mm (in)	5kg(11lbs)	20kg(44lbs)	1.5kg(3.3lbs)	15kg(3.3lbs)	5kg(11lbs)	20kg(44lbs)	5kg(11lbs)	20kg(44lbs)
2.6 (3/32)	350 (14)	✓		✓		✓		✓	
3.2 (1/8)	350 (14)	✓		✓		✓		✓	
4.0 (5/32)	400 (16)	✓		✓		✓		✓	
5.0 (3/16)	400 (16)	✓		✓		✓		✓	

SMW

SAW

GMW

GTAW

FCW

Non-FERROUS

APPENDIX

Typical Chemical Composition of All-Weld Metal (%)

C	Si	Mn	P	S	Ni	Ti	B
0.08	0.35	1.35	0.013	0.004	0.45	0.018	0.0015

Typical Mechanical Properties of All-Weld Metal

YS MPa(lbs/in ²)	TS MPa(lbs/in ²)	EL (%)	Temp °C(°F)	CVN-Impact Value J (ft·lbs)
540 (78,400)	590 (85,600)	30.0	-46 (-51) -60 (-76)	190 (137) 100 (72)

Typical Welding Parameters / Amp.(A)

Diameter mm (in)	2.6 (3/32)	3.2 (1/8)	4.0 (5/32)	5.0 (3/16)
Length mm (in)	350 (14)	400 (16)	450 (18)	450 (18)
F	60~90	90~140	130~190	180~240
V-up, OH	50~80	80~120	120~170	150~200

S-78LTH

Type : Basic

Conformances

AWS A5.5/ ASME SFA5.5 E7018-G
EN ISO 2560-A-E46 5 1Ni B 3 2 H5

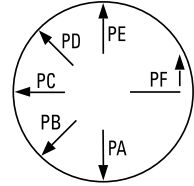
Applications

- Low temperature strength steel
- Offshore structure
- LPG, LNG storage tank

Features

- Low-Hydrogen electrode
- Iron powder and low hydrogen type electrode (high efficiency)
- Good impact value at -60°C
- Vacuum sealed package available ($HDM \leq 5\text{ml}/100\text{g}$)

Welding Position



Current

AC or DC +

Redrying Conditions

350~400°C (662~752°F) X 1hr

Diameter / Packaging

Diameter mm (in)	Length mm (in)	Standard		Vacuum				P.V.C	
		packet 5kg(11lbs)	carton 20kg(44lbs)	packet 1.5kg(3.3lbs)	carton 15kg(3.3lbs)	packet 5kg(11lbs)	carton 20kg(44lbs)	packet 5kg(11lbs)	carton 20kg(44lbs)
2.6 (3/32)	350 (14)	✓		✓		✓		✓	
3.2 (1/8)	350 (14)	✓		✓		✓		✓	
4.0 (5/32)	400 (16)	✓		✓		✓		✓	
5.0 (3/16)	400 (16)	✓		✓		✓		✓	

SMW

SAW

GMW

GTAW

FCW

Non-FERROUS

APPENDIX

Typical Chemical Composition of All-Weld Metal (%)

C	Si	Mn	P	S	Ni	Ti	B
0.06	0.23	1.25	0.015	0.004	0.73	0.023	0.003

Typical Mechanical Properties of All-Weld Metal

YS MPa(lbs/in ²)	TS MPa(lbs/in ²)	EL (%)	Temp °C(°F)	CVN-Impact Value J (ft·lbs)
525 (76,100)	600 (87,000)	32	-45 (-51) -60 (-76)	165 (121) 113 (83)

Typical Welding Parameters / Amp.(A)

Diameter mm (in)	2.6 (3/32)	3.2 (1/8)	4.0 (5/32)	5.0 (3/16)
Length mm (in)	350 (14)	400 (16)	450 (18)	450 (18)
F	60~90	90~140	130~190	180~240
V-up, OH	50~80	80~120	120~170	150~200

S-7016.LS

Type : Basic

Conformances

AWS A5.5/ ASME SFA5.5 E7016-G H4R

JIS Z3211 E4916-N1 AP L

EN ISO 2560-A-E46 6 1Ni B 1 2

KR 3H10, 3YH10 (-60°C ≥34 J)

ABS 3H10, 3Y (-60°C ≥34 J)

LR 5Y40H15

BV 3, 3YHH (-60°C ≥34 J)

DNV-GL 5YH10

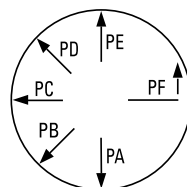
Applications

- Low temperature strength steel
- Offshore structure
- LPG, LNG storage tank

Features

- Extra low hydrogen electrode
- Good impact value at -60°C
- CTOD properties at -10°C (14°F) temperature

Welding Position



Current

AC or DC +

Redrying Conditions

350~400°C (662~752°F) X

0.5~1hr

Diameter / Packaging

Diameter mm (in)	Length mm (in)	Standard		Vacuum				P.V.C	
		packet 5kg(11lbs)	carton 20kg(44lbs)	packet 1.5kg(3.3lbs)	carton 15kg(3.3lbs)	packet 5kg(11lbs)	carton 20kg(44lbs)	packet 5kg(11lbs)	carton 20kg(44lbs)
2.6 (3/32)	350 (14)	✓		✓		✓		✓	
3.2 (1/8)	350 (14)	✓		✓		✓		✓	
4.0 (5/32)	400 (16)	✓		✓		✓		✓	
5.0 (3/16)	400 (16)	✓		✓		✓		✓	

SMW

SAW

GMAW

GTAW

FCAW

Non-FERROUS

APPENDIX

Typical Chemical Composition of All-Weld Metal (%)

C	Si	Mn	P	S	Ni
0.06	0.30	0.98	0.013	0.008	0.80

Typical Mechanical Properties of All-Weld Metal

YS MPa(lbs/in ²)	TS MPa(lbs/in ²)	EL (%)	Temp °C(°F)	CVN-Impact Value J (ft·lbs)
538 (78,100)	589 (85,500)	30.0	-45 (-49) -60 (-76)	95 (70) 73 (54)

Typical Welding Parameters / Amp.(A)

Diameter mm (in)	2.6 (3/32)	3.2 (1/8)	4.0 (5/32)	5.0 (3/16)	6.0 (15/64)
Length mm (in)	350 (14)	350 (14)	400 (16)	400 (16)	450 (18)
F	55-85	90-130	130-180	180-240	250-310
V-up, OH	50-80	80-115	110-170	150-200	-

S-86LTH

Type : Basic

Conformances

AWS A5.5/ ASME SFA5.5 E8016-G
ABS AWS A5.5 E8016-G (-60°C ≥47 J)

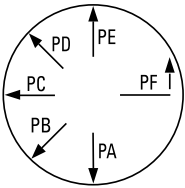
Applications

- OffShore Structure
- LPG vessel
- LPG storage
- Heat Exchanger

Features

- 55kg grade low-hydrogen high tensile electrode (-60°C)
- Ni, Ti, B contained in the weld-metal.
- Great tensile strength in low-temperature
- Anti- Low temperature crack (Low hydrogen)

Welding Position



Current

AC or DC +

Redrying Conditions

350~400°C (662~752°F) X
0.5~1hr

Diameter / Packaging

Diameter	Length	Vacuum				Steel can	
		packet	carton	packet	carton	packet	carton
	mm (in)	1.5kg (3.3lbs)	15Kg (33lbs)	5kg (11lbs)	20kg (44lbs)	4.5Kg (9.9lbs)	18Kg (40lbs)
2.6 (3/32)	350 (14)	✓		✓		✓	
3.2 (1/8)	350 (14)	✓		✓		✓	
4.0 (5/32)	400 (16)	✓		✓		✓	
5.0 (3/16)	400 (16)	✓		✓		✓	

SMW

SAW

GMW

GTAW

FCW

Non-FERROUS

APPENDIX

Typical Chemical Composition of All-Weld Metal (%)

C	Si	Mn	P	S	Cr	Ti	B
0.05	0.29	1.49	0.01	0.002	0.91	0.022	0.003

Typical Mechanical Properties of All-Weld Metal

YS MPa(lbs/in ²)	TS MPa(lbs/in ²)	EL (%)	Temp °C(°F)	CVN Impact Test J J (ft-lbs)	Heat Treatment
521 (75,600)	600 (87,000)	28	-45 (-49) -60 (-76)	143 (106) 125 (92)	AW
502 (72,800)	571 (82,800)	31.4	-45 (-49) -60 (-76)	137 (101) 123 (91)	625°C(1157°F) X 8hr

Typical Welding Parameters / Amp.(A)

Diameter mm (in)	2.6 (3/32)	3.2 (1/8)	4.0 (5/32)	5.0 (3/16)
Length mm (in)	350 (14)	350 (14)	400 (16)	400 (16)
Flat (1G-PA)	60~90	90~140	130~190	180~250
3G (PF) & 4G,5G (PE)	50~80	80~120	120~170	150~200

S-8016.C1

Type : Basic

Conformances

AWS A5.5/ ASME SFA5.5 E8016-C1

JIS Z3211 E5516-N5 AP L

EN ISO 2560-A-E46 5 2Ni B 1 2

ABS AWS A5.5 E8016-C1

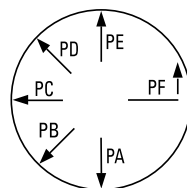
Applications

- Low temperature strength steel (2.5% Ni)
- Offshore structure

Features

- Good impact value at -60°C

Welding Position



Current

AC or DC +

Redrying Conditions

300~350°C (572~662°F) X

0.5~1hr

Diameter / Packaging

Diameter mm (in)	Length mm (in)	Standard	
		packet 5kg(11lbs)	carton 20kg(44lbs)
2.6 (3/32)	350 (14)	✓	
3.2 (1/8)	350 (14)	✓	
4.0 (5/32)	400 (16)	✓	
5.0 (3/16)	400 (16)	✓	
6.0 (15/64)	450 (18)	✓	

Typical Chemical Composition of All-Weld Metal (%)

C	Si	Mn	P	S	Ni
0.06	0.52	1.03	0.012	0.006	2.38

Typical Mechanical Properties of All-Weld Metal

YS MPa(lbs/in ²)	TS MPa(lbs/in ²)	EL (%)	Temp °C(°F)	CVN-Impact Value J (ft-lbs)	Heat Treatment
515 (74,800)	592 (86,000)	32.0	-60 (-76)	116 (86)	605 (1121°F) X 1hr. S.R

Typical Welding Parameters / Amp.(A)

Diameter mm (in)	2.6 (3/32)	3.2 (1/8)	4.0 (5/32)	5.0 (3/16)	6.0 (15/64)
Length mm (in)	350 (14)	350 (14)	400 (16)	400 (16)	450 (18)
F	55~90	90~130	130~190	190~240	250~300
V-up, OH	50~80	80~120	120~170	-	-

SMW

SAW

GMW

GTAW

FCW

Non-FERROUS

APPENDIX

S-8016.C2

Type : Basic

Conformances

AWS A5.5/ ASME SFA5.5 E8016-C2

JIS Z3211 E5516-N7 AP L

EN ISO 2560-A-E46 6 3Ni B 1 2

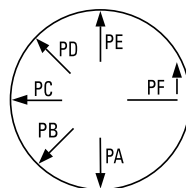
Applications

- Low temperature strength steel (3.5% Ni)
- Offshore structure

Features

- Good impact value at -60~-75°C

Welding Position



Current

AC or DC +

Redrying Conditions

300~350°C (572~662°F) X

0.5~1hr

Diameter / Packaging

Diameter	Length	Standard	
		packet	carton
mm (in)	mm (in)	5kg(11lbs)	20kg(44lbs)
2.6 (3/32)	350 (14)		✓
3.2 (1/8)	350 (14)		✓
4.0 (5/32)	400 (16)		✓
5.0 (3/16)	400 (16)		✓
6.0 (15/64)	450 (18)		✓

Typical Chemical Composition of All-Weld Metal (%)

C	Si	Mn	P	S	Ni
0.06	0.50	0.90	0.011	0.006	3.20

Typical Mechanical Properties of All-Weld Metal

YS MPa(lbs/in ²)	TS MPa(lbs/in ²)	EL (%)	Temp °C(°F)	CVN-Impact Value J (ft.-lbs)	Heat Treatment
530 (77,000)	630 (91,000)	30.0	-75 (-103)	60 (44)	605 (1121°F) X 1hr. S.R

Typical Welding Parameters / Amp.(A)

Diameter mm (in)	2.6 (3/32)	3.2 (1/8)	4.0 (5/32)	5.0 (3/16)	6.0 (15/64)
Length mm (in)	350 (14)	350 (14)	400 (16)	400 (16)	450 (18)
F	55~90	90~130	130~190	190~240	250~300
V-up, OH	50~80	80~120	120~170	-	-

S-8016.C3

Type : Basic

Conformances

AWS A5.5/ ASME SFA5.5 E8016-C3

JIS Z3211 E5516-N2

EN ISO 2560-A-E46 4 1Ni B 1 2

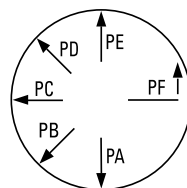
Applications

- Low temperature strength steel (1% Ni)
- Offshore structure

Features

- Good impact value at -40°C

Welding Position



Current

AC or DC +

Redrying Conditions

300~350°C (572~662°F) X

0.5~1hr

Diameter / Packaging

Diameter mm (in)	Length mm (in)	Standard	
		packet 5kg(11lbs)	carton 20kg(44lbs)
2.6 (3/32)	350 (14)	✓	
3.2 (1/8)	350 (14)	✓	
4.0 (5/32)	400 (16)	✓	
5.0 (3/16)	400 (16)	✓	
6.0 (15/64)	450 (18)	✓	

Typical Chemical Composition of All-Weld Metal (%)

C	Si	Mn	P	S	Ni
0.06	0.54	1.12	0.015	0.006	0.96

Typical Mechanical Properties of All-Weld Metal

YS MPa(lbs/in ²)	TS MPa(lbs/in ²)	EL (%)	Temp °C(°F)	CVN-Impact Value J (ft·lbs)
540 (78,400)	620 (90,000)	26.0	-40 (-40)	80 (59)

Typical Welding Parameters / Amp.(A)

Diameter mm (in)	2.6 (3/32)	3.2 (1/8)	4.0 (5/32)	5.0 (3/16)	6.0 (15/64)
Length mm (in)	350 (14)	350 (14)	400 (16)	400 (16)	450 (18)
F	55~90	90~130	130~190	190~240	250~300
V-up, OH	50~80	80~120	120~170	-	-

SMAW

SAW

GMW

GTAW

FCAW

Non-FERROUS

APPENDIX

S-8018.C1

Type : Basic

Conformances

AWS A5.5/ ASME SFA5.5 E8018-C1

JIS Z3211 E5518-N5 AP L

EN ISO 2560-A-E46 5 2Ni B 3 2

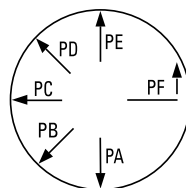
Applications

- Low temperature strength steel (2.5% Ni)
- Offshore structure

Features

- Good impact value at -60°C
- Iron powder and low hydrogen type electrode (high efficiency)

Welding Position



Current

AC or DC +

Redrying Conditions

300~350°C (572~662°F) X

0.5~1hr

Diameter / Packaging

Diameter mm (in)	Length mm (in)	Standard	
		packet 5kg(11lbs)	carton 20kg(44lbs)
2.6 (3/32)	350 (14)		✓
3.2 (1/8)	350 (14)		✓
4.0 (5/32)	400 (16)		✓
5.0 (3/16)	400 (16)		✓
6.0 (15/64)	450 (18)		✓

Typical Chemical Composition of All-Weld Metal (%)

C	Si	Mn	P	S	Ni
0.08	0.66	0.70	0.011	0.009	2.40

Typical Mechanical Properties of All-Weld Metal

YS MPa(lbs/in ²)	TS MPa(lbs/in ²)	EL (%)	Temp °C(°F)	CVN-Impact Value J (ft.-lbs)	Heat Treatment
518 (75,200)	593 (86,100)	30.2	-60 (-76)	78 (58)	605 (1121°F) X 1hr. S.R

Typical Welding Parameters / Amp.(A)

Diameter mm (in)	3.2 (1/8)	4.0 (5/32)	5.0 (3/16)	6.0 (15/64)
Length mm (in)	350 (14)	400 (16)	400 (16)	450 (18)
F	90~130	130~180	190~240	250~300
V-up, OH	80~120	120~170	-	-

S-8018.C3

Type : Basic

Conformances

AWS A5.5/ ASME SFA5.5 E8018-C3

JIS Z3211 E5518-N2

EN ISO 2560-A-E46 4 1Ni B 3 2

ABS AWS A5.5 E8018-C3

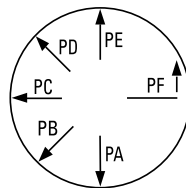
Applications

- Low temperature strength steel (1% Ni)
- Offshore structure

Features

- Good impact value at -40°C
- Iron powder and low hydrogen type electrode (high efficiency)

Welding Position



Current

AC or DC +

Redrying Conditions

300~350°C (572~662°F) X

0.5~1hr

Diameter / Packaging

Diameter mm (in)	Length mm (in)	Standard	
		packet 5kg(11lbs)	carton 20kg(44lbs)
2.6 (3/32)	350 (14)	✓	
3.2 (1/8)	350 (14)	✓	
4.0 (5/32)	400 (16)	✓	
5.0 (3/16)	400 (16)	✓	
6.0 (15/64)	450 (18)	✓	

Typical Chemical Composition of All-Weld Metal (%)

C	Si	Mn	P	S	Ni
0.07	0.59	1.00	0.020	0.009	0.94

Typical Mechanical Properties of All-Weld Metal

YS MPa(lbs/in ²)	TS MPa(lbs/in ²)	EL (%)	Temp °C(°F)	CVN-Impact Value J (ft·lbs)
540 (78,400)	619 (89,900)	30.8	-40 (-40)	76 (56)

Typical Welding Parameters / Amp.(A)

Diameter mm (in)	2.6 (3/32)	3.2 (1/8)	4.0 (5/32)	5.0 (3/16)	6.0 (15/64)
Length mm (in)	350 (14)	350 (14)	400 (16)	400 (16)	450 (18)
F	55~90	90~130	130~190	190~240	250~300
V-up, OH	50~80	80~120	120~170	-	-

SMW

SAW

GMW

GTAW

FCAW

Non-FERROUS

APPENDIX

S-7010.A1

Type : Cellulesic

Conformances

AWS A5.5/ ASME SFA5.5 E7010-A1

EN ISO 2560-A-E42 0 Mo C 1 5

ABS AWS A5.5 E7010-A1

LR 2Y

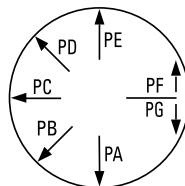
Applications

- Low alloy steel (0.5% Mo)
- Pipe line

Features

- Good X-ray performance
- Good mechanical properties

Welding Position



Current

DC ±

Redrying Conditions

70~100°C (158~212°F) X 0.5~1hr

Diameter / Packaging

Diameter mm (in)	Length mm (in)	Standard	
		packet 5kg(11lbs)	carton 20kg(44lbs)
2.6 (3/32)	350 (14)		✓
3.2 (1/8)	350 (14)		✓
4.0 (5/32)	400 (16)		✓
5.0 (3/16)	400 (16)		✓

Typical Chemical Composition of All-Weld Metal (%)

C	Si	Mn	P	S	Mo
0.09	0.12	0.32	0.015	0.015	0.61

Typical Mechanical Properties of All-Weld Metal

YS MPa(lbs/in ²)	TS MPa(lbs/in ²)	EL (%)	Heat Treatment
552 (80,000)	575 (83,400)	28.4	620°C(1148°F) X 1hr. S.R

Typical Welding Parameters / Amp.(A)

Diameter mm (in)	2.6 (3/32)	3.2 (1/8)	4.0 (5/32)	5.0 (3/16)
Length mm (in)	300 (12)	350 (14)	350 (14)	350 (14)
F & HF	55~80	80~120	120~160	160~210
V-up, OH	50~70	70~110	110~150	-

S-7016.A1

Type : Basic

Conformances

AWS A5.5/ ASME SFA5.5 E7016-A1

JIS Z3223 E4916-1M3

EN 1599 - EMo B 1 2

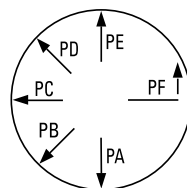
Applications

- Low alloy steel (0.5% Mo)
- Pressure vessels

Features

- Good mechanical properties
- Good bead appearance

Welding Position



Current

AC, DC ±

Redrying Conditions

300~350°C (572~662°F) X

0.5~1hr

Diameter / Packaging

Diameter mm (in)	Length mm (in)	Standard	
		packet 5kg(11lbs)	carton 20kg(44lbs)
2.6 (3/32)	350 (14)	✓	
3.2 (1/8)	350 (14)	✓	
4.0 (5/32)	400 (16)	✓	
5.0 (3/16)	400 (16)	✓	
6.0 (15/64)	450 (18)	✓	

Typical Chemical Composition of All-Weld Metal (%)

C	Si	Mn	P	S	Mo
0.07	0.50	0.80	0.012	0.008	0.60

Typical Mechanical Properties of All-Weld Metal

YS MPa(lbs/in ²)	TS MPa(lbs/in ²)	EL (%)	Heat Treatment
560 (81,000)	650 (94,000)	28.0	620°C(1148°F) X 1hr. S.R

Typical Welding Parameters / Amp.(A)

Diameter mm (in)	2.6 (3/32)	3.2 (1/8)	4.0 (5/32)	5.0 (3/16)	6.0 (15/64)
Length mm (in)	350 (14)	350 (14)	400 (16)	400 (16)	450 (18)
F & HF	55~90	90~130	130~190	190~240	250~300
V-up, OH	50~80	80~120	120~170	-	-

SMW

SAW

GMW

GTAW

FCAW

Non-FERROUS

APPENDIX

S-7018.A1

Type : Basic

Conformances

AWS A5.5/ ASME SFA5.5 E7018-A1

JIS Z3223 E4918-1M3

EN 1599 - EMo B 3 2

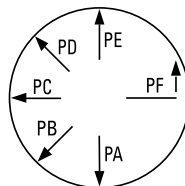
Applications

- Low alloy steel (0.5% Mo)
- Pressure vessels

Features

- Good mechanical properties
- Good bead appearance
- Iron powder type electrode (high efficiency)

Welding Position



Current

AC, DC ±

Redrying Conditions

300~350°C (572~662°F) X

0.5~1hr

Diameter / Packaging

Diameter	Length	Standard	
		packet	carton
mm (in)	mm (in)	5kg(11lbs)	20kg(44lbs)
2.6 (3/32)	350 (14)		✓
3.2 (1/8)	350 (14)		✓
4.0 (5/32)	400 (16)		✓
5.0 (3/16)	400 (16)		✓
6.0 (15/64)	450 (18)		✓

Typical Chemical Composition of All-Weld Metal (%)

C	Si	Mn	P	S	Mo
0.07	0.77	0.88	0.018	0.010	0.52

Typical Mechanical Properties of All-Weld Metal

YS MPa(lbs/in ²)	TS MPa(lbs/in ²)	EL (%)	Heat Treatment
477 (69,300)	617 (89,600)	32.8	620°C(1148°F) X 1hr. S.R

Typical Welding Parameters / Amp.(A)

Diameter mm (in)	2.6 (3/32)	3.2 (1/8)	4.0 (5/32)	5.0 (3/16)	6.0 (15/64)
Length mm (in)	350 (14)	350 (14)	400 (16)	400 (16)	450 (18)
F & HF	55~90	90~130	130~190	190~240	250~300
V-up, OH	50~80	80~120	120~170	-	-

S-8016.B1

Type : Basic

Conformances

AWS A5.5/ ASME SFA5.5 E8016-B1

EN 1599 - ECrMo0.5 B 1 2

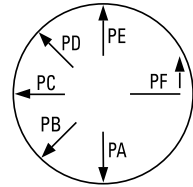
Applications

- Low alloy steel (0.5%Cr-0.5%Mo)
- Pressure vessels
- Power plant

Features

- Good crack resistance

Welding Position



Current

AC, DC ±

Redrying Conditions

300~350°C (572~662°F) X

0.5~1hr

Diameter / Packaging

Diameter mm (in)	Length mm (in)	Standard	
		packet 5kg(11lbs)	carton 20kg(44lbs)
2.6 (3/32)	350 (14)	✓	
3.2 (1/8)	350 (14)	✓	
4.0 (5/32)	400 (16)	✓	
5.0 (3/16)	400 (16)	✓	
6.0 (15/64)	450 (18)	✓	

Typical Chemical Composition of All-Weld Metal (%)

C	Si	Mn	P	S	Cr	Mo
0.05	0.57	0.85	0.012	0.005	0.51	0.51

Typical Mechanical Properties of All-Weld Metal

YS MPa(lbs/in ²)	TS MPa(lbs/in ²)	EL (%)	Heat Treatment
505 (73,300)	589 (85,500)	31.0	690°C(1274°F) X 1hr. S.R

Typical Welding Parameters / Amp.(A)

Diameter mm (in)	2.6 (3/32)	3.2 (1/8)	4.0 (5/32)	5.0 (3/16)	6.0 (15/64)
Length mm (in)	350 (14)	350 (14)	400 (16)	400 (16)	450 (18)
F & HF	55~90	90~130	130~190	190~240	250~300
V-up, OH	50~80	80~120	120~170	-	-

SMW

SAW

GMW

GTAW

FCAW

Non-FERROUS

APPENDIX

S-8016.B2

Type : Basic

Conformances

AWS A5.5/ ASME SFA5.5 E8016-B2

JIS Z3223 E5516-1CM

EN 1599 - ECrMo1 B 1 2

ABS AWS A5.5 E8016-B2

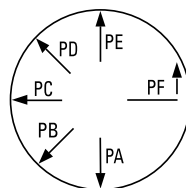
Applications

- Low alloy steel (1.25%Cr-0.5%Mo)
- Pressure vessels
- Power plant

Features

- Maximum service temperature at 550°C (1022°F)
- Good mechanical properties
- Good creep resistance

Welding Position



Current

AC, DC ±

Redrying Conditions

300~350°C (572~662°F) X

0.5~1hr

Diameter / Packaging

Diameter mm (in)	Length mm (in)	Standard	
		packet 5kg(11lbs)	carton 20kg(44lbs)
2.6 (3/32)	350 (14)		✓
3.2 (1/8)	350 (14)		✓
4.0 (5/32)	400 (16)		✓
5.0 (3/16)	400 (16)		✓
6.0 (15/64)	450 (18)		✓

Typical Chemical Composition of All-Weld Metal (%)

C	Si	Mn	P	S	Cr	Mo
0.07	0.51	0.66	0.012	0.008	1.22	0.54

Typical Mechanical Properties of All-Weld Metal

YS MPa(lbs/in ²)	TS MPa(lbs/in ²)	EL (%)	Heat Treatment
537 (78,000)	622 (90,300)	29.8	690°C(1274°F) X 1hr. S.R

Typical Welding Parameters / Amp.(A)

Diameter mm (in)	2.6 (3/32)	3.2 (1/8)	4.0 (5/32)	5.0 (3/16)	6.0 (15/64)
Length mm (in)	350 (14)	350 (14)	400 (16)	400 (16)	450 (18)
F & HF	55~90	90~130	130~190	190~240	250~300
V-up, OH	50~80	80~120	120~170	-	-

S-8016.B2R

Type : Basic

Conformances

AWS A5.5/ ASME SFA5.5 E8016-B2
JIS Z3223 E5516-1CM
EN 1599-ECrMo1 B 1 2 H5
ABS AWS A5.5 E8016-B2 (-30°C ≥27 J)

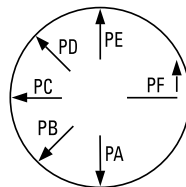
Applications

- Pressure vessels
- Powder plant
- Low alloy steel (1.25%Cr-0.5%Mo)

Features

- Fire-coal Energy plant, Oil refinery, High temperature/ chemical facility
- 2.25% Cr-1.0% Mo Steel welding
- Relevant elements P, Sn, As and Sb controlled (X-Factor ≤15ppm)
- Low-Hydrogen electrode (HDM ≤5ml/100g)
- Good impact value at low temperature

Welding Position



Current

AC or DC+

Redrying Conditions

350~400°C (662~752°F) X
0.5~1hr

Diameter / Packaging

Diameter mm (in)	Length mm (in)	Standard		Vacuum		Steel can	
		packet	carton	packet	carton	packet	carton
		5kg(11lbs)	20kg(44lbs)	5kg(11lbs)	20kg(44lbs)	4.5Kg(9.9lbs)	18Kg(40lbs)
2.6 (3/32)	350 (14)	✓		✓		✓	
3.2 (1/8)	350 (14)	✓		✓		✓	
4.0 (5/32)	400 (16)	✓		✓		✓	
5.0 (3/16)	400 (16)	✓		✓		✓	

SWAW

SAW

GMW

GTAW

FCW

Non-FERROUS

APPENDIX

Typical Chemical Composition of All-Weld Metal (%)

C	Si	Mn	P	S	Cr	Mo	Sb	X-factor
0.07	0.48	0.66	0.01	0.004	1.24	0.53	0.001	13ppm

$$\text{X-factor} = (10\text{P} + 5\text{Sb} + 4\text{Sn} + \text{As})/100 \leq 15 \text{ (ppm)}$$

Typical Mechanical Properties of All-Weld Metal

YS MPa(lbs/in ²)	TS MPa(lbs/in ²)	EL (%)	CVN-Impact Value J (ft·lbs)			Heat Treatment
			0°C (32°F)	-20°C (-4°F)	-30°C (-22°F)	
628 (91,100)	721 (104,600)	23.4	175 (129)	155 (114)	79 (58)	690°C(1274°F) X 1hr
491 (71,200)	591 (85,700)	28.8	225 (166)	203 (150)	183 (135)	690°C(1274°F) X 8hr

Typical Welding Parameters / Amp.(A)

Diameter mm (in)	2.6 (3/32)	3.2 (1/8)	4.0 (5/32)	5.0 (3/16)
Length mm (in)	350 (14)	350 (14)	400 (16)	400 (16)
F & HF	55~90	90~130	130~180	190~240
V-up, OH	50~80	80~120	120~170	-

S-8018.B2

Type : Basic

Conformances

AWS A5.5/ ASME SFA5.5 E8018-B2
JIS Z3223 E5518-1CM
EN 1599 - ECrMo1 B 3 2
ABS AWS A5.5 E8018-B2

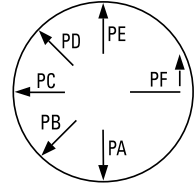
Applications

- Low alloy steel (1.25%Cr-0.5%Mo)

Features

- Iron powder and low hydrogen type electrode (high efficiency)
- Good mechanical properties
- Good creep resistance

Welding Position



Current

AC, DC ±

Redrying Conditions

300~350°C (572~662°F) X
0.5~1hr

Diameter / Packaging

Diameter mm (in)	Length mm (in)	Standard	
		packet 5kg(11lbs)	carton 20kg(44lbs)
2.6 (3/32)	350 (14)	✓	
3.2 (1/8)	350 (14)	✓	
4.0 (5/32)	400 (16)	✓	
5.0 (3/16)	400 (16)	✓	
6.0 (15/64)	450 (18)	✓	

Typical Chemical Composition of All-Weld Metal (%)

C	Si	Mn	P	S	Cr	Mo
0.08	0.32	0.75	0.012	0.005	1.20	0.50

Typical Mechanical Properties of All-Weld Metal

YS MPa(lbs/in ²)	TS MPa(lbs/in ²)	EL (%)	Heat Treatment
563 (82,000)	641 (93,000)	27.6	690°C(1274°F) X 1hr. S.R

Typical Welding Parameters / Amp.(A)

Diameter mm (in)	2.6 (3/32)	3.2 (1/8)	4.0 (5/32)	5.0 (3/16)	6.0 (15/64)
Length mm (in)	350 (14)	350 (14)	400 (16)	400 (16)	450 (18)
F & HF	55~90	90~130	130~190	190~240	250~300
V-up, OH	50~80	80~120	120~170	-	-

SMW

SAW

GMW

GTAW

FCAW

Non-FERROUS

APPENDIX

S-8018.B2R

Type : Basic

Conformances

AWS A5.5/ ASME SFA5.5 E8018-B2
JIS Z3223 E5518-1CM
EN 1599 - ECrMo1 B 3 2 H5

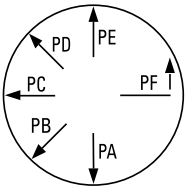
Applications

- Low alloy steel (1.25%Cr-0.5%Mo)

Features

- Relevant elements P, Sn, As and Sb controlled (X-Factor $\leq 15\text{ppm}$)
- Low-Hydrogen electrode (HDM $\leq 5\text{ml}/100\text{g}$)
- Iron powder type electrode (high efficiency)
- Good impact value at low temperature

Welding Position



Current

AC, DC $\pm$

Redrying Conditions

350~400°C (662~752°F) X
0.5~1hr

Diameter / Packaging

Diameter	Length	Standard		Vacuum				P.V.C	
		packet	carton	packet	carton	packet	carton	packet	carton
mm (in)	mm (in)	5kg(11lbs)	20kg(44lbs)	1.5kg(3.3lbs)	15kg(3.3lbs)	5kg(11lbs)	20kg(44lbs)	5kg(11lbs)	20kg(44lbs)
2.6 (3/32)	350 (14)			✓		✓		✓	
3.2 (1/8)	350 (14)			✓		✓		✓	
4.0 (5/32)	400 (16)			✓		✓		✓	
5.0 (3/16)	400 (16)			✓		✓		✓	

Typical Chemical Composition of All-Weld Metal (%)

C	Si	Mn	P	S	Cr	Mo	Sn	As	Sb	X-factor
0.069	0.57	0.82	0.007	0.010	1.32	0.58	0.0050	0.0020	0.0010	10.4ppm

$X\text{-factor} = (10P + 5Sb + 4Sn + As)/100 \leq 15 \text{ (ppm)}$

Typical Mechanical Properties of All-Weld Metal

YS MPa(lbs/in ²)	TS MPa(lbs/in ²)	EL (%)	Temp °C(°F)	CVN-Impact Value J (ft.lbs)	Heat Treatment
608 (88,200)	684 (99,200)	25.4	0 (32) -20 (-4)	144 (106) 62 (46)	690°C(1274°F) X 1hr. S.R
606 (87,900)	661 (95,900)	27.2	0 (32) -20 (-4)	143 (106) 91 (67)	690°C(1274°F) X 2hr. S.R

Typical Welding Parameters / Amp.(A)

Diameter mm (in)	2.6 (3/32)	3.2 (1/8)	4.0 (5/32)	5.0 (3/16)
Length mm (in)	350 (14)	350 (14)	400 (16)	400 (16)
F & HF	55-90	90-130	130-190	190-240
V-up, OH	50-80	80-120	120-180	-

SMW

SAW

GMW

GTAW

FCAW

Non-FERROUS

APPENDIX

S-9016.B3

Type : Basic

Conformances

AWS A5.5/ ASME SFA5.5 E9016-B3

JIS Z3223 E6216-2C1M

EN 1599 - ECrMo2 B 1 2

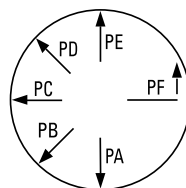
Applications

- Low alloy steel (2.25%Cr-1%Mo)
- Pressure vessels
- Power plant

Features

- Maximum service temperature at 600°C (1112°F)
- Good mechanical properties
- Good creep resistance

Welding Position



Current

AC, DC ±

Redrying Conditions

300~350°C (572~662°F) X

0.5~1hr

Diameter / Packaging

Diameter	Length	Standard	
		packet	carton
mm (in)	mm (in)	5kg(11lbs)	20kg(44lbs)
2.6 (3/32)	350 (14)		✓
3.2 (1/8)	350 (14)		✓
4.0 (5/32)	400 (16)		✓
5.0 (3/16)	400 (16)		✓
6.0 (15/64)	450 (18)		✓

Typical Chemical Composition of All-Weld Metal (%)

C	Si	Mn	P	S	Cr	Mo
0.07	0.57	0.82	0.022	0.012	2.32	1.07

Typical Mechanical Properties of All-Weld Metal

YS MPa(lbs/in ²)	TS MPa(lbs/in ²)	EL (%)	Heat Treatment
554 (80,500)	663 (96,300)	25.6	690°C(1274°F) X 1hr. S.R

Typical Welding Parameters / Amp.(A)

Diameter mm (in)	2.6 (3/32)	3.2 (1/8)	4.0 (5/32)	5.0 (3/16)	6.0 (15/64)
Length mm (in)	350 (14)	350 (14)	400 (16)	400 (16)	450 (18)
F & HF	55~90	90~130	130~190	190~240	250~300
V-up, OH	50~80	80~120	120~170	-	-

S-9016.B3R

Type : Basic

Conformances

AWS A5.5/ ASME SFA5.5 E9016-B3
JIS Z3223 E6216-2C1M
EN 1599 - ECrMo2 B 1 2 H5
ABS AWS A5.5 E9016-B3 (-30°C ≥27 J)

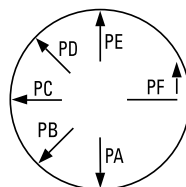
Applications

- Pressure vessels
- Powder plant
- Low alloy steel (2.25%Cr-1.0%Mo)

Features

- Fire-coal Energy plant, Oil refinery, High temperature/ chemical facility
- 2.25% Cr-1.0% Mo Steel welding
- Relevant elements P, Sn, As and Sb controlled (X-Factor ≤15ppm)
- Low-Hydrogen electrode (HDM ≤5ml/100g)
- Good impact value at low temperature

Welding Position



Current

AC or DC+

Redrying Conditions

350~400°C (662~752°F) X
0.5~1hr

Diameter / Packaging

Diameter mm (in)	Length mm (in)	Standard		Vacuum		Steel can	
		packet	carton	packet	carton	packet	carton
		5kg(11lbs)	20kg(44lbs)	5kg(11lbs)	20kg(44lbs)	4.5Kg(9.9lbs)	18Kg(40lbs)
2.6 (3/32)	350 (14)	✓		✓		✓	
3.2 (1/8)	350 (14)	✓		✓		✓	
4.0 (5/32)	400 (16)	✓		✓		✓	
5.0 (3/16)	400 (16)	✓		✓		✓	

SWAW

SAW

GMW

GTAW

FCW

Non-FERROUS

APPENDIX

Typical Chemical Composition of All-Weld Metal (%)

C	Si	Mn	P	S	Cr	Mo	Sb	X-factor
0.09	0.46	0.83	0.011	0.004	2.35	0.98	0.001	13ppm

$$\text{X-factor} = (10\text{P} + 5\text{Sb} + 4\text{Sn} + \text{As})/100 \leq 15 \text{ (ppm)}$$

Typical Mechanical Properties of All-Weld Metal

YS MPa(lbs/in ²)	TS MPa(lbs/in ²)	EL (%)	CVN-Impact Value J (ft·lbs)			Heat Treatment
			0°C (32°F)	-20°C (-4°F)	-30°C (-22°F)	
675 (97,900)	759 (110,000)	23.2	139 (103)	116 (86)	103 (76)	690°C(1274°F) X 1hr
623 (90,400)	680 (98,600)	22.4	145 (107)	111 (82)	108 (80)	690°C(1274°F) X 8hr

Typical Welding Parameters / Amp.(A)

Diameter mm (in)	2.6 (3/32)	3.2 (1/8)	4.0 (5/32)	5.0 (3/16)
Length mm (in)	350 (14)	350 (14)	400 (16)	400 (16)
F & HF	55~90	90~130	130~180	190~240
V-up, OH	50~80	80~120	120~170	-

S-9018.B3

Type : Basic

Conformances

AWS A5.5/ ASME SFA5.5 E9018-B3
JIS Z3223 E6218-2C1M
EN 1599 - ECrMo2 B 3 2
KR AWS A5.5 E9018-B3
ABS AWS A5.5 E9018-B3
LR AWS A5.5 E9018-B3
DNV-GL -(H10)

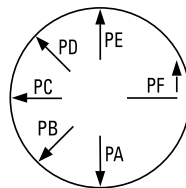
Applications

- Low alloy steel (2.25%Cr-1%Mo)

Features

- Maximum service temperature at 600°C (1112°F)
- Good mechanical properties
- Good creep resistance
- Iron powder low hydrogen type electrode (high efficiency)

Welding Position



Current

AC, DC ±

Redrying Conditions

300~350°C (572~662°F) X
0.5~1hr

Diameter / Packaging

Diameter mm (in)	Length mm (in)	Standard	
		packet 5kg(11lbs)	carton 20kg(44lbs)
2.6 (3/32)	350 (14)	✓	
3.2 (1/8)	350 (14)	✓	
4.0 (5/32)	400 (16)	✓	
5.0 (3/16)	400 (16)	✓	
6.0 (15/64)	450 (18)	✓	

Typical Chemical Composition of All-Weld Metal (%)

C	Si	Mn	P	S	Cr	Mo
0.08	0.64	0.83	0.020	0.011	2.11	1.0

Typical Mechanical Properties of All-Weld Metal

YS MPa(lbs/in²)	TS MPa(lbs/in²)	EL (%)	Heat Treatment
570 (82,800)	677 (98,300)	24.2	690°C(1274°F) X 1hr. S.R

Typical Welding Parameters / Amp.(A)

Diameter mm (in)	2.6 (3/32)	3.2 (1/8)	4.0 (5/32)	5.0 (3/16)	6.0 (15/64)
Length mm (in)	350 (14)	350 (14)	400 (16)	400 (16)	450 (18)
F & HF	55~90	90~130	130~190	190~240	250~300
V-up, OH	50~80	80~120	120~170	-	-

SMW

SAW

GMW

GTAW

FCAW

Non-FERROUS

APPENDIX

S-9018.B3R

Type : Basic

Conformances

AWS A5.5/ ASME SFA5.5 E9018-B3
JIS Z3223 E6218-2C1M
EN 1599 - ECrMo2 B 3 2 H5

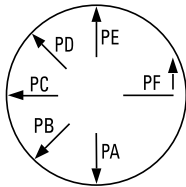
Applications

- Low alloy steel (2.25%Cr-1%Mo)

Features

- Relevant elements P, Sn, As and Sb controlled (X-Factor $\leq 15\text{ppm}$)
- Low-Hydrogen electrode (HDM $\leq 5\text{ml}/100\text{g}$)
- Iron powder type electrode (high efficiency)
- Good impact value at low temperature

Welding Position



Current

AC, DC $\pm$

Redrying Conditions

350~400°C (662~752°F) X
0.5~1hr

Diameter / Packaging

Diameter	Length	Standard		Vacuum				P.V.C	
		packet	carton	packet	carton	packet	carton	packet	carton
mm (in)	mm (in)	5kg(11lbs)	20kg(44lbs)	1.5kg(3.3lbs)	15kg(3.3lbs)	5kg(11lbs)	20kg(44lbs)	5kg(11lbs)	20kg(44lbs)
2.6 (3/32)	350 (14)			✓		✓		✓	
3.2 (1/8)	350 (14)			✓		✓		✓	
4.0 (5/32)	400 (16)			✓		✓		✓	
5.0 (3/16)	400 (16)			✓		✓		✓	

Typical Chemical Composition of All-Weld Metal (%)

C	Si	Mn	P	S	Cr	Mo	Sn	As	Sb	X-factor
0.072	0.62	0.79	0.009	0.010	2.22	0.97	0.0060	0.0020	0.0070	13.1ppm

$X\text{-factor} = (10P + 5Sb + 4Sn + As)/100 \leq 15 \text{ (ppm)}$

Typical Mechanical Properties of All-Weld Metal

YS MPa(lbs/in ²)	TS MPa(lbs/in ²)	EL (%)	Temp °C(°F)	CVN-Impact Value J (ft.lbs)	Heat Treatment
632 (91,700)	721 (104,600)	23.8	0 (32) -20 (-4)	121 (89) 81 (60)	690°C(1274°F) X 1hr. S.R
606 (87,900)	703 (102,000)	25.2	0 (32) -20 (-4)	132 (97) 105 (77)	690°C(1274°F) X 2hr. S.R

Typical Welding Parameters / Amp.(A)

Diameter mm (in)	2.6 (3/32)	3.2 (1/8)	4.0 (5/32)	5.0 (3/16)
Length mm (in)	350 (14)	350 (14)	400 (16)	400 (16)
F & HF	55-90	90-130	130-190	190-240
V-up, OH	50-80	80-120	120-180	-

SMW

SAW

GMW

GTAW

FCAW

Non-FERROUS

APPENDIX

S-8016.B5

Type : Basic

Conformances

AWS A5.5/ ASME SFA5.5 E8016-B5

EN 1599 - ECrMo5 B 1 2

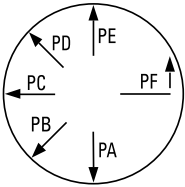
Applications

- Low alloy steel (0.5%Cr-1%Mo)

Features

- Good mechanical properties

Welding Position



Current

AC, DC ±

Redrying Conditions

300~350°C (572~662°F) X

0.5~1hr

Diameter / Packaging

Diameter	Length	Standard	
		packet	carton
mm (in)	mm (in)	5kg(11lbs)	20kg(44lbs)
2.6 (3/32)	350 (14)		✓
3.2 (1/8)	350 (14)		✓
4.0 (5/32)	400 (16)		✓
5.0 (3/16)	400 (16)		✓
6.0 (15/64)	450 (18)		✓

Typical Chemical Composition of All-Weld Metal (%)

C	Si	Mn	P	S	Cr	Mo
0.10	0.48	0.59	0.019	0.009	0.51	1.0

Typical Mechanical Properties of All-Weld Metal

YS MPa(lbs/in ²)	TS MPa(lbs/in ²)	EL (%)	Heat Treatment
555 (80,600)	663 (96,300)	27.8	690°C(1274°F) X 1hr. S.R

Typical Welding Parameters / Amp.(A)

Diameter mm (in)	2.6 (3/32)	3.2 (1/8)	4.0 (5/32)	5.0 (3/16)	6.0 (15/64)
Length mm (in)	350 (14)	350 (14)	400 (16)	400 (16)	450 (18)
F & HF	55~90	90~130	130~190	190~240	250~300
V-up, OH	50~80	80~120	120~170	-	-

S-8016.B6

Type : Basic

Conformances

AWS A5.5/ ASME SFA5.5 E8016-B6
JIS Z3223 DT2516
EN 1599 - ECrMo5 B 1 2

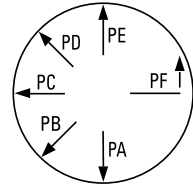
Applications

- Low alloy steel (5%Cr-0.5%Mo)

Features

- Low hydrogen type electrode
- Good creep resistance at high temperature
- Good crack resistance

Welding Position



Current

AC, DC ±

Redrying Conditions

300~350°C (572~662°F) X
0.5~1hr

Diameter / Packaging

Diameter mm (in)	Length mm (in)	Standard		Vacuum				P.V.C	
		packet 5kg(11lbs)	carton 20kg(44lbs)	packet 1.5kg(3.3lbs)	carton 15kg(3.3lbs)	packet 5kg(11lbs)	carton 20kg(44lbs)	packet 5kg(11lbs)	carton 20kg(44lbs)
2.6 (3/32)	350 (14)	✓		✓		✓		✓	
3.2 (1/8)	350 (14)	✓		✓		✓		✓	
4.0 (5/32)	350 (14)	✓		✓		✓		✓	
	400 (16)	✓		✓		✓		✓	
5.0 (3/16)	400 (16)	✓		✓		✓		✓	

SWAW

SAW

GMW

GTAW

FCW

Non-FERROUS

APPENDIX

Typical Chemical Composition of All-Weld Metal (%)

C	Si	Mn	P	S	Cr	Ni	Mo
0.06	0.57	0.85	0.005	0.004	5.45	0.02	0.51

Typical Mechanical Properties of All-Weld Metal

YS MPa(lbs/in ²)	TS MPa(lbs/in ²)	EL (%)	Temp °C(°F)	CVN-Impact Value J (ft-lbs)	Heat Treatment
570 (82,700)	670 (97,200)	22	0 (32)	136 (100)	740°C(1364°F) X 1hr. S.R

Typical Welding Parameters / Amp.(A)

Diameter mm (in)	2.6 (3/32)	3.2 (1/8)	4.0 (5/32)	5.0 (3/16)
Length mm (in)	350 (14)	350 (14)	400 (16)	400 (16)
F	50~90	80~120	120~160	160~210
V-up, OH	50~80	70~110	90~130	-

S-8015.B8

Type : Basic

Conformances

AWS A5.5/ ASME SFA5.5 E8015-B8

EN 1599 - ECrMo9 B 3 2 H5

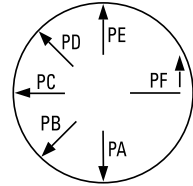
Applications

- Pressure vessels
- Powder plant
- Low alloy steel (9%Cr-1%Mo)

Features

- 9% Cr Steel Welding for superheated pipe (boilers and refinery)
- Good resistance for high temperature creep
- Anti-temperature / Anti-Corrosion

Welding Position



Current

DC +

Redrying Conditions

350~400°C (662~752°F) X

0.5~1hr

Diameter / Packaging

Diameter mm (in)	Length mm (in)	Standard		Vacuum	
		packet 5kg(11lbs)	carton 20kg(44lbs)	packet 5kg(11lbs)	carton 20kg(44lbs)
2.6 (3/32)	350 (14)	✓		✓	
3.2 (1/8)	350 (14)	✓		✓	
4.0 (5/32)	400 (16)	✓		✓	
5.0 (3/16)	400 (16)	✓		✓	

SWAW

SAW

GMWAW

GTAW

FCWAW

Non-FERROUS

APPENDIX

Typical Chemical Composition of All-Weld Metal (%)

C	Si	Mn	P	S	Cr	Ni	Mo
0.08	0.27	0.72	0.008	0.005	8.81	0.19	0.94

Typical Mechanical Properties of All-Weld Metal

YS MPa(lbs/in ²)	TS MPa(lbs/in ²)	EL (%)	Temp °C(°F)	CVN-Impact Value J (ft.-lbs)	Heat Treatment
628 (91,100)	721 (104,600)	23.4	20 (68) 0 (32)	36 (27) 32 (24)	740°C(1364°F) X 1hr

Typical Welding Parameters / Amp.(A)

Diameter mm (in)	2.6 (3/32)	3.2 (1/8)	4.0 (5/32)	5.0 (3/16)
Length mm (in)	350 (14)	400 (16)	400 (16)	450 (18)
F	70~100	90~130	130~170	170~220
V-up, OH	60~90	80~120	100~150	-

S-9015.B9

Type : Basic

Conformances

AWS A5.5/ ASME SFA5.5 E9015-B91

JIS Z3223 E6215-9C1MV

EN 1599 - ECrMo91 B 4 2 H5

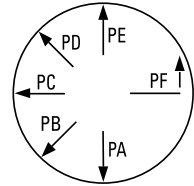
Applications

- Heat resistant steel (9%Cr-1%Mo)

Features

- Good creep resistance at high temperature
- Maximum service temperature at 650°C (1202°F)
- Low-Hydrogen electrode (HDM ≤5ml/100g)
- Good performance with DCEP

Welding Position



Current

DC ±

Redrying Conditions

350~400°C (662~752°F) X

0.5~1hr

Diameter / Packaging

Diameter mm (in)	Length mm (in)	Standard		Vacuum				P.V.C	
		packet 5kg(11lbs)	carton 20kg(44lbs)	packet 1.5kg(3.3lbs)	carton 15kg(3.3lbs)	packet 5kg(11lbs)	carton 20kg(44lbs)	packet 5kg(11lbs)	carton 20kg(44lbs)
2.6 (3/32)	350 (14)	✓		✓		✓		✓	
3.2 (1/8)	350 (14)	✓		✓		✓		✓	
4.0 (5/32)	350 (14)	✓		✓		✓		✓	
	400 (16)	✓		✓		✓		✓	
5.0 (3/16)	400 (16)	✓		✓		✓		✓	

SWAW

SAW

GMW

GTAW

FCW

Non-FERROUS

APPENDIX

Typical Chemical Composition of All-Weld Metal (%)

C	Si	Mn	P	S	Cr	Ni	Mo	V	Nb	N
0.10	0.24	0.90	0.008	0.006	9.25	0.50	0.99	0.25	0.023	0.043

Typical Mechanical Properties of All-Weld Metal

YS MPa(lbs/in ²)	TS MPa(lbs/in ²)	EL (%)	Temp °C(°F)	CVN-Impact Value J (ft.-lbs)	Heat Treatment
604 (87,600)	746 (108,200)	22.2	20 (68)	71 (52)	760°C(1400°F) X 2hr. S.R
684 (99,200)	733 (106,300)	25.2	20 (68)	85 (63)	760°C(1400°F) X 4hr. S.R

Typical Welding Parameters / Amp.(A)

Diameter mm (in)	2.6 (3/32)	3.2 (1/8)	4.0 (5/32)		5.0 (3/16)
Length mm (in)	350 (14)	350 (14)	350 (14)	400 (16)	400 (16)
F & HF	55-90	90~130	130~190	130~190	190~240
V-up, OH	50~80	80~120	120~180	120~180	-

S-9016.B9

Type : Basic

Conformances

AWS A5.5/ ASME SFA5.5 E9016-B91

JIS Z3223 E6216-9C1MV

EN 1599 - ECrMo91 B 3 2 H5

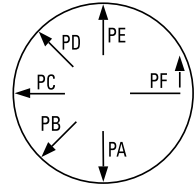
Applications

- Heat resistant steel (9%Cr-1%Mo)

Features

- Good creep resistance at high temperature
- Maximum service temperature at 650°C (1202°F)
- Low-Hydrogen electrode (HDM ≤5ml/100g)

Welding Position



Current

AC, DC ±

Redrying Conditions

350~400°C (662~752°F) X

0.5~1hr

Diameter / Packaging

Diameter	Length	Standard		Vacuum				P.V.C	
		packet	carton	packet	carton	packet	carton	packet	carton
mm (in)	mm (in)	5kg(11lbs)	20kg(44lbs)	1.5kg(3.3lbs)	15kg(3.3lbs)	5kg(11lbs)	20kg(44lbs)	5kg(11lbs)	20kg(44lbs)
2.6 (3/32)	350 (14)	✓		✓		✓		✓	
3.2 (1/8)	350 (14)	✓		✓		✓		✓	
4.0 (5/32)	350 (14)	✓		✓		✓		✓	
	400 (16)	✓		✓		✓		✓	
5.0 (3/16)	400 (16)	✓		✓		✓		✓	

SWAW

SAW

GMW

GTAW

FCW

Non-FERROUS

APPENDIX

Typical Chemical Composition of All-Weld Metal (%)

C	Si	Mn	P	S	Cr	Ni	Mo	V	Nb	N
0.10	0.24	1.00	0.009	0.006	9.07	0.45	1.00	0.22	0.036	0.035

Typical Mechanical Properties of All-Weld Metal

YS MPa(lbs/in ²)	TS MPa(lbs/in ²)	EL (%)	Temp °C(°F)	CVN-Impact Value J (ft-lbs)	Heat Treatment
660 (95,700)	762 (110,500)	24.8	20 (68)	71 (52)	760°C(1400°F) X 2hr. S.R

Typical Welding Parameters / Amp.(A)

Diameter mm (in)	2.6 (3/32)	3.2 (1/8)	4.0 (5/32)		5.0 (3/16)
Length mm (in)	350 (14)	350 (14)	350 (14)	400 (16)	400 (16)
F & HF	80~110	110~150	150~200	150~200	190~240
V-up, OH	70~100	100~140	140~200	140~200	-

S-240A.R

Type : Rutile

Conformances

JIS Z3251 DF2A-250-R

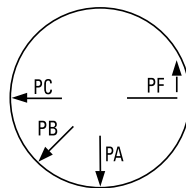
Applications

- Hardfacing of rollers, gears, crane wheels and abrasive parts

Features

- Light abrasive resistance, impact resistance
- Good cutting properties
- Stable arc
- Easy to remove slag
- Low spatter
- Good bead appearance

Welding Position



Current

AC or DC ±

Redrying Conditions

100°C (212°F) X 1hr

Diameter / Packaging

Diameter mm (in)	Length mm (in)	Standard	
		packet 5kg(11lbs)	carton 20kg(44lbs)
2.6 (3/32)	350 (14)	✓	
3.2 (1/8)	350 (14)	✓	
4.0 (5/32)	400 (16)	✓	
5.0 (3/16)	400 (16)	✓	
6.0 (15/64)	450 (18)	✓	

Typical Chemical Composition of All-Weld Metal (%)

C	Si	Mn	P	S	Cr
0.10	0.37	0.49	0.017	0.009	0.89

Typical Mechanical Properties of All-Weld Metal

Preheat & Interpass Temp.°C(°F)	Postheat	Heat Treatment	Hardness (HB)
150 (302)	-	-	240
-	-	650°C (1202°F) Tempering	200
-	-	900°C (1652°F), O.Q	330

Typical Welding Parameters / Amp.(A)

Diameter mm (in)	2.6 (3/32)	3.2 (1/8)	4.0 (5/32)	5.0 (3/16)	6.0 (15/64)
Length mm (in)	350 (14)	350 (14)	400 (16)	400 (16)	450 (18)
F & HF	50~85	80~130	130~180	180~240	210~280
V-up, OH	45~70	70~120	120~160	-	-

SWAW

SAW

GMWAW

GTAW

FCAW

Non-FERROUS

APPENDIX

S-350A.R

Type : Rutile

Conformances

JIS Z3251 DF2A-350-R

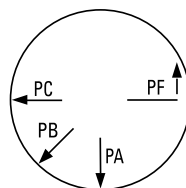
Applications

- Hardfacing of rollers, gears, crane wheels and abrasive parts

Features

- Medium abrasive resistance, impact resistance
- Machining / Quenching possible
- Easy to remove slag
- Good bead appearance

Welding Position



Current

AC or DC $\pm$

Redrying Conditions

100°C (212°F) X 1hr

Diameter / Packaging

Diameter	Length	Standard	
		packet	carton
mm (in)	mm (in)	5kg(11lbs)	20kg(44lbs)
2.6 (3/32)	350 (14)		✓
3.2 (1/8)	350 (14)		✓
4.0 (5/32)	400 (16)		✓
5.0 (3/16)	400 (16)		✓
6.0 (15/64)	450 (18)		✓

Typical Chemical Composition of All-Weld Metal (%)

C	Si	Mn	P	S	Cr
0.10	0.50	1.00	0.010	0.007	2.40

Typical Mechanical Properties of All-Weld Metal

Preheat & Interpass Temp.°C(°F)	Postheat	Heat Treatment	Hardness (HB)
150 (302)	-	-	370
-	-	650°C (1202°F) Tempering	280
-	-	850°C (1562°F), O.Q	430

Typical Welding Parameters / Amp.(A)

Diameter mm (in)	2.6 (3/32)	3.2 (1/8)	4.0 (5/32)	5.0 (3/16)	6.0 (15/64)
Length mm (in)	350 (14)	350 (14)	400 (16)	400 (16)	450 (18)
F & HF	55~90	90~140	140~190	190~240	220~300
V-up, OH	50~80	80~130	110~160	-	-

S-260A.B

Type : Basic

Conformances

JIS Z3251 DF2A-300-B

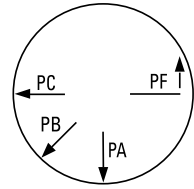
Applications

- Hardfacing of rollers, gears, crane wheels and abrasive parts

Features

- Light abrasive resistance, impact resistance
- Good cutting properties
- Easy to remove slag
- Low spatter
- Good bead appearance

Welding Position



Current

AC or DC ±

Redrying Conditions

350°C (662°F) X 1hr

Diameter / Packaging

Diameter mm (in)	Length mm (in)	Standard	
		packet 5kg(11lbs)	carton 20kg(44lbs)
2.6 (3/32)	350 (14)	✓	
3.2 (1/8)	350 (14)	✓	
4.0 (5/32)	400 (16)	✓	
5.0 (3/16)	400 (16)	✓	
6.0 (15/64)	450 (18)	✓	

Typical Chemical Composition of All-Weld Metal (%)

C	Si	Mn	P	S	Cr
0.15	0.68	2.15	0.015	0.007	0.05

Typical Mechanical Properties of All-Weld Metal

Preheat & Interpass Temp.°C(°F)	Postheat	Heat Treatment	Hardness (HB)
150 (302)	-	-	260
-	-	650°C (1202°F) Tempering	240
-	-	900°C (1652°F), O.Q	380

Typical Welding Parameters / Amp.(A)

Diameter mm (in)	2.6 (3/32)	3.2 (1/8)	4.0 (5/32)	5.0 (3/16)	6.0 (15/64)
Length mm (in)	350 (14)	350 (14)	400 (16)	400 (16)	450 (18)
F & HF	55~90	90~140	140~190	190~240	220~300
V-up, OH	50~80	80~130	110~160	-	-

SWAW

SAW

GMWAW

GTAW

FCAW

Non-FERROUS

APPENDIX

S-350B.B

Type : Basic

Conformances

JIS Z3251 DF2A-400-B

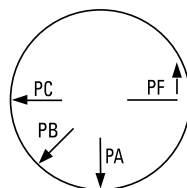
Applications

- Hardfacing of rollers, gears, crane wheels and abrasive parts

Features

- Medium abrasive resistance, impact resistance
- Machining possible
- Low spatter
- Good bead appearance
- Hardness increased by quenching after machining

Welding Position



Current

AC or DC ±

Redrying Conditions

350°C (662°F) X 1hr

Diameter / Packaging

Diameter	Length	Standard	
		packet	carton
mm (in)	mm (in)	5kg(11lbs)	20kg(44lbs)
2.6 (3/32)	350 (14)		✓
3.2 (1/8)	350 (14)		✓
4.0 (5/32)	400 (16)		✓
5.0 (3/16)	400 (16)		✓
6.0 (15/64)	450 (18)		✓

Typical Chemical Composition of All-Weld Metal (%)

C	Si	Mn	P	S	Cr
0.26	0.82	1.44	0.015	0.009	1.88

Typical Mechanical Properties of All-Weld Metal

Preheat & Interpass Temp.°C(°F)	Postheat	Heat Treatment	Hardness (HB)
150 (302)	-	-	390
-	-	650°C (1202°F) Tempering	280
-	-	850°C (1562°F), O.Q	470

Typical Welding Parameters / Amp.(A)

Diameter mm (in)	2.6 (3/32)	3.2 (1/8)	4.0 (5/32)	5.0 (3/16)	6.0 (15/64)
Length mm (in)	350 (14)	350 (14)	400 (16)	400 (16)	450 (18)
F & HF	55~90	90~140	140~190	190~240	220~300
V-up, OH	50~80	80~130	110~160	-	-

S-450B.B

Type : Basic

Conformances

JIS Z3251 DF2A-450-B

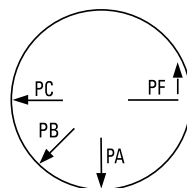
Applications

- Hardfacing of rollers, gears, crane wheels and abrasive parts

Features

- Mixed metal structure of austenite and martensite
- Under-lay with low hydrogen type carbon steel electrode
- Preheat at more than 150°C(302°F)

Welding Position



Current

AC or DC ±

Redrying Conditions

350°C (662°F) X 1 hr

Diameter / Packaging

Diameter	Length	Standard	
		packet	carton
mm (in)	mm (in)	5kg(11lbs)	20kg(44lbs)
2.6 (3/32)	350 (14)	✓	
3.2 (1/8)	350 (14)	✓	
4.0 (5/32)	400 (16)	✓	
5.0 (3/16)	400 (16)	✓	
6.0 (15/64)	450 (18)	✓	

Typical Chemical Composition of All-Weld Metal (%)

C	Si	Mn	P	S	Cr	Mo
0.30	1.06	0.56	0.019	0.01	1.64	0.63

Typical Mechanical Properties of All-Weld Metal

Preheat & Interpass Temp.°C(°F)	Postheat	Heat Treatment	Hardness (HB)
150 (302)	-	-	420
300 (572)	-	-	380
-	-	650°C (1202°F) 6hr.F.C	410
-	-	625°C (1157°F) 6hr.F.C	330

Typical Welding Parameters / Amp.(A)

Diameter mm (in)	2.6 (3/32)	3.2 (1/8)	4.0 (5/32)	5.0 (3/16)	6.0 (15/64)
Length mm (in)	350 (14)	350 (14)	400 (16)	400 (16)	450 (18)
F & HF	55~90	90~140	140~190	190~240	220~300
V-up, OH	50~80	80~130	110~160	-	-

SWAW

SAW

GM/MAW

GTAW

FCAW

Non-FERROUS

APPENDIX

S-500B.B

Type : Basic

Conformances

JIS Z3251 DF2B-500-B

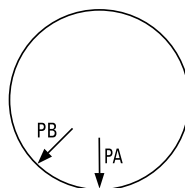
Applications

- Hardfacing of rollers, gears, crane wheels and abrasive parts

Features

- Under-lay with low hydrogen type carbon steel electrode
- Preheat at more than 150°C(302°F)
- Machining difficult

Welding Position



Current

AC or DC ±

Redrying Conditions

350°C (662°F) X 1hr

Diameter / Packaging

Diameter mm (in)	Length mm (in)	Standard	
		packet 5kg(11lbs)	carton 20kg(44lbs)
2.6 (3/32)	350 (14)		✓
3.2 (1/8)	350 (14)		✓
4.0 (5/32)	400 (16)		✓
5.0 (3/16)	400 (16)		✓
6.0 (15/64)	450 (18)		✓

Typical Chemical Composition of All-Weld Metal (%)

C	Si	Mn	P	S	Cr	Mo
0.41	0.75	1.73	0.018	0.007	1.60	0.86

Typical Mechanical Properties of All-Weld Metal

Preheat & Interpass Temp.°C(°F)	Postheat	Heat Treatment	Hardness (HB)
150 (302)	-	-	520
300 (572)	-	-	480

Typical Welding Parameters / Amp.(A)

Diameter mm (in)	2.6 (3/32)	3.2 (1/8)	4.0 (5/32)	5.0 (3/16)	6.0 (15/64)
Length mm (in)	350 (14)	350 (14)	400 (16)	400 (16)	450 (18)
F & HF	55~90	90~140	140~190	190~240	220~300

S-600B.B

Type : Basic

Conformances

JIS Z3251 DF2B-600-B

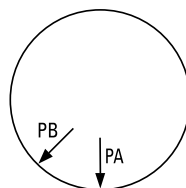
Applications

- Hardfacing of rollers, gears, crane wheels and abrasive parts

Features

- Under-lay with low hydrogen type carbon steel electrode
- Preheat at more than 150°C(302°F)
- Suitable for soil abrasion
- Martensite structure (All-weld metal)

Welding Position



Current

AC or DC ±

Redrying Conditions

350°C (662°F) X 1hr

Diameter / Packaging

Diameter	Length	Standard	
		packet	carton
mm (in)	mm (in)	5kg(11lbs)	20kg(44lbs)
2.6 (3/32)	350 (14)		✓
3.2 (1/8)	350 (14)		✓
4.0 (5/32)	400 (16)		✓
5.0 (3/16)	400 (16)		✓
6.0 (15/64)	450 (18)		✓

Typical Chemical Composition of All-Weld Metal (%)

C	Si	Mn	P	S	Cr	Mo
0.52	1.10	1.61	0.022	0.009	3.90	1.34

Typical Mechanical Properties of All-Weld Metal

Preheat & Interpass Temp.°C(°F)	Postheat	Heat Treatment	Hardness (HB)
150 (302)	-	-	540
300 (572)	-	-	500
600 (1112)	-	-	450

Typical Welding Parameters / Amp.(A)

Diameter mm (in)	2.6 (3/32)	3.2 (1/8)	4.0 (5/32)	5.0 (3/16)	6.0 (15/64)
Length mm (in)	350 (14)	350 (14)	400 (16)	400 (16)	450 (18)
F & HF	55~90	90~140	140~190	190~240	220~300

SMAW

SAW

GMW

GTAW

FCAW

Non-FERROUS

APPENDIX

S-700B.B

Type : Basic

Conformances

JIS Z3251 DF3C-600-B

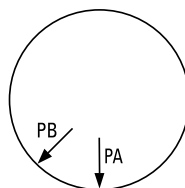
Applications

- Hardfacing of rollers, gears, crane wheels and abrasive parts

Features

- Preheat at more than 150°C(302°F)
- Postheat at about 600°C(1112°F), if possible
- Martensite structure (All-weld metal)
- Machining impossible (As welded)
- Mostly suitable for soil abrasion

Welding Position



Current

AC or DC ±

Redrying Conditions

350°C (662°F) X 1hr

Diameter / Packaging

Diameter	Length	Standard	
		packet	carton
mm (in)	mm (in)	5kg(11lbs)	20kg(44lbs)
2.6 (3/32)	350 (14)		✓
3.2 (1/8)	350 (14)		✓
4.0 (5/32)	400 (16)		✓
5.0 (3/16)	400 (16)		✓
6.0 (15/64)	450 (18)		✓

Typical Chemical Composition of All-Weld Metal (%)

C	Si	Mn	P	S	Cr	Mo
0.56	1.26	1.67	0.029	0.011	4.06	1.84

Typical Mechanical Properties of All-Weld Metal

Preheat & Interpass Temp.°C(°F)	Postheat	Heat Treatment	Hardness (HB)
150 (302)	-	-	610
300 (572)	-	-	580

Typical Welding Parameters / Amp.(A)

Diameter mm (in)	2.6 (3/32)	3.2 (1/8)	4.0 (5/32)	5.0 (3/16)	6.0 (15/64)
Length mm (in)	350 (14)	350 (14)	400 (16)	400 (16)	450 (18)
F & HF	55~90	90~140	140~190	190~240	220~300

Conformances

JIS Z3251 DFCrA-600-BR

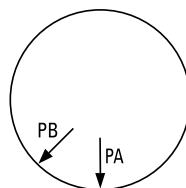
Applications

- Mills to crush clinker in cement industry
- Screws in oil industry

Features

- Good wear resistance
- Austenite structure containing Cr-Carbide
- Machining impossible (As welded)
- Preheat at more than 150°C(302°F)

Welding Position



Current

AC or DC ±

Redrying Conditions

350°C (662°F) X 1hr

Diameter / Packaging

Diameter	Length	Standard	
		packet	carton
mm (in)	mm (in)	5kg(11lbs)	20kg(44lbs)
2.6 (3/32)	350 (14)		
3.2 (1/8)	350 (14)	✓	
4.0 (5/32)	400 (16)	✓	
5.0 (3/16)	400 (16)	✓	
6.0 (15/64)	450 (18)		

Typical Chemical Composition of All-Weld Metal (%)

C	Si	Mn	P	S	Cr
3.47	0.90	1.11	0.018	0.014	33.87

Typical Mechanical Properties of All-Weld Metal

Preheat & Interpass Temp.°C(°F)	Postheat	Heat Treatment	Hardness (HB)
≥300 (572)	-	-	610

Typical Welding Parameters / Amp.(A)

Diameter mm (in)	3.2 (1/8)	4.0 (5/32)	5.0 (3/16)
Length mm (in)	350 (14)	400 (16)	400 (16)
F & HF	90~140	140~190	190~240

S-13MN.B

Type : Basic

Conformances

JIS Z3251 DFMA-250-B

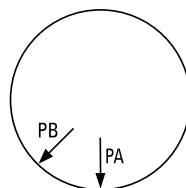
Applications

- Light impact abrasion, crusher hammers, jaws, rolls and buckets

Features

- High impact resistance
- Good resistance to abrasion
- Mostly suitable for soil abrasion
- Cutting properties impossible
- Easy to remove slag

Welding Position



Current

AC or DC ±

Redrying Conditions

350°C (662°F) X 1 hr

Diameter / Packaging

Diameter mm (in)	Length mm (in)	Standard	
		packet 5kg(11lbs)	carton 20kg(44lbs)
2.6 (3/32)	350 (14)		
3.2 (1/8)	350 (14)		✓
4.0 (5/32)	400 (16)		✓
5.0 (3/16)	400 (16)		✓
6.0 (15/64)	450 (18)		✓

Typical Chemical Composition of All-Weld Metal (%)

C	Si	Mn	P	S	Cr	Mo
0.38	0.06	14.5	0.030	0.003	1.16	1.57

Typical Mechanical Properties of All-Weld Metal

Preheat & Interpass Temp. °C(°F)	Postheat	Heat Treatment	Hardness (HB)
RT	-	-	220
	-	After work hardening	480

Typical Welding Parameters / Amp.(A)

Diameter mm (in)	3.2 (1/8)	4.0 (5/32)	5.0 (3/16)	6.0 (15/64)
Length mm (in)	350 (14)	400 (16)	400 (16)	450 (18)
F & HF	90~140	140~190	190~240	220~300

S-307.16

Type : Rutile

Conformances

EN ISO 3581-A-E 18 8 Mn R 1 2

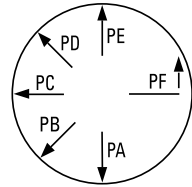
Applications

- Stainless steel(18%Cr-8%), 13% Mn steel, Dissimilar welding

Features

- Low crack sensitivity in high temperature
- Easy to remove slag
- Low spatter
- Good bead appearance

Welding Position



Current

AC or DC +

Redrying Conditions

350°C (662°F) X 1hr

Diameter / Packaging

Diameter	Length	P.V.C	
		packet	carton
mm (in)	mm (in)	2.5kg(5.5lbs)	10kg(22lbs)
2.6 (3/32)	300 (12)		✓
3.2 (1/8)	350 (14)		✓
4.0 (5/32)	400 (16)		✓
5.0 (3/16)	400 (16)		✓

Typical Chemical Composition of All-Weld Metal (%)

C	Si	Mn	P	S	Cr	Ni
0.09	0.87	6.0	0.025	0.01	19.7	9.0

Typical Mechanical Properties of All-Weld Metal

TS MPa(lbs/in²)	EL (%)	Temp °C (°F)	CVN Impact Test J (ft.-lbs)
643 (93,300)	38	-20 (-4)	60 (37)

Typical Welding Parameters / Amp.(A)

Diameter mm (in)	2.0 (5/64)	2.6 (3/32)	3.2 (1/8)	4.0 (5/32)	5.0 (3/16)
Length mm (in)	300 (12)	300 (12)	350 (14)	400 (16)	400 (16)
F & HF	25~55	50~85	70~115	95~145	135~180
V-up, OH	20~50	45~80	65~110	85~135	-

SMW

SAW

GMW

GTAW

FCAW

Non-FERROUS

APPENDIX

S-308L.15

Type : Basic

Conformances

AWS A5.4/ ASME SFA5.4 E308L-15

EN ISO 3581-A-E 19 9 L B

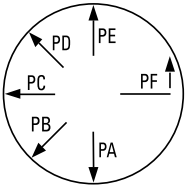
Applications

- Stainless steel(18%Cr-8%)

Features

- Good resistance to corrosion and oxidizing environments
- Easy to remove slag
- Low spatter
- Good bead appearance

Welding Position



Current

DC +

Redrying Conditions

350°C (662°F) X 1hr

Diameter / Packaging

Diameter	Length	P.V.C	
		packet	carton
		2.5kg(5.5lbs)	10kg(22lbs)
2.6 (3/32)	300 (12)	✓	
3.2 (1/8)	350 (14)	✓	
4.0 (5/32)	400 (16)	✓	
5.0 (3/16)	400 (16)	✓	

Typical Chemical Composition of All-Weld Metal (%)

C	Si	Mn	P	S	Cr	Ni
0.03	0.20	1.20	0.015	0.010	19.3	9.9

Typical Mechanical Properties of All-Weld Metal

TS MPa(lbs/in ²)	EL (%)
600 (87,000)	48

Typical Welding Parameters / Amp.(A)

Diameter mm (in)	2.0 (5/64)	2.6 (3/32)	3.2 (1/8)	4.0 (5/32)	5.0 (3/16)
Length mm (in)	300 (12)	300 (12)	350 (14)	400 (16)	400 (16)
F & HF	25~55	50~85	70~115	95~145	135~180
V-up, OH	20~50	45~80	65~110	85~135	-

S-308.16N

Type : Rutile

Conformances

AWS A5.4/ ASME SFA5.4 E308-16

JIS Z3221 ES308-16

EN ISO 3581-A-E 19 9 R

KR RD308

ABS AWS A5.4 E308-16

DNV-GL NV 308

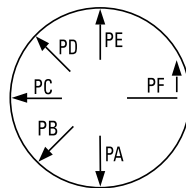
Applications

- Stainless steel (18%Cr-8%Ni)

Features

- Good resistance to corrosion and oxidizing environments
- Easy to remove slag
- Low spatter
- Good bead appearance

Welding Position



Current

AC or DC ±

Redrying Conditions

350°C (662°F) X 1hr

Diameter / Packaging

Diameter	Length	P.V.C	
		packet	carton
mm (in)	mm (in)	2.5kg(5.5lbs)	10kg(22lbs)
2.6 (3/32)	350 (14)	✓	
3.2 (1/8)	350 (14)	✓	
4.0 (5/32)	400 (16)	✓	
5.0 (3/16)	400 (16)	✓	
6.0 (15/64)	450 (18)	✓	

Typical Chemical Composition of All-Weld Metal (%)

C	Si	Mn	P	S	Cr	Ni
0.03	0.66	0.87	0.026	0.014	19.2	10.2

Typical Mechanical Properties of All-Weld Metal

TS MPa(lbs/in²)	EL (%)
562 (81,600)	47.8

Typical Welding Parameters / Amp.(A)

Diameter mm (in)	2.0 (5/64)	2.6 (3/32)	3.2 (1/8)	4.0 (5/32)	5.0 (3/16)
Length mm (in)	300 (12)	300 (12)	350 (14)	350 (14)	350 (14)
F & HF	25~55	50~85	70~115	95~145	135~180
V-up, OH	20~50	45~80	65~110	85~135	-

SMW

SAW

GMW

GTAW

FCAW

Non-FERROUS

APPENDIX

S-308H.16

Type : Rutile

Conformances

AWS A5.4/ ASME SFA5.4 E308H-16

JIS Z3221 ES308H-16

EN ISO 3581-A-E 199 H 3 2

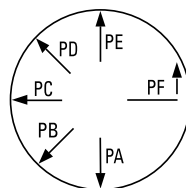
Applications

- Stainless steel (ASTM 304H, 304)

Features

- Good creep resistance
- Service temperature up to 700°C(1292°F)
- Easy to remove slag
- Low spatter
- Good bead appearance

Welding Position



Current

AC or DC ±

Redrying Conditions

350°C (662°F) X 1hr

Diameter / Packaging

Diameter mm (in)	Length mm (in)	P.V.C	
		packet 2.5kg(5.5lbs)	carton 10kg(22lbs)
2.6 (3/32)	350 (14)	✓	
3.2 (1/8)	350 (14)	✓	
4.0 (5/32)	400 (16)	✓	
5.0 (3/16)	400 (16)	✓	
6.0 (15/64)	450 (18)	✓	

Typical Chemical Composition of All-Weld Metal (%)

C	Si	Mn	P	S	Cr	Ni
0.05	0.65	0.90	0.03	0.02	18.9	9.9

Typical Mechanical Properties of All-Weld Metal

TS MPa(lbs/in ²)	EL (%)
590 (85,500)	40.0

Typical Welding Parameters / Amp.(A)

Diameter mm (in)	2.0 (5/64)	2.6 (3/32)	3.2 (1/8)	4.0 (5/32)	5.0 (3/16)
Length mm (in)	300 (12)	300 (12)	350 (14)	350 (14)	350 (14)
F & HF	25~55	50~85	70~115	95~145	135~180
V-up, OH	20~50	45~80	65~110	85~135	-

S-308L.16N[17]

Type : Rutile, Rutile-acid



Conformances

AWS A5.4/ ASME SFA5.4 E308L-16
 JIS Z3221 ES308L-16 / EN ISO 3581-A-E 199 L R
 AWS A5.4 / ASME SFA5.4 E308L-17
 JIS Z3221 ES308L-17 / EN ISO 3581-A-E 199 L R
 KR RD308L
 ABS AWS A5.4 E308L-16
 AWS A5.4 E308L-17
 LR 304L
 BV 308L

DNV-GL NV 308L
 NK KD308L
 CWB CSA W48 E308L-16
 TÜV EN ISO 3581-A - E 199 L
 DB DIN EN ISO 3581-A-E 199 L R
 CE
 CCS 304L

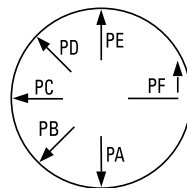
Applications

- Stainless steel (low carbon 18%Cr-8%Ni)

Features

- Good resistance to corrosion and oxidizing environments
- Easy to remove slag
- Good bead appearance
- High moisture resistance (17 type)

Welding Position



Current

AC or DC ±

Redrying Conditions

350°C (662°F) X 1hr

Diameter / Packaging

Diameter mm (in)	Length mm (in)	Standard		Vacuum				P.V.C	
		packet 5kg(11lbs)	carton 20kg(44lbs)	packet 1.5kg(3.3lbs)	carton 15kg(3.3lbs)	packet 5kg(11lbs)	carton 20kg(44lbs)	packet 2.5kg(11lbs)	carton 10kg(22lbs)
2.0 (5/64)	300 (12)								✓
2.6 (3/32)	300 (12)								✓
3.2 (1/8)	350 (14)								✓
4.0 (5/32)	350 (14)								✓
5.0 (3/16)	350 (14)								✓

SMW

SAW

GMW

GTAW

FCW

Non-FERROUS

APPENDIX

Typical Chemical Composition of All-Weld Metal (%)

Product name	C	Si	Mn	P	S	Cr	Ni
S-308L.16N	0.02	0.67	0.87	0.028	0.018	19.2	10.0
S-308L.17	0.02	0.63	0.98	0.028	0.017	19.0	9.9

Typical Mechanical Properties of All-Weld Metal

Product name	TS MPa(lbs/in ²)	EL (%)
S-308L.16N	561 (81,500)	44.0
S-308L.17	570 (82,800)	49.0

Typical Welding Parameters / Amp.(A)

Diameter mm (in)	2.0 (5/64)	2.6 (3/32)	3.2 (1/8)	4.0 (5/32)	5.0 (3/16)
Length mm (in)	300 (12)	300 (12)	350 (14)	350 (14)	350 (14)
F & HF	25~55	50~85	70~115	95~145	135~180
V-up, OH	20~50	45~80	65~110	85~135	-

S-308Mo.16

Type : Rutile

Conformances

AWS A5.4/ ASME SFA5.4 E308Mo-16

JIS Z3221 ES308Mo-16

EN ISO 3581-A-E 20 10 3

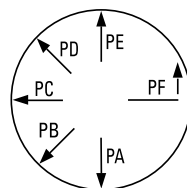
Applications

- Stainless steel (ASTM CF8M)

Features

- Easy to remove slag
- Smooth welding
- Low spatter

Welding Position



Current

AC or DC ±

Redrying Conditions

350°C (662°F) X 1 hr

Diameter / Packaging

Diameter	Length	P.V.C	
		packet	carton
mm (in)	mm (in)	2.5kg(5.5lbs)	10kg(22lbs)
2.6 (3/32)	350 (14)	✓	
3.2 (1/8)	350 (14)	✓	
4.0 (5/32)	400 (16)	✓	
5.0 (3/16)	400 (16)	✓	
6.0 (15/64)	450 (18)	✓	

Typical Chemical Composition of All-Weld Metal (%)

C	Si	Mn	P	S	Cr	Ni	Mo
0.03	0.65	0.77	0.032	0.017	18.5	9.7	2.3

Typical Mechanical Properties of All-Weld Metal

TS MPa(lbs/in ²)	EL (%)
621 (90,200)	42.3

Typical Welding Parameters / Amp.(A)

Diameter mm (in)	2.0 (5/64)	2.6 (3/32)	3.2 (1/8)	4.0 (5/32)	5.0 (3/16)
Length mm (in)	300 (12)	300 (12)	350 (14)	350 (14)	350 (14)
F & HF	25~55	50~85	70~115	95~145	135~180
V-up, OH	20~50	45~80	65~110	85~135	-

SMAW

SAW

GMW

GTAW

FCAW

Non-FERROUS

APPENDIX

S-308LT.16

Type : Basic

Conformances

AWS A5.4/ ASME SFA5.4 E308L-16

JIS Z3221 ES308L-16

EN ISO 3581-A-E 199 L R

ABS AWS A5.4 E308L-16 (-196°C)

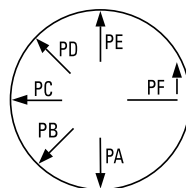
Applications

- Stainless steel (308L)
- LPG, LNG storage tank

Features

- Good impact value up to -196°C
- Easy to remove slag
- Low spatter

Welding Position



Current

AC or DC ±

Redrying Conditions

350°C (662°F) X 1 hr

Diameter / Packaging

Diameter mm (in)	Length mm (in)	P.V.C	
		packet 2.5kg(5.5lbs)	carton 10kg(22lbs)
2.6 (3/32)	350 (14)	✓	
3.2 (1/8)	350 (14)	✓	
4.0 (5/32)	400 (16)	✓	
5.0 (3/16)	400 (16)	✓	
6.0 (15/64)	450 (18)	✓	

Typical Chemical Composition of All-Weld Metal (%)

C	Si	Mn	P	S	Cr	Ni	Mo
0.035	0.77	1.74	0.023	0.012	19.2	9.9	0.14

Typical Mechanical Properties of All-Weld Metal

TS MPa(lbs/in ²)	EL (%)	Temp °C(°F)	CVN-Impact Value J (ft.-lbs)
576 (83,500)	49.8	-196 (-321)	36 (27)

Typical Welding Parameters / Amp.(A)

Diameter mm (in)	2.0 (5/64)	2.6 (3/32)	3.2 (1/8)	4.0 (5/32)	5.0 (3/16)
Length mm (in)	300 (12)	300 (12)	350 (14)	350 (14)	350 (14)
F & HF	25~55	50~85	70~115	95~145	135~180
V-up, OH	20~50	45~80	65~110	85~135	-

S-309L.15

Type : Basic

Conformances

AWS A5.4/ ASME SFA5.4 E309L-15

JIS Z3221 ES309L-15

EN ISO 3581-A-E 23 12 L B

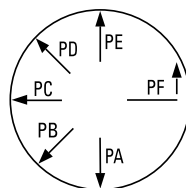
Applications

- Welding of dissimilar steels
- Buffer layer for build-up

Features

- Good resistance to heat and corrosion
- Good crack resistance
- Easy to remove slag

Welding Position



Current

DC +

Redrying Conditions

350°C (662°F) X 1 hr

Diameter / Packaging

Diameter	Length	P.V.C	
		packet	carton
mm (in)	mm (in)	2.5kg(5.5lbs)	10kg(22lbs)
2.6 (3/32)	300 (12)	✓	
3.2 (1/8)	350 (14)	✓	
4.0 (5/32)	400 (16)	✓	
5.0 (3/16)	400 (16)	✓	

Typical Chemical Composition of All-Weld Metal (%)

C	Si	Mn	P	S	Cr	Ni
0.03	0.60	1.25	0.015	0.010	23.5	13.0

Typical Mechanical Properties of All-Weld Metal

TS MPa(lbs/in ²)	EL (%)
610 (88,500)	40

Typical Welding Parameters / Amp.(A)

Diameter mm (in)	2.0 (5/64)	2.6 (3/32)	3.2 (1/8)	4.0 (5/32)	5.0 (3/16)
Length mm (in)	300 (12)	300 (12)	350 (14)	400 (16)	400 (16)
F & HF	25~55	50~85	70~115	95~145	135~180
V-up, OH	20~50	45~80	65~110	85~135	-

SMW

SAW

GMW

GTAW

FCAW

Non-FERROUS

APPENDIX

S-309.16N

Type : Rutile

Conformances

AWS A5.4/ ASME SFA5.4 E309-16

JIS Z3221 ES309-16

EN ISO 3581-A-E 23 12 R

KR RD309

ABS AWS A5.4 E309-16

LR SS/CMn

DNV-GL NV 309

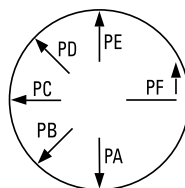
Applications

- Welding of dissimilar steels

Features

- Good resistance to heat and corrosion
- Easy to remove slag
- Low spatter

Welding Position



Current

AC or DC ±

Redrying Conditions

350°C (662°F) X 1hr

Diameter / Packaging

Diameter	Length	P.V.C	
		packet	carton
		2.5kg(5.5lbs)	10kg(22lbs)
2.6 (3/32)	350 (14)	✓	
3.2 (1/8)	350 (14)	✓	
4.0 (5/32)	400 (16)	✓	
5.0 (3/16)	400 (16)	✓	
6.0 (15/64)	450 (18)	✓	

Typical Chemical Composition of All-Weld Metal (%)

C	Si	Mn	P	S	Cr	Ni	Mo
0.03	0.79	1.10	0.025	0.016	23.4	12.5	0.10

Typical Mechanical Properties of All-Weld Metal

TS MPa(lbs/in ²)	EL (%)
579 (84,100)	38.6

Typical Welding Parameters / Amp.(A)

Diameter mm (in)	2.0 (5/64)	2.6 (3/32)	3.2 (1/8)	4.0 (5/32)	5.0 (3/16)
Length mm (in)	300 (12)	300 (12)	350 (14)	350 (14)	350 (14)
F & HF	25~55	50~85	70~115	95~145	135~180
V-up, OH	20~50	45~80	65~110	85~135	-

S-309L.16[17]

Type : Rutile, Rutile-acid



Conformances

AWS A5.4/ ASME SFA5.4 E309L-16
 JIS Z3221 ES309L-16 / EN ISO 3581-A-E 23 12 L R
 AWS A5.4 / ASME SFA5.4 E309L-17
 JIS Z3221 ES309L-17 / EN ISO 3581-A-E 23 12 L R
 KR RD309L
 ABS AWS A5.4 E309L-16
 AWS A5.4 E309L-17
 LR SS/CMn
 BV UP

DNV-GL VL 309L
 NK KD309L
 CWB CSA W48 E309L-16
 TÜV EN ISO 3581-A-E 23 12 L R
 DB DIN EN ISO 3581-A-E 23 12 L R
 CE
 CCS 309L

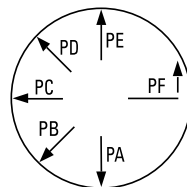
Applications

- Welding of dissimilar steels
- Buffer layer for bulid-up

Features

- Good resistance to heat and corrosion
- Good crack resistance
- Easy to remove slag
- High moisture resistance (17 type)

Welding Position



Current

AC or DC ±

Redrying Conditions

350°C (662°F) X 1 hr

Diameter / Packaging

Diameter mm (in)	Length mm (in)	Standard		Vacuum				P.V.C	
		packet 5kg(11lbs)	carton 20kg(44lbs)	packet 1.5kg(3.3lbs)	carton 15kg(3.3lbs)	packet 5kg(11lbs)	carton 20kg(44lbs)	packet 2.5kg(11lbs)	carton 10kg(22lbs)
2.0 (5/64)	300 (12)								✓
2.6 (3/32)	300 (12)								✓
3.2 (1/8)	350 (14)								✓
4.0 (5/32)	350 (14)								✓
5.0 (3/16)	350 (14)								✓

SMW

SAW

GMW

GTAW

FCW

Non-FERROUS

APPENDIX

Typical Chemical Composition of All-Weld Metal (%)

Product name	C	Si	Mn	P	S	Cr	Ni	Mo
S-309L.16	0.02	0.76	1.21	0.028	0.018	22.9	12.7	0.10
S-309L.17	0.02	0.63	1.15	0.028	0.017	23.1	12.8	0.10

Typical Mechanical Properties of All-Weld Metal

Product name	TS MPa(lbs/in ²)	EL (%)
S-309L.16N	563 (81,800)	43.0
S-309L.17	570 (82,800)	43.0

Typical Welding Parameters / Amp.(A)

Diameter mm (in)	2.0 (5/64)	2.6 (3/32)	3.2 (1/8)	4.0 (5/32)	5.0 (3/16)
Length mm (in)	300 (12)	300 (12)	350 (14)	350 (14)	350 (14)
F & HF	25~55	50~85	70~115	95~145	135~180
V-up, OH	20~50	45~80	65~110	85~135	-

S-309Mo.16

Type : Rutile

Conformances

AWS A5.4/ ASME SFA5.4 E309Mo-16

JIS Z3221 ES309Mo-16

EN ISO 3581-A-E 23 12 2 R

ABS AWS A5.4 E309Mo-16

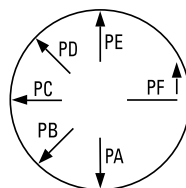
Applications

- Welding of dissimilar steels (root pass)

Features

- Good resistance to heat and crack
- Easy to remove slag
- Good bead appearance

Welding Position



Current

AC or DC ±

Redrying Conditions

350°C (662°F) X 1 hr

Diameter / Packaging

Diameter	Length	P.V.C	
		packet	carton
mm (in)	mm (in)	2.5kg(5.5lbs)	10kg(22lbs)
2.6 (3/32)	350 (14)	✓	
3.2 (1/8)	350 (14)	✓	
4.0 (5/32)	400 (16)	✓	
5.0 (3/16)	400 (16)	✓	
6.0 (15/64)	450 (18)	✓	

Typical Chemical Composition of All-Weld Metal (%)

C	Si	Mn	P	S	Cr	Ni	Mo
0.03	0.77	1.21	0.026	0.015	23.3	12.6	2.4

Typical Mechanical Properties of All-Weld Metal

TS MPa(lbs/in²)	EL (%)
662 (96,100)	35.7

Typical Welding Parameters / Amp.(A)

Diameter mm (in)	2.0 (5/64)	2.6 (3/32)	3.2 (1/8)	4.0 (5/32)	5.0 (3/16)
Length mm (in)	300 (12)	300 (12)	350 (14)	350 (14)	350 (14)
F & HF	25~55	50~85	70~115	95~145	135~180
V-up, OH	20~50	45~80	65~110	85~135	-

SMW

SAW

GMW

GTAW

FCAW

Non-FERROUS

APPENDIX

S-309MoL.16

Type : Rutile



Conformances

AWS A5.4/ ASME SFA5.4 E309LMo-16

JIS Z3221 ES309LMo-16

EN ISO 3581-A-E 23 12 2 L R

DNV-GL NV 309MoL (-20°C)

TÜV EN ISO 3581-A - E 23 12 2 L R

DB EN ISO 3581-A-E 23 12 2 L R

CE

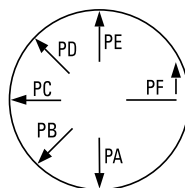
Applications

- Welding of dissimilar steels
- Welding of low carbon 22%Cr-12%Ni-2.5%Mo stainless steel

Features

- Good resistance to heat and crack
- Easy to remove slag
- Good bead appearance

Welding Position



Current

AC or DC ±

Redrying Conditions

350°C (662°F) X 1hr

Diameter / Packaging

Diameter mm (in)	Length mm (in)	P.V.C	
		packet 2.5kg(5.5lbs)	carton 10kg(22lbs)
2.6 (3/32)	350 (14)	✓	
3.2 (1/8)	350 (14)	✓	
4.0 (5/32)	400 (16)	✓	
5.0 (3/16)	400 (16)	✓	
6.0 (15/64)	450 (18)	✓	

Typical Chemical Composition of All-Weld Metal (%)

C	Si	Mn	P	S	Cr	Ni	Mo
0.02	0.72	1.30	0.027	0.013	23.3	12.7	2.4

Typical Mechanical Properties of All-Weld Metal

TS MPa(lbs/in ²)	EL (%)
690 (99,000)	33.8

Typical Welding Parameters / Amp.(A)

Diameter mm (in)	2.0 (5/64)	2.6 (3/32)	3.2 (1/8)	4.0 (5/32)	5.0 (3/16)
Length mm (in)	300 (12)	300 (12)	350 (14)	350 (14)	350 (14)
F & HF	25~55	50~85	70~115	95~145	135~180
V-up, OH	20~50	45~80	65~110	85~135	-

S-310.15

Type : Basic(Lime)

Conformances

AWS A5.4/ ASME SFA5.4 E310-15

JIS Z3221 ES310-15

EN ISO 3581-A-E 25 20 B

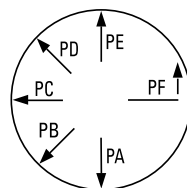
Applications

- Welding of 13%Cr or clad part of 18%Cr-8%Ni steel

Features

- Basic type electrode
- Good mechanical properties
- Martensite structure (All-weld metal)

Welding Position



Current

DC ±

Redrying Conditions

350°C (662°F) X 1 hr

Diameter / Packaging

Diameter	Length	P.V.C	
		packet	carton
mm (in)	mm (in)	2.5kg(5.5lbs)	10kg(22lbs)
2.6 (3/32)	350 (14)	✓	
3.2 (1/8)	350 (14)	✓	
4.0 (5/32)	400 (16)	✓	
5.0 (3/16)	400 (16)	✓	
6.0 (15/64)	450 (18)	✓	

Typical Chemical Composition of All-Weld Metal (%)

C	Si	Mn	P	S	Cr	Ni
0.10	0.60	1.90	0.018	0.013	26.5	20.6

Typical Mechanical Properties of All-Weld Metal

TS MPa(lbs/in ²)	EL (%)
610 (88,400)	35.0

Typical Welding Parameters / Amp.(A)

Diameter mm (in)	2.0 (5/64)	2.6 (3/32)	3.2 (1/8)	4.0 (5/32)	5.0 (3/16)
Length mm (in)	300 (12)	300 (12)	350 (14)	350 (14)	350 (14)
F & HF	25~55	50~85	70~115	95~145	135~180
V-up, OH	20~50	45~80	65~110	85~135	-

SMW

SAW

GMW

GTAW

FCAW

Non-FERROUS

APPENDIX

S-310.16

Type : Rutile

Conformances

AWS A5.4/ ASME SFA5.4 E310-16

JIS Z3221 ES310-16

EN ISO 3581-A-E 25 20 R

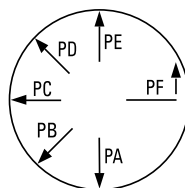
Applications

- Stainless steel (25%Cr-20%Ni)

Features

- Good heat resistance
- Good mechanical properties
- Martensite structure (All-weld metal)
- Easy to remove slag

Welding Position



Current

AC or DC ±

Redrying Conditions

350°C (662°F) X 1 hr

Diameter / Packaging

Diameter	Length	P.V.C	
		packet	carton
mm (in)	mm (in)	2.5kg(5.5lbs)	10kg(22lbs)
2.6 (3/32)	350 (14)	✓	
3.2 (1/8)	350 (14)	✓	
4.0 (5/32)	400 (16)	✓	
5.0 (3/16)	400 (16)	✓	
6.0 (15/64)	450 (18)	✓	

Typical Chemical Composition of All-Weld Metal (%)

C	Si	Mn	P	S	Cr	Ni
0.10	0.60	1.90	0.018	0.013	26.5	20.6

Typical Mechanical Properties of All-Weld Metal

TS MPa(lbs/in ²)	EL (%)
610 (88,400)	35.0

Typical Welding Parameters / Amp.(A)

Diameter mm (in)	2.0 (5/64)	2.6 (3/32)	3.2 (1/8)	4.0 (5/32)	5.0 (3/16)
Length mm (in)	300 (12)	300 (12)	350 (14)	350 (14)	350 (14)
F & HF	25~55	50~85	70~115	95~145	135~180
V-up, OH	20~50	45~80	65~110	85~135	-

S-312.16

Type : Basic

Conformances

AWS A5.4/ ASME SFA5.4 E312-16

JIS Z3221 ES312-16

EN ISO 3581-A-E 29 9 R

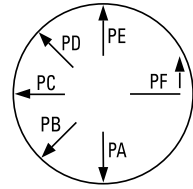
Applications

- Welding of dissimilar steels
- Buffer layer for bulid-up

Features

- Good crack resistance
- Excellent buffer effect against stress
- Easy to remove slag

Welding Position



Current

AC or DC $\pm$

Redrying Conditions

350°C (662°F) X 1 hr

Diameter / Packaging

Diameter	Length	P.V.C	
		packet	carton
mm (in)	mm (in)	2.5kg(5.5lbs)	10kg(22lbs)
2.6 (3/32)	350 (14)	✓	
3.2 (1/8)	350 (14)	✓	
4.0 (5/32)	400 (16)	✓	
5.0 (3/16)	400 (16)	✓	
6.0 (15/64)	450 (18)	✓	

Typical Chemical Composition of All-Weld Metal (%)

C	Si	Mn	P	S	Cr	Ni
0.11	0.49	1.41	0.021	0.013	29.5	9.5

Typical Mechanical Properties of All-Weld Metal

TS MPa(lbs/in ²)	EL (%)
803 (116,600)	22.0

Typical Welding Parameters / Amp.(A)

Diameter mm (in)	2.0 (5/64)	2.6 (3/32)	3.2 (1/8)	4.0 (5/32)	5.0 (3/16)
Length mm (in)	300 (12)	300 (12)	350 (14)	350 (14)	350 (14)
F & HF	25~55	50~85	70~115	95~145	135~180
V-up, OH	20~50	45~80	65~110	85~135	-

S-316.16N

Type : Rutile

Conformances

AWS A5.4/ ASME SFA5.4 E316-16
JIS Z3221 ES316-16
EN ISO 3581-A-E 19 12 3 R
KR RD316
ABS AWS A5.4 E316-16
BV UP (E316-16, -20°C)
DNV-GL NV 316

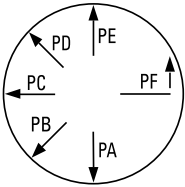
Applications

- Stainless steel (18%Cr-12%Ni-2%Mo)

Features

- Good resistance to corrosion and oxidizing environments
- Good heat resistance
- asy to remove slag
- Low spatter

Welding Position



Current

AC or DC ±

Redrying Conditions

350°C (662°F) X 1hr

Diameter / Packaging

Diameter	Length	P.V.C	
		packet	carton
		2.5kg(5.5lbs)	10kg(22lbs)
2.6 (3/32)	350 (14)	✓	
3.2 (1/8)	350 (14)	✓	
4.0 (5/32)	400 (16)	✓	
5.0 (3/16)	400 (16)	✓	
6.0 (15/64)	450 (18)	✓	

Typical Chemical Composition of All-Weld Metal (%)

C	Si	Mn	P	S	Cr	Ni	Mo
0.03	0.77	0.9	0.03	0.029	18.7	12.3	2.5

Typical Mechanical Properties of All-Weld Metal

TS MPa(lbs/in ²)	EL (%)
572 (83,100)	40.8

Typical Welding Parameters / Amp.(A)

Diameter mm (in)	2.0 (5/64)	2.6 (3/32)	3.2 (1/8)	4.0 (5/32)	5.0 (3/16)
Length mm (in)	300 (12)	300 (12)	350 (14)	350 (14)	350 (14)
F & HF	25~55	50~85	70~115	95~145	135~180
V-up, OH	20~50	45~80	65~110	85~135	-

S-316L.16N[17]

Type : Rutile, Rutile-acid



Conformances

AWS A5.4/ ASME SFA5.4 E316L-16
 JIS Z3221 ES316L-16 / EN ISO 3581-A-E 19 12 3 L R
 AWS A5.4 / ASME SFA5.4 E316L-17
 JIS Z3221 ES316L-17 / EN ISO 3581-A-E 19 12 3 L R
 KR RD316L
 ABS AWS A5.4 E316L-16
 AWS A5.4 E316L-17
 LR 316L

BV UP (E316L-16, -20°C)
 DNV-GL NV 316L
 NK KD316L
 CWB CSA W48 E316L-16
 TÜV EN ISO 3581-A-E 19 12 3 L R
 DB EN ISO 3581-A-E 19 12 3 L R
 CE
 CCS 316L

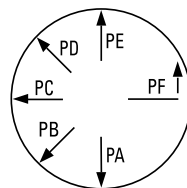
Applications

- Stainless steel (low carbon 18%Cr-12%Ni-2%Mo)

Features

- Good resistance to corrosion and oxidizing environments
- Good heat resistance
- Easy to remove slag
- High moisture resistance (17 type)

Welding Position



Current

AC or DC ±

Redrying Conditions

350°C (662°F) X 1hr

Diameter / Packaging

Diameter mm (in)	Length mm (in)	Standard		Vacuum				P.V.C	
		packet 5kg(11lbs)	carton 20kg(44lbs)	packet 1.5kg(3.3lbs)	carton 15kg(3.3lbs)	packet 5kg(11lbs)	carton 20kg(44lbs)	packet 2.5kg(11lbs)	carton 10kg(22lbs)
2.0 (5/64)	300 (12)								✓
2.6 (3/32)	300 (12)								✓
3.2 (1/8)	350 (14)								✓
4.0 (5/32)	350 (14)								✓
5.0 (3/16)	350 (14)								✓

SMW

SAW

GMW

GTAW

FCAW

Non-FERROUS

APPENDIX

Typical Chemical Composition of All-Weld Metal (%)

Product name	C	Si	Mn	Cr	Ni	Mo
S-316L.16N	0.02	0.75	0.95	18.5	12.7	2.7
S-316L.17	0.02	0.60	1.15	23.1	12.1	2.5

Typical Mechanical Properties of All-Weld Metal

Product name	TS MPa(lbs/in ²)	EL (%)
S-316L.16N	557 (80,900)	45.2
S-316L.17	560 (81,300)	48.0

Typical Welding Parameters / Amp.(A)

Diameter mm (in)	2.0 (5/64)	2.6 (3/32)	3.2 (1/8)	4.0 (5/32)	5.0 (3/16)
Length mm (in)	300 (12)	300 (12)	350 (14)	350 (14)	350 (14)
F & HF	25~55	50~85	70~115	95~145	135~180
V-up, OH	20~50	45~80	65~110	85~135	-

S-316LT.16

Type : Basic

Conformances

AWS A5.4/ ASME SFA5.4 E316L-16

JIS Z3221 ES316L-16

EN ISO 3581-A-E 19 12 3 L R

ABS AWS A5.4 E316L-16 (-196°C)

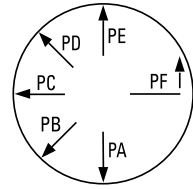
Applications

- Stainless steel (18%Cr-12%Ni-2%Mo)
- LPG, LNG storage tank

Features

- Good impact value up to -196°C
- Good resistance to inter-crystalline corrosion
- Easy to remove slag
- Low spatter

Welding Position



Current

AC or DC ±

Redrying Conditions

350°C (662°F) X 1 hr

Diameter / Packaging

Diameter	Length	P.V.C	
		packet	carton
mm (in)	mm (in)	2.5kg(5.5lbs)	10kg(22lbs)
2.6 (3/32)	350 (14)	✓	
3.2 (1/8)	350 (14)	✓	
4.0 (5/32)	400 (16)	✓	
5.0 (3/16)	400 (16)	✓	
6.0 (15/64)	450 (18)	✓	

Typical Chemical Composition of All-Weld Metal (%)

C	Si	Mn	P	S	Cr	Ni	Mo
0.035	0.55	1.59	0.021	0.016	18.5	13.5	2.5

Typical Mechanical Properties of All-Weld Metal

TS MPa(lbs/in ²)	EL (%)	Temp °C(°F)	CVN-Impact Value J (ft.-lbs)
570 (82,700)	40.6	-196 (-321)	36 (27)

Typical Welding Parameters / Amp.(A)

Diameter mm (in)	2.0 (5/64)	2.6 (3/32)	3.2 (1/8)	4.0 (5/32)	5.0 (3/16)
Length mm (in)	300 (12)	300 (12)	350 (14)	350 (14)	350 (14)
F & HF	25~55	50~85	70~115	95~145	135~180
V-up, OH	20~50	45~80	65~110	85~135	-

S-317.16

Type : Rutile

Conformances

AWS A5.4/ ASME SFA5.4 E317-16

JIS Z3221 ES317-16

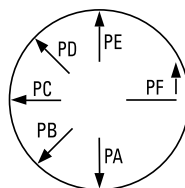
Applications

- Stainless steel (317L)

Features

- Good resistance to nitroxide and sulfide
- Good heat resistance
- Easy to remove slag

Welding Position



Current

AC or DC ±

Redrying Conditions

350°C (662°F) X 1hr

Diameter / Packaging

Diameter	Length	P.V.C	
		packet	carton
		2.5kg(5.5lbs)	10kg(22lbs)
2.6 (3/32)	350 (14)	✓	
3.2 (1/8)	350 (14)	✓	
4.0 (5/32)	400 (16)	✓	
5.0 (3/16)	400 (16)	✓	
6.0 (15/64)	450 (18)	✓	

Typical Chemical Composition of All-Weld Metal (%)

C	Si	Mn	P	S	Cr	Ni	Mo
0.02	0.63	1.05	0.029	0.018	18.3	12.6	3.2

Typical Mechanical Properties of All-Weld Metal

TS MPa(lbs/in ²)	EL (%)
558 (85,400)	38.4

Typical Welding Parameters / Amp.(A)

Diameter mm (in)	2.0 (5/64)	2.6 (3/32)	3.2 (1/8)	4.0 (5/32)	5.0 (3/16)
Length mm (in)	300 (12)	300 (12)	350 (14)	350 (14)	350 (14)
F & HF	25~55	50~85	70~115	95~145	135~180
V-up, OH	20~50	45~80	65~110	85~135	-

S-347.16

Type : Rutile

Conformances

AWS A5.4/ ASME SFA5.4 E347-16

JIS Z3221 ES347-16

EN ISO 3581-A-E 19 9 Nb R

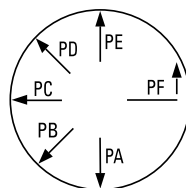
Applications

- Stainless steel (321, 347)

Features

- Contains stabilizing element(Nb)
- High temperature strength
- Suitable for welding of boiler and gas turbine
- Easy to remove slag

Welding Position



Current

AC or DC ±

Redrying Conditions

350°C (662°F) X 1 hr

Diameter / Packaging

Diameter mm (in)	Length mm (in)	P.V.C	
		packet 2.5kg(5.5lbs)	carton 10kg(22lbs)
2.6 (3/32)	350 (14)	✓	
3.2 (1/8)	350 (14)	✓	
4.0 (5/32)	400 (16)	✓	
5.0 (3/16)	400 (16)	✓	
6.0 (15/64)	450 (18)	✓	

Typical Chemical Composition of All-Weld Metal (%)

C	Si	Mn	P	S	Cr	Ni	Nb
0.02	0.75	0.82	0.027	0.014	19.3	9.8	0.35

Typical Mechanical Properties of All-Weld Metal

TS MPa(lbs/in²)	EL (%)
603 (87,600)	42.4

Typical Welding Parameters / Amp.(A)

Diameter mm (in)	2.0 (5/64)	2.6 (3/32)	3.2 (1/8)	4.0 (5/32)	5.0 (3/16)
Length mm (in)	300 (12)	300 (12)	350 (14)	350 (14)	350 (14)
F & HF	25~55	50~85	70~115	95~145	135~180
V-up, OH	20~50	45~80	65~110	85~135	-

SMAW

SAW

GMW

GTAW

FCAW

Non-FERROUS

APPENDIX

S-2209.16

Type : Rutile

Conformances

AWS A5.4/ ASME SFA5.4 E2209-16
JIS Z3221 ES2209-16
EN ISO 3581-A-E 22 9 3 N L
KR AWS A5.4 E2209-16
ABS AWS A5.4 E2209-16 (-46°C ≥ 27 J)

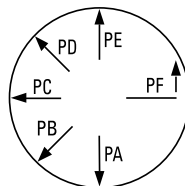
Applications

- Welding of duplex stainless steel (SAF2205, UNS S31803)

Features

- Ferritic/austenitic structure (All-weld metal)
- Service temperature up to 250°C
- High resistance to pitting, intergranular and stress corrosion
- PREN 35
- Easy to remove slag
- Good bead appearance

Welding Position



Current

AC or DC ±

Redrying Conditions

350°C (662°F) X 1 hr

Diameter / Packaging

Diameter mm (in)	Length mm (in)	P.V.C	
		packet 2.5kg(5.5lbs)	carton 10kg(22lbs)
2.6 (3/32)	350 (14)	✓	
3.2 (1/8)	350 (14)	✓	
4.0 (5/32)	400 (16)	✓	
5.0 (3/16)	400 (16)	✓	
6.0 (15/64)	450 (18)	✓	

Typical Chemical Composition of All-Weld Metal (%)

C	Si	Mn	Cr	Ni	Mo	N
0.029	0.78	1.03	23.1	9.2	3.1	0.12

Typical Mechanical Properties of All-Weld Metal

TS MPa(lbs/in ²)	EL (%)	Temp °C(°F)	CVN-Impact Value J (ft.-lbs)
830 (120,400)	28.0	-20(-4) -50(-58)	50 (37) 45 (33)

Typical Welding Parameters / Amp.(A)

Diameter mm (in)	2.0 (5/64)	2.6 (3/32)	3.2 (1/8)	4.0 (5/32)	5.0 (3/16)
Length mm (in)	300 (12)	300 (12)	350 (14)	350 (14)	350 (14)
F & HF	25-55	50-85	70-115	95-145	135-180
V-up, OH	20-50	45-80	65-110	85-135	-

S-2594.16

Type : Rutile

Conformances

AWS A5.4/ ASME SFA5.4 E2594-16

EN ISO 3581-A-E 25 9 4 N L

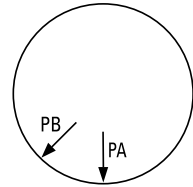
Applications

- Welding of super duplex stainless steel (UNS S32750, S32760)

Features

- Service temperature up to 250°C
- High resistance to Pitting corrosion and embrittlement
- PREN 41
- Easy to remove slag
- Good bead appearance

Welding Position



Current

AC or DC ±

Redrying Conditions

350°C (662°F) X 1hr

Diameter / Packaging

Diameter	Length	P.V.C	
		packet	carton
mm (in)	mm (in)	2.5kg(5.5lbs)	10kg(22lbs)
2.6 (3/32)	350 (14)	✓	
3.2 (1/8)	350 (14)	✓	
4.0 (5/32)	400 (16)	✓	
5.0 (3/16)	400 (16)	✓	
6.0 (15/64)	450 (18)	✓	

Typical Chemical Composition of All-Weld Metal (%)

C	Si	Mn	Cr	Ni	Mo	N
0.019	0.58	0.53	25.17	8.9	3.9	0.22

Typical Mechanical Properties of All-Weld Metal

TS MPa(lbs/in ²)	EL (%)	Temp °C(°F)	CVN-Impact Value J (ft.-lbs)
830 (120,400)	28.0	-20(-4) -50(-58)	35 (25) 30 (22)

Typical Welding Parameters / Amp.(A)

Diameter mm (in)	2.0 (5/64)	2.6 (3/32)	3.2 (1/8)	4.0 (5/32)	5.0 (3/16)
Length mm (in)	300 (12)	300 (12)	350 (14)	350 (14)	350 (14)
F & HF	25~55	50~85	70~115	95~145	135~180
V-up, OH	20~50	45~80	65~110	85~135	-

SMW

SAW

GMW

GTAW

FCAW

Non-FERROUS

APPENDIX

S-NCI

Type : Basic

Conformances

AWS A5.15/ ASME SFA5.15 ENi-CI

JIS Z3252 DFCNi

EN ISO 1071 - E C Ni-CI 1

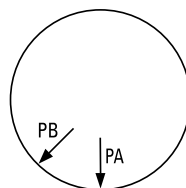
Applications

- Repairing and joining of cast iron

Features

- Graphite coated electrode
- Preheat at 150°C (302°F)

Welding Position



Current

AC or DC ±

Redrying Conditions

350°C (662°F) X 1hr

Diameter / Packaging

Diameter	Length	P.V.C	
		packet	carton
mm (in)	mm (in)	2.5kg(5.5lbs)	10kg(22lbs)
2.6 (3/32)	350 (14)		✓
3.2 (1/8)	350 (14)		✓
4.0 (5/32)	400 (16)		✓
5.0 (3/16)	400 (16)		✓
6.0 (15/64)	450 (18)		✓

Typical Chemical Composition of All-Weld Metal (%)

C	Si	Mn	P	S	Fe	Ni
1.38	0.79	0.36	0.004	0.003	0.58	98.3

Typical Mechanical Properties of All-Weld Metal

Hardness
(HRB)

77.6

Typical Welding Parameters / Amp.(A)

Diameter mm (in)	2.6 (3/32)	3.2 (1/8)	4.0 (5/32)
Length mm (in)	300 (12)	350 (14)	350 (14)
F	55~80	80~130	110~160

S-NFC

Type : Basic

Conformances

AWS A5.15/ ASME SFA5.15 ENiFe-CI

JIS Z3252 DFCNiFe

EN ISO 1071 - E C NiFe-CI 1

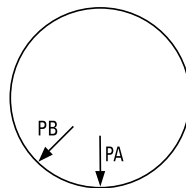
Applications

- Welding of normal grades of cast iron

Features

- Good crack resistance
- Preheat at 100~200°C (212~392°F)
- Easy to remove slag

Welding Position



Current

AC or DC ±

Redrying Conditions

350°C (662°F) X 1hr

Diameter / Packaging

Diameter	Length	P.V.C	
		packet	carton
mm (in)	mm (in)	2.5kg(5.5lbs)	10kg(22lbs)
2.6 (3/32)	350 (14)	✓	
3.2 (1/8)	350 (14)	✓	
4.0 (5/32)	400 (16)	✓	
5.0 (3/16)	400 (16)	✓	
6.0 (15/64)	450 (18)	✓	

Typical Chemical Composition of All-Weld Metal (%)

C	Si	Mn	P	S	Fe	Ni
1.73	0.59	1.34	0.005	0.001	45.7	Bal

Typical Mechanical Properties of All-Weld Metal

Hardness (HRB)
90

Typical Welding Parameters / Amp.(A)

Diameter mm (in)	3.2 (1/8)	4.0 (5/32)
Length mm (in)	350 (14)	350 (14)
F	80~130	110~160

SMW

SAW

GMW

GTAW

FCAW

Non-FERROUS

APPENDIX

S-FCF

Type : Basic

Conformances

AWS A5.15/ ASME SFA5.15 ESt

JIS Z3252 DFCFe

EN ISO 1071 - E Z 1

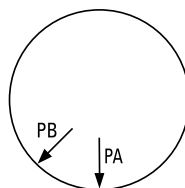
Applications

- Repairing of cast iron

Features

- Machining impossible (As welded)
- Easy to remove slag
- Preheat at 200~350°C (392~662°F)
- Stable arc and good bead appearance

Welding Position



Current

AC or DC ±

Redrying Conditions

350°C (662°F) X 1 hr

Diameter / Packaging

Diameter	Length	P.V.C	
		packet	carton
mm (in)	mm (in)	2.5kg(5.5lbs)	10kg(22lbs)
2.6 (3/32)	350 (14)	✓	
3.2 (1/8)	350 (14)	✓	
4.0 (5/32)	400 (16)	✓	
5.0 (3/16)	400 (16)	✓	
6.0 (15/64)	450 (18)	✓	

Typical Chemical Composition of All-Weld Metal (%)

C	Si	Mn	P	S	Fe
2.47	0.41	0.45	0.024	0.024	96.6

Typical Mechanical Properties of All-Weld Metal

Hardness (HRB)
450~510

Typical Welding Parameters / Amp.(A)

Diameter mm (in)	2.6 (3/32)	3.2 (1/8)	4.0 (5/32)	5.0 (3/16)
Length mm (in)	300 (12)	350 (14)	350 (14)	400 (16)
F	55~80	80~130	110~160	150~200

SAW

Wire/Flux Combination



S-777MX X H-14

Type : Neutral



Conformances

AWS A5.17 / ASME SFA5.17 F7A0-EH14
JIS Z3352 SA AR1
EN ISO 14174-S A AR 1 / EN ISO 14171-A-S4
KR 2M, 2YM
ABS 2M, 2YM

LR 2M, 2YM
BV A2M, A2YM
DNV-GL I1YM
NK KAW2M, KAW52M
CE

Applications

- LPG tanks
- Spiral pipes
- Agricultural implements

Features

- Easy to remove slag
- High speed welding
- Horizontal and flat fillet welding
- Density : 1.0g/cm³

Current

AC, DC +

Basicity Index

0.5

Packages (Flux)

Tin Can 20kg(44lbs)
PE Bag 20kg(44lbs)

Flux Composition

Consumable	Chemical Composition, wt%		
	Al ₂ O ₃ + TiO ₂	SiO ₂ + MnO	CaO + MgO
S-777MX	55	25	20

Diameter / Packaging

Diameter mm (in)	Spool	Basket			Coil					Pac				
	20kg (44lbs)	25kg (55lbs)	100kg (220lbs)	25kg (55lbs)	100kg (220lbs)	200kg (440lbs)	250kg (551lbs)	300kg (661lbs)	500kg (1102lbs)	200kg (440lbs)	250kg (551lbs)	300kg (661lbs)	350kg (771lbs)	400kg (881lbs)
1.6 (1/16)	✓			✓							✓			✓
2.0 (5/64)	✓			✓	✓	✓	✓					✓		
2.4 (3/32)	✓	✓		✓	✓	✓								
3.2 (1/8)		✓		✓	✓	✓	✓	✓			✓	✓	✓	
4.0 (5/32)		✓		✓	✓	✓		✓	✓	✓	✓	✓	✓	✓
4.8 (3/16)	✓			✓	✓			✓	✓					
6.4 (1/4)				✓	✓									

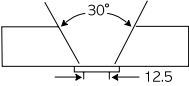
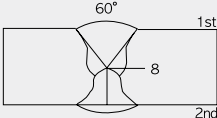
Typical Chemical Composition of All-Weld Metal(%)

Wire	C	Si	Mn	P	S	BM	Th.(mm)
H-14	0.08	0.53	0.94	0.021	0.014	SS400	25

Typical Mechanical Properties of All-Weld Metal

Wire	YS MPa(lbs/in ²)	TS MPa(lbs/in ²)	EL (%)	Temp °C(°F)	CVN-Impact Value J (ft-lbs)	BM	Th.(mm)
H-14	560 (81,000)	620 (90,000)	27	-18 (0)	48 (35)	SS400	25
	-	530 (76,900)	-	-5 (23)	72 (53)	SM490	20

Typical Welding Parameters

Wire	Dia. (mm)	Th. (mm)	Groove Design (mm)	Pass	Amp. (A)	Volt. (V)	Speed (cm/min)	Remarks
H-14	4.0	25		1~13	570	30	40	AWS A5.17
H-14	4.8	20			800 850	36 37	25 45	Both Single pass

S-777MXT X H-14 [M-12K]

Type : Neutral

Conformances

AWS A5.17/ ASME SFA5.17 F7A0-EH14
 AWS A5.17/ ASME SFA5.17 F7A(P)Z-EM12K
 JIS Z3352 SA AR1
 EN ISO 14174-S A AR 1 / EN ISO 14171-A-S4 [S2Si]

Applications

- LPG tanks
- Boiler(Fin tube)

Features

- Easy to remove slag
- High speed welding
- Density : 1.0g/cm³

Current

AC, DC +

Basicity Index

0.5

Packages (Flux)

Tin Can 20kg(44lbs)
 PE Bag 20kg(44lbs)

Flux Composition

Consumable	Chemical Composition, wt%		
	Al ₂ O ₃ + FeI ₂ O ₃	TiO ₂ + MnO	SiO ₂ + CaO
S-777MXT	55	25	15

Diameter / Packaging

- H-14 : ✓ • M-12K : ○

Diameter	Spool	Basket			Coil					Pac				
	20kg (44lbs)	25kg (55lbs)	100kg (220lbs)	25kg (55lbs)	100kg (220lbs)	200kg (440lbs)	250kg (551lbs)	300kg (661lbs)	500kg (1102lbs)	200kg (440lbs)	250kg (551lbs)	300kg (661lbs)	350kg (771lbs)	400kg (881lbs)
1.6 (1/16)	✓○			✓○							✓		○	✓
2.0 (5/64)	✓○			✓○	✓	✓	✓				○	✓	○	○
2.4 (3/32)	✓	✓○	○	✓○	✓○	✓								○
3.2 (1/8)		✓○	○	✓○	✓○	✓	✓			○	✓	✓	✓	○
4.0 (5/32)		✓○	○	✓○	✓○	✓○		✓	✓○	✓○	✓○	✓○	✓	✓○
4.8 (3/16)	✓			✓○	✓○			✓○	✓○	○				
6.4 (1/4)				✓	✓									

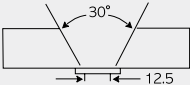
Typical Chemical Composition of All-Weld Metal(%)

Wire	C	Si	Mn	P	S	BM	Th.(mm)
H-14	0.09	0.52	1.18	0.023	0.013	SS400	25
M-12K	0.06	0.52	0.73	0.024	0.016	SS400	25

Typical Mechanical Properties of All-Weld Metal

Wire	YS MPa(lbs/in ²)	TS MPa(lbs/in ²)	EL (%)	CVN-Impact Value J (ft.lbs)		BM	Th.(mm)
				0°C (32°F)	-18°C (0°F)		
H-14	550 (79,800)	600 (87,000)	29.8	65 (48)	41 (30)	SS400	25
M-12K	510 (74,000)	560 (81,200)	28.6	42 (31)	-	SS400	25

Typical Welding Parameters

Wire	Dia. (mm)	Th. (mm)	Groove Design (mm)	Pass	Amp. (A)	Volt. (V)	Speed (cm/min)	Remarks
H-14 (M-12K)	4.0	25		1~13	570	30	40	AWS A5.17

SWAW

SAW

GMAW

GTAW

FCAW

Non-FERROUS

APPENDIX

S-777MXT X A-2 [B-2]

Type : Neutral

Conformances

AWS A5.23/ ASME SFA5.23 F8PZ-EA2-A2
 AWS A5.23/ ASME SFA5.23 F8A(P)Z-EB2-B2
 JIS Z3352 SA AR1
 EN ISO 14174-S A AR 1 / EN ISO 14171-A-S2Mo [S2CrMo1]

Applications

- Heat resistant steels
- Fin-tube

Features

- Easy to remove slag
- High speed welding
- Density : 1.0g/cm³

Current

AC, DC +

Basicity Index

0.5

Packages (Flux)

Tin Can 20kg(44lbs)
 PE Bag 20kg(44lbs)

Flux Composition

Consumable	Chemical Composition, wt%		
	Al ₂ O ₃ + Fe ₂ O ₃	TiO ₂ + MnO	SiO ₂ + CaO
S-777MXT	55	25	15

Diameter / Packaging

- A-2 : ✓ • B-2 : ○

Diameter mm (in)	Spool	Basket			Coil					Pac				
	20kg (44lbs)	25kg (55lbs)	100kg (220lbs)	25kg (55lbs)	100kg (220lbs)	200kg (440lbs)	250kg (551lbs)	300kg (661lbs)	500kg (1102lbs)	200kg (440lbs)	250kg (551lbs)	300kg (661lbs)	350kg (771lbs)	400kg (881lbs)
1.6 (1/16)	✓													
2.0 (5/64)		✓		✓○	○							✓○	○	
2.4 (3/32)		✓○		✓○	○							○		
3.2 (1/8)		✓		✓○				✓				○		
4.0 (5/32)		✓		✓○	✓○	✓	✓		✓		✓	✓○	✓	✓

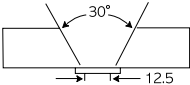
Typical Chemical Composition of All-Weld Metal(%)

Wire	C	Si	Mn	P	S	Cr	Mo	BM	Th.(mm)
A-2	0.05	0.68	0.75	0.020	0.010	-	0.46	SM570	25
B-2	0.05	0.68	0.75	0.020	0.010	1.06	0.44	A387-Gr11	25

Typical Mechanical Properties of All-Weld Metal

Wire	YS MPa(lbs/in ²)	TS MPa(lbs/in ²)	EL (%)	PWHT	Temp °C(°F)	CVN-Impact Value J (ft-lbs)	BM	Th.(mm)
A-2	580 (84,100)	640 (92,800)	28.0	As welded	-	-	SM570	25
B-2	630 (91,400)	720 (104,400)	20.8	As welded	0 (32)	32 (24)	A387-Gr.11	25
B-2	560 (81,200)	640 (92,800)	25.0	690°CX1hr	0 (32)	45 (33)	A387-Gr.11	25

Typical Welding Parameters

Wire	Dia. (mm)	Th. (mm)	Groove Design (mm)	Pass	Amp. (A)	Volt. (V)	Speed (cm/min)	Remarks
A-2 (B-2)	4.0	25		1~13	570	30	40	AWS A5.23
B-2	2.4	12		1	400	28	100	Fin tube of boiler

S-777MXH X H-14

Type : Neutral

Conformances

AWS A5.17 / ASME SFA5.17 F7A(P)2-EH14
JIS Z3352 SA AB1
EN ISO 14174-S A AB 1 / EN ISO 14171-A-S4
KR 2T, 2YT, 3M, 3YM
ABS 2T, 2YT, 3M, 3YM
LR 3M, 3YM, 2T, 2YT

BV A2T, A2YT, A3M, A3YM
DNV-GL IYTH10, IIYM H10
NK KAW3M, KAW53M
KAW2T, KAW52T
CWB CSA W48 F49A(P)3-EH14

Applications

- LPG tanks
- General fabrication
- Structural fabrication

Features

- Easy to remove slag
- High speed welding
- Horizontal and flat fillet welding
- Density : 1.2g/cm³

Current

AC, DC +

Basicity Index

0.9

Packages (Flux)

Tin Can 20kg(44lbs)
PE Bag 20kg(44lbs)

Flux Composition

Consumable	Chemical Composition, wt%		
	Al ₂ O ₃ + Fe ₂ O ₃	MgO + MnO	SiO ₂ + CaF ₂
S-777MXH	35	35	30

Diameter / Packaging

Diameter mm (in)	Spool	Basket			Coil					Pac				
	20kg (44lbs)	25kg (55lbs)	100kg (220lbs)	25kg (55lbs)	100kg (220lbs)	200kg (440lbs)	250kg (551lbs)	300kg (661lbs)	500kg (1102lbs)	200kg (440lbs)	250kg (551lbs)	300kg (661lbs)	350kg (771lbs)	400kg (881lbs)
1.6 (1/16)	✓			✓							✓			✓
2.0 (5/64)	✓			✓	✓	✓	✓					✓		
2.4 (3/32)	✓	✓		✓	✓	✓								
3.2 (1/8)		✓		✓	✓	✓	✓	✓			✓	✓	✓	
4.0 (5/32)		✓		✓	✓	✓		✓	✓	✓	✓	✓	✓	✓
4.8 (3/16)	✓			✓	✓			✓	✓					
6.4 (1/4)				✓	✓									

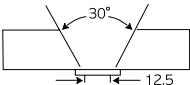
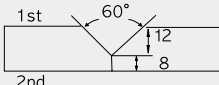
Typical Chemical Composition of All-Weld Metal(%)

Wire	C	Si	Mn	P	S	BM	Th.(mm)
H-14	0.07	0.30	1.37	0.028	0.021	SS400	25
	0.12	0.30	1.43	0.024	0.012	SM490	20

Typical Mechanical Properties of All-Weld Metal

Wire	YS MPa(lbs/in ²)	TS MPa(lbs/in ²)	EL (%)	Temp °C(°F)	CVN-Impact Value J (ft-lbs)	BM	Th.(mm)
H-14	520 (75,500)	570 (87,700)	30	-29 (-20)	120 (88)	SS400	25
	-	560 (81,300)	-	0 (32)	70 (52)	SM490	20

Typical Welding Parameters

Wire	Dia. (mm)	Th. (mm)	Groove Design (mm)	Pass	Amp. (A)	Volt. (V)	Speed (cm/min)	Remarks
H-14	4.0	25		1~13	570	30	40	AWS A5.17
H-14	4.8	20		1st 2nd	800 850	34 36	25 25	Both Side Single-pass

S-777MXH X A-3

Type : Neutral

Conformances

AWS A5.23/ ASME SFA5.23 F8A4-EA3-A3
JIS Z3352 SA AB1
EN ISO 14174-S A AB 1 / EN ISO 14171-A-S4Mo

Applications

- LPG tanks
- General fabrication
- Structural fabrication

Features

- Easy to remove slag
- High speed welding
- Horizontal and flat fillet welding
- Density : 1.2g/cm³

Current

AC, DC +

Basicity Index

0.9

Packages (Flux)

Tin Can 20kg(44lbs)
PE Bag 20kg(44lbs)

Flux Composition

Consumable	Chemical Composition, wt%		
	Al ₂ O ₃ + Fe ₂ O ₃	MgO + MnO	SiO ₂ + CaF ₂
S-777MXH	35	35	30

Diameter / Packaging

Diameter mm (in)	Spool	Basket			Coil					Pac				
	20kg (44lbs)	25kg (55lbs)	100kg (220lbs)	25kg (55lbs)	100kg (220lbs)	200kg (440lbs)	250kg (551lbs)	300kg (661lbs)	500kg (1102lbs)	200kg (440lbs)	250kg (551lbs)	300kg (661lbs)	350kg (771lbs)	400kg (881lbs)
1.6 (1/16)	✓												✓	
2.0 (5/64)	✓			✓										
2.4 (3/32)				✓										
3.2 (1/8)				✓	✓			✓			✓			
4.0 (5/32)				✓	✓	✓		✓	✓		✓			
4.8 (3/16)				✓	✓			✓						

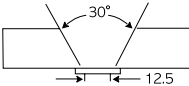
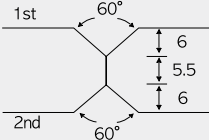
Typical Chemical Composition of All-Weld Metal(%)

Wire	C	Si	Mn	P	S	Mo	BM	Th.(mm)
A-3	0.04	0.28	1.30	0.025	0.015	0.50	SM570	25

Typical Mechanical Properties of All-Weld Metal

Wire	YS MPa(lbs/in²)	TS MPa(lbs/in²)	EL (%)	Temp °C(°F)	CVN-Impact Value J (ft-lbs)	BM	Th.(mm)
A-3	630 (91,500)	660 (95,900)	26	-40 (-40)	40 (30)	SM570	25
	-	640 (93,000)	-	-20 (-4)	70 (52)	API5L×65	17.5

Typical Welding Parameters

Wire	Dia. (mm)	Th. (mm)	Groove Design (mm)	Pass	Amp. (A)	Volt. (V)	Speed (cm/min)	Remarks
A-3	4.0	25		1~13	570	30	40	AWS A5.23
A-3	L(DC+):4.0	17.5		1st	(L)770 (T)640	32 40	110	Both Side Single-pass (tandem)
	T(AC):4.0			2nd	(L)1050 (T)750	32 42	120	

S-727 X L-8 [L-12]

Type : Active

Conformances

AWS A5.17 / ASME SFA5.17 F7A2-EL8 [EL12]

JIS Z3352 SA AB1

EN ISO 14174-S A AB 1 / EN ISO 14171-A-S1

KR 2TM, 2YTM

ABS 2TM, 2YTM

2TM, 2YTM(Two-run tech : Max 5.0mm) (L-12)

LR 2TM, 2YTM

2YMH5 (L-12)

BV A2TM, A2YTM

DNV-GL IITYM

NK KAW2TM, KAW52TM

Applications

- Steel industry
- General fabrications

Features

- Good resistance to porosity on rust, scales and primers
- Fillet welding of thin and medium plates
- Density : 1.2g/cm³

Current

AC, DC +

Basicity Index

1.1

Packages (Flux)

Tin Can 20kg(44lbs)

PE Bag 20kg(44lbs)

Flux Composition

Consumable	Chemical Composition, wt%			
	MgO + MnO	CaF ₂ + CaO	Al ₂ O ₃ + SiO ₂	TiO ₂ + FeO
S-727	20	10	50	15

Diameter / Packaging

- L-8 : ✓
- L-12 : ○

Diameter mm (in)	Spool	Basket			Coil					Pac				
	20kg (44lbs)	25kg (55lbs)	100kg (220lbs)	25kg (55lbs)	100kg (220lbs)	200kg (440lbs)	250kg (551lbs)	300kg (661lbs)	500kg (1102lbs)	200kg (440lbs)	250kg (551lbs)	300kg (661lbs)	350kg (771lbs)	400kg (881lbs)
1.6 (1/16)	✓													
2.0 (5/64)	✓	✓		○										
2.4 (3/32)				✓○										
3.2 (1/8)				✓○										
4.0 (5/32)				✓○	✓									
4.8 (3/16)				✓	✓			✓	✓					
6.4 (1/4)								✓	✓					

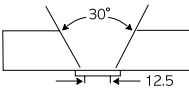
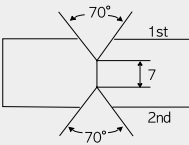
Typical Chemical Composition of All-Weld Metal(%)

Wire	C	Si	Mn	P	S	BM	Th.(mm)
L-8	0.08	0.35	1.45	0.030	0.020	SS400	25

Typical Mechanical Properties of All-Weld Metal

Wire	YS MPa(lbs/in ²)	TS MPa(lbs/in ²)	EL (%)	Temp °C(°F)	CVN-Impact Value J (ft-lbs)	BM	Th.(mm)
L-8	480 (69,400)	560 (81,000)	30	-29 (-20)	50 (30)	SS400	25
	-	550 (79,900)	-	0 (32)	50 (30)	SM490A	28

Typical Welding Parameters

Wire	Dia. (mm)	Th. (mm)	Groove Design (mm)	Pass	Amp. (A)	Volt. (V)	Speed (cm/min)	Remarks
L-8	4.0	25		1~14	570	30	40	AWS A5.17
L-8	4.8	20		1st 2nd	880 970	34 35	28 33	Both side Single pass

S-707 X L-8

Type : Active

Conformances

AWS A5.17/ ASME SFA5.17 F7A4-EL8

JIS Z3352 SA AB1

EN ISO 14174-S A AB 1 / EN ISO 14171-A-S1

KR 3TM, 3YTM

ABS 3TM, 3YTM

LR 3TM, 3YTM

BV A3TM, A3YTM

DNV-GL IIIYTM

NK KAW3TM, KAW53TM

RINA 3YM, 3YT

RS 3YTM

Applications

- Shipbuilding

Features

- Both side single-layer welding
- Low consumption of flux
- Density : 1.1g/cm³

Current

AC, DC +

Basicity Index

1.6

Packages (Flux)

Tin Can 20kg(44lbs)

PE Bag 20kg(44lbs)

Flux Composition

Consumable	Chemical Composition, wt%			
	SiO ₂ + TiO ₂	CaO + MgO	Al ₂ O ₃ + MnO	CaF ₂
S-707	15	30	40	15

Diameter / Packaging

Diameter	Spool	Basket			Coil					Pac				
mm (in)	20kg (44lbs)	25kg (55lbs)	100kg (220lbs)	25kg (55lbs)	100kg (220lbs)	200kg (440lbs)	250kg (551lbs)	300kg (661lbs)	500kg (1102lbs)	200kg (440lbs)	250kg (551lbs)	300kg (661lbs)	350kg (771lbs)	400kg (881lbs)
1.6 (1/16)	✓													
2.0 (5/64)	✓	✓												
2.4 (3/32)				✓										
3.2 (1/8)				✓										
4.0 (5/32)				✓	✓									
4.8 (3/16)				✓	✓			✓	✓					
6.4 (1/4)								✓	✓					

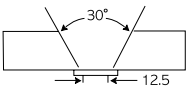
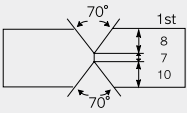
Typical Chemical Composition of All-Weld Metal(%)

Wire	C	Si	Mn	P	S	BM	Th.(mm)
L-8	0.07	0.40	1.40	0.028	0.015	SS400	25
	0.08	0.32	1.29	0.015	0.014	AH36	25

Typical Mechanical Properties of All-Weld Metal

Wire	YS MPa(lbs/in ²)	TS MPa(lbs/in ²)	EL (%)	Temp °C(°F)	CVN-Impact Value J (ft-lbs)	BM	Th.(mm)
L-8	490 (71,000)	560 (81,000)	31	-40 (-40)	70 (52)	SS400	25
	-	570 (82,800)	-	-20 (-4)	40 (30)	AH36	25

Typical Welding Parameters

Wire	Dia. (mm)	Th. (mm)	Groove Design (mm)	Pass	Amp. (A)	Volt. (V)	Speed (cm/min)	Remarks
L-8	4.0	25		1~13	570	30	40	AWS A5.17
L-8	4.8	25		1st 2nd	950 1100	34 37	40 30	Both side Single pass

SMW

SAW

GMW

GTAW

FCAW

Non-FERROUS

APPENDIX

S-737 X H-14

Type : Neutral

Conformances

AWS A5.17/ ASME SFA5.17 F7A(P)4-EH14
JIS Z3352 SA AB1
EN ISO 14174-S A AB 1 / EN ISO 14171-A-S4
KR 3M, 3YM

ABS 3M, 3YM
LR 3M, 3YM
DNV-GL IIIYM

Applications

- Storage tanks
- Pressure vessels
- Shipbuilding

Features

- Good performance and bead appearance
- Easy to remove slag
- Density : 1.1g/cm³

Current

AC, DC +

Basicity Index

1.6

Packages (Flux)

Tin Can 20kg(44lbs)
PE Bag 20kg(44lbs)

Flux Composition

Consumable	Chemical Composition, wt%			
	SiO ₂ + TiO ₂	CaO + MgO	Al ₂ O ₃ + MnO	CaF ₂

Diameter / Packaging

Diameter	Spool	Basket			Coil					Pac				
mm (in)	20kg (44lbs)	25kg (55lbs)	100kg (220lbs)	25kg (55lbs)	100kg (220lbs)	200kg (440lbs)	250kg (551lbs)	300kg (661lbs)	500kg (1102lbs)	200kg (440lbs)	250kg (551lbs)	300kg (661lbs)	350kg (771lbs)	400kg (881lbs)
1.6 (1/16)	✓			✓							✓			✓
2.0 (5/64)	✓			✓	✓	✓	✓					✓		
2.4 (3/32)	✓	✓		✓	✓	✓								
3.2 (1/8)		✓		✓	✓	✓	✓	✓			✓	✓	✓	
4.0 (5/32)		✓		✓	✓	✓		✓	✓	✓	✓	✓	✓	✓
4.8 (3/16)	✓			✓	✓			✓	✓					
6.4 (1/4)				✓	✓									

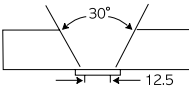
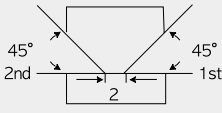
Typical Chemical Composition of All-Weld Metal(%)

Wire	C	Si	Mn	P	S	BM	Th.(mm)
H-14	0.08	0.31	1.60	0.025	0.019	SS400	25
	0.07	0.40	1.53	0.020	0.013	SM490	28

Typical Mechanical Properties of All-Weld Metal

Wire	YS MPa(lbs/in ²)	TS MPa(lbs/in ²)	EL (%)	Temp °C(°F)	CVN-Impact Value J (ft-lbs)	BM	Th.(mm)
H-14	510 (74,000)	570 (82,800)	31	-40 (-40)	110 (81)	SS400	25
	-	540 (78,400)	-	-20 (-4)	60 (44)	SM490	28

Typical Welding Parameters

Wire	Dia. (mm)	Th. (mm)	Groove Design (mm)	Pass	Amp. (A)	Volt. (V)	Speed (cm/min)	Remarks
H-14	4.0	25		1~13	570	30	40	AW A5.17
H-14	3.2	28		1	450	28	35	1st Horizontal ML
				2~4	500	26	50	
				5	450	28	35	
				6~8	500	26	50	

S-717 X M-12K [A-2]

Type : Neutral



Conformances

AWS A5.17/ ASME SFA5.17 F7A(P)6-EM12K
 AWS A5.23/ ASME SFA5.23 F8A0-EA2-A4
 JIS Z3352 SA AB1
 EN ISO 14174-S A AB 1 / EN ISO 14171-A-S2Si [S2Mo]
 KR 3M, 3YM
 ABS 3M, 3YM
 LR 3YM
 BV A3, A3YM
 DNV-GL IIYM

NK KAW53M
 CWB CSA W48 F49A(P)5-EM12K
 TÜV EN ISO 14174 - S A AB 1
 EN ISO 14171-A - S2Si
 DB DIN EN ISO 14174-S A AB1
 DIN EN ISO 14171-A-S2Si
 CE
 RS 3YM

Applications

- Pressure vessels
- Windtower
- Structural steels

Features

- Good performance with thick plates
- Good resistance to crack
- Density : 1.1g/cm³

Current

AC, DC +

Basicity Index

1.9

Packages (Flux)

Tin Can 20kg(44lbs)
 PE Bag 20kg(44lbs)

Flux Composition

Consumable	Chemical Composition, wt%			
	SiO ₂ + TiO ₂	Al ₂ O ₃ + MnO	CaO + MgO	CaF ₂
S-717	10	30	35	10

Diameter / Packaging

- M-12K : √ • A-2 : ○

Diameter mm (in)	Spool	Basket			Coil					Pac				
	20kg (44lbs)	25kg (55lbs)	100kg (220lbs)	25kg (55lbs)	100kg (220lbs)	200kg (440lbs)	250kg (551lbs)	300kg (661lbs)	500kg (1102lbs)	200kg (440lbs)	250kg (551lbs)	300kg (661lbs)	350kg (771lbs)	400kg (881lbs)
1.6 (1/16)	√○			√									√	
2.0 (5/64)	√	○		√○							√	○	√	√
2.4 (3/32)		√○	√	√○	√									√
3.2 (1/8)		√○	√	√○	√			○		√				√
4.0 (5/32)		√○	√	√○	√○	√○	○		√○	√	√○	√○	○	√○
4.8 (3/16)				√	√			√	√	√				

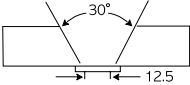
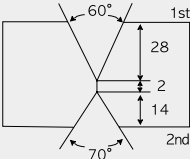
Typical Chemical Composition of All-Weld Metal(%)

Wire	C	Si	Mn	P	S	Mo	BM	Th.(mm)
M-12K	0.09	0.26	1.40	0.023	0.004	-	SS400	25
M-12K	0.08	0.54	1.47	0.025	0.018	-	BS4360-Gr.50D	44
A-2	0.08	0.35	1.58	0.023	0.005	0.49	SS400	25

Typical Mechanical Properties of All-Weld Metal

Wire	YS MPa(lbs/in ²)	TS MPa(lbs/in ²)	EL (%)	Temp °C(°F)	CVN-Impact Value J (ft-lbs)	BM	Th.(mm)
M-12K	555 (80,500)	614 (89,100)	29	-51 (-60)	60 (44)	SS400	25
M-12K	510 (74,000)	580 (84,200)	28	-20 (-4)	70 (52)	BS4360-Gr.50D	44
A-2	542 (78,610)	650 (94,300)	32	-20 (-4)	60 (44)	SS400	25

Typical Welding Parameters

Wire	Dia. (mm)	Th. (mm)	Groove Design (mm)	Pass	Amp. (A)	Volt. (V)	Speed (cm/min)	Remarks
M-12K (A-2)	4.0	25		1~13	570	30	40	AWS A5.17/ A5.23
M-12K	4.0	44		1 2~14	500 600	32 36	40 50	1st ML
				15 16~23	500 600	32 36	40 50	2nd

S-777Q X M-12K

Type : Neutral

Conformances

AWS A5.17/ ASME SFA5.17 F7A2-EM12K

JIS Z3352 SA AR1

EN ISO 14174-S A AR 1 / EN ISO 14171-A-S2Si

Applications

- LPG tanks
- General fabrications
- Structural steels
- Shipbuilding

Features

- Easy to remove slag
- High speed welding
- Horizontal and flat fillet welding
- Density : 1.0g/cm³

Current

AC, DC +

Basicity Index

0.6

Packages (Flux)

Tin Can 20kg(44lbs)

Flux Composition

Consumable	Chemical Composition, wt%			
	Al ₂ O ₃ + MgO	MnO + TiO ₂	Fe ₂ O ₃ + SiO ₂	CaF ₂ + CaO
S-777Q	50	20	15	15

Diameter / Packaging

Diameter mm (in)	Spool	Basket			Coil					Pac				
	20kg (44lbs)	25kg (55lbs)	100kg (220lbs)	25kg (55lbs)	100kg (220lbs)	200kg (440lbs)	250kg (551lbs)	300kg (661lbs)	500kg (1102lbs)	200kg (440lbs)	250kg (551lbs)	300kg (661lbs)	350kg (771lbs)	400kg (881lbs)
1.6 (1/16)	✓			✓									✓	
2.0 (5/64)	✓			✓							✓		✓	✓
2.4 (3/32)		✓	✓	✓	✓									✓
3.2 (1/8)		✓	✓	✓	✓					✓				✓
4.0 (5/32)		✓	✓	✓	✓	✓			✓	✓	✓	✓		✓
4.8 (3/16)				✓	✓			✓	✓	✓				

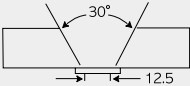
Typical Chemical Composition of All-Weld Metal(%)

Wire	C	Si	Mn	P	S	BM	Th.(mm)
M-12K	0.05	0.83	1.41	0.024	0.009	SS400	25

Typical Mechanical Properties of All-Weld Metal

Wire	YS Mpa(lbs/in ²)	TS Mpa(lbs/in ²)	EL (%)	Temp °C(°F)	CVN-Impact Value J (ft-lbs)	BM	Th.(mm)
M-12K	537 (78,000)	621 (90,000)	28.1	-18 (0) -29 (-20)	41 (30) 32 (24)	SS400	25

Typical Welding Parameters

Wire	Dia. (mm)	Th. (mm)	Groove Design (mm)	Pass	Amp. (A)	Volt. (V)	Speed (cm/min)	Remarks
M-12K	4.0	25		1~13	550	30	40	AWS A5.17

SWAW

SAW

GMWAW

GTAW

FCAW

Non-FERROUS

APPENDIX

S-707T X H-14

Type : Neutral



Conformances

AWS A5.17/ ASME SFA5.17 F7A(P)6-EH14
JIS Z3352 SA AB1
EN ISO 14174-S A AB 1 / EN ISO 14171-A-S4
KR 3T, 3YT, 4YM
ABS 4YM, 3T, 3YT
LR 4YM, 3T, 3YT

BV A4YM, A3T, A3YT
DNV-GL IVYM, IIIYT
NK KAW53T, KAW54M
CE
RINA 4YM, 3YT
RS 3T, 3YT, 4Y40T, 4Y40M H10

Applications

- Shipbuilding

Features

- Both side single-layer welding
- Low consumption of flux
- Density : 1.2g/cm³

Current

AC, DC +

Basicity Index

1.8

Packages (Flux)

Tin Can 20kg(44lbs)
PE Bag 20kg(44lbs)

Flux Composition

Consumable	Chemical Composition, wt%		
	SiO ₂ + Al ₂ O ₃	MgO + CaF ₂ + CaO	MnO + FeO
S-707T	50	45	5

Diameter / Packaging

Diameter mm (in)	Spool	Basket			Coil					Pac				
	20kg (44lbs)	25kg (55lbs)	100kg (220lbs)	25kg (55lbs)	100kg (220lbs)	200kg (440lbs)	250kg (551lbs)	300kg (661lbs)	500kg (1102lbs)	200kg (440lbs)	250kg (551lbs)	300kg (661lbs)	350kg (771lbs)	400kg (881lbs)
1.6 (1/16)	✓			✓							✓			✓
2.0 (5/64)	✓			✓	✓	✓	✓					✓		
2.4 (3/32)	✓	✓		✓	✓	✓								
3.2 (1/8)		✓		✓	✓	✓	✓	✓			✓	✓	✓	
4.0 (5/32)		✓		✓	✓	✓		✓	✓	✓	✓	✓	✓	✓
4.8 (3/16)	✓			✓	✓			✓	✓					
6.4 (1/4)				✓	✓									

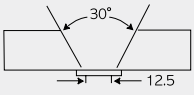
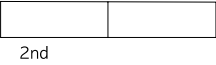
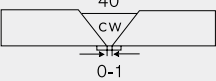
Typical Chemical Composition of All-Weld Metal(%)

Wire	C	Si	Mn	P	S	BM	Th.(mm)
H-14	0.10	0.37	1.54	0.020	0.012	SS400	25
	0.14	0.41	1.43	0.018	0.008	EH36	20
	0.11	0.29	1.52	0.018	0.009	DH36	25

Typical Mechanical Properties of All-Weld Metal

Wire	YS MPa(lbs/in ²)	TS MPa(lbs/in ²)	EL (%)	Position of fracture	CVN-Impact Value J (ft-lbs)			BM	Th.(mm)
					0°C (32°F)	-20°C (-4°F)	-51°C (-60°F)		
H-14	570 (82,800)	605 (87,900)	28.0	-	-	-	80 (59)	SS400	25
	-	570 (82,800)	-	BM	-	50 (37)	-	EH36	20
	-	580 (84,200)	23.0	-	70 (52)	-	-	DH36	25

Typical Welding Parameters

Wire	Dia. (mm)	Th. (mm)	Groove Design (mm)	Pass	Amp. (A)	Volt. (V)	Speed (cm/min)	Remarks
H-14	4.0	25		1~13	550	30	40	AWS A5.17
H-14	4.8	20		1st L(DC+) T(AC)	1100 700	37 42	100	Tandem
				2nd L(DC+) T(AC)	1200 700	37 42	100	SL
H-14	4.8	25		1	1150	35	20	FAB OSW (DC+)

SMW

SAW

GMW

GTAW

FCAW

Non-FERROUS

APPENDIX

S-787TB X H-14

Type : Neutral



Conformances

AWS A5.17/ ASME SFA5.17 F7A(P)8-EH14
JIS Z3352 SA FB1
EN ISO 14174-S A FB 1 / EN ISO 14171-A-S4
KR 3YT, 4Y40M (-60°C ≥41 J)
ABS 3T, 3YT, 5Y400M
LR 3YT, 5Y40M
BV A5Y40M, A3T, A3YT

DNV-GL VY40M H10, IIIYT(35t),
VYT (20t)
NK KAWL3TM, KAW54Y40M
DB DIN EN ISO 14174-S A FB1
DIN EN ISO 14171-A-S4
CWB CSA W48 F49A(P)6-EH14
CE

Applications

- Offshore structure
- Pressure vessels
- Cryogenic applications

Features

- Good impact value at low temperature
- Good resistance to pockmark and porosity
- Density : 1.2g/cm³

Current

AC, DC +

Basicity Index

2.4

Packages (Flux)

Tin Can 20kg(44lbs)
PE Bag 20kg(44lbs)

Flux Composition

Consumable	Chemical Composition, wt%			
	SiO ₂ + TiO ₂	CaO + MgO	Al ₂ O ₃ + MnO	CaF ₂
S-787TB	15	55	15	15

Diameter / Packaging

Diameter	Spool		Basket		Coil					Pac				
	20kg (44lbs)	25kg (55lbs)	100kg (220lbs)	25kg (55lbs)	100kg (220lbs)	200kg (440lbs)	250kg (551lbs)	300kg (661lbs)	500kg (1102lbs)	200kg (440lbs)	250kg (551lbs)	300kg (661lbs)	350kg (771lbs)	400kg (881lbs)
1.6 (1/16)	✓			✓							✓			✓
2.0 (5/64)	✓			✓	✓	✓	✓					✓		
2.4 (3/32)	✓	✓		✓	✓	✓								
3.2 (1/8)		✓		✓	✓	✓	✓	✓			✓	✓	✓	
4.0 (5/32)		✓		✓	✓	✓		✓	✓	✓	✓	✓	✓	✓
4.8 (3/16)	✓			✓	✓			✓	✓					
6.4 (1/4)				✓	✓									

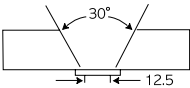
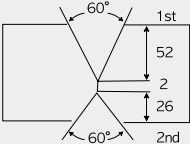
Typical Chemical Composition of All-Weld Metal(%)

Wire	C	Si	Mn	P	S	Ti	B	BM	Th.(mm)
H-14	0.09	0.25	1.53	0.020	0.015	0.020	0.0020	SS400	25
	0.06	0.12	1.12	0.012	0.005	0.021	0.0024	API-2HGr.50	80

Typical Mechanical Properties of All-Weld Metal

Wire	YS MPa(lbs/in ²)	TS MPa(lbs/in ²)	EL (%)	Temp °C(°F)	CVN-Impact Value J (ft-lbs)	BM	Th.(mm)
H-14	580 (84,200)	620 (90,000)	31	-62 (-80)	90 (66)	SS400	25
				-40 (-40)	90 (66)	API-2H Gr.50	80
	470 (68,200)	550 (76,800)	34	-62 (-80)	70 (52)		

Typical Welding Parameters

Wire	Dia. (mm)	Th. (mm)	Groove Design (mm)	Pass	Amp. (A)	Volt. (V)	Speed (cm/min)	Remarks
H-14	4.0	25		1~13	570	30	40	AWS A5.17
H-14	4.0	80		1	220	26	55	(FCAW)
				2	450	28	30	1st
				3~25	600	34	30	
				26	450	28	30	2nd
				27~36	600	34	30	Back Gouging

Superflux 55ULT X H-14

Type : Neutral



Conformances

AWS A5.17/ ASME SFA5.17 F7A(P)8-EH14
JIS Z3352 SA FB1
EN ISO 14174-S A FB 1 / EN ISO 14171-A-S4
KR 4Y40M H5 (-60°C ≥41 J)
ABS 5Y400M H5, 4YT
LR 4YT, 4Y40M H5
BV A5Y40M HHH, A4YT
DNV-GL VY40M H5, IVYT / VYT (T:t≤20mm)

NK KAW54T, KAW54Y40M H5
(-60°C ≥41 J)
TÜV EN ISO 14174 - S A FB 1
EN ISO 14171-A - S4
DB DIN EN 7ISO 14174-S A FB1
DIN EN ISO 14171-A-S4
CE
RINA 5Y40M, 4YT
RS 5YT, 4Y40T, 5Y40M H5

Applications

- Offshore
- Shipbuilding
- Cryogenic applications

Features

- Good impact value and CTOD at low temperature
- Low hydrogen content
- Tandem, multi-electrode applicable
- Density : 1.2g/cm³

Current

AC, DC +

Basicity Index

2.5

Packages (Flux)

Tin Can 20kg(44lbs)

PE Bag 20kg(44lbs)

Flux Composition

Consumable	Chemical Composition, wt%			
	SiO ₂ + TiO ₂	CaO + MgO	Al ₂ O ₃ + MnO	CaF ₂
Superflux 55ULT	20	40	20	15

Diameter / Packaging

Diameter mm (in)	Spool	Basket			Coil					Pac				
	20kg (44lbs)	25kg (55lbs)	100kg (220lbs)	25kg (55lbs)	100kg (220lbs)	200kg (440lbs)	250kg (551lbs)	300kg (661lbs)	500kg (1102lbs)	200kg (440lbs)	250kg (551lbs)	300kg (661lbs)	350kg (771lbs)	400kg (881lbs)
1.6 (1/16)	✓			✓							✓			✓
2.0 (5/64)	✓			✓	✓	✓	✓					✓		
2.4 (3/32)	✓	✓		✓	✓	✓								
3.2 (1/8)		✓		✓	✓	✓	✓	✓			✓	✓	✓	
4.0 (5/32)		✓		✓	✓	✓		✓	✓	✓	✓	✓	✓	✓
4.8 (3/16)	✓			✓	✓			✓	✓					
6.4 (1/4)				✓	✓									

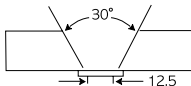
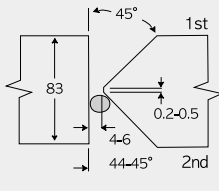
Typical Chemical Composition of All-Weld Metal(%)

Wire	C	Si	Mn	P	S	Ti	B	BM	Th.(mm)
H-14	0.09	0.21	1.34	0.019	0.012	0.018	0.0015	SS400	25
	0.08	0.26	1.40	0.020	0.009	0.020	0.0018	EH36-TM	83

Typical Mechanical Properties of All-Weld Metal

Wire	YS MPa(lbs/in ²)	TS MPa(lbs/in ²)	EL (%)	Position of fracture	CVN-Impact Value J (ft-lbs)		BM	Th.(mm)
					-40°C (-40°F)	-62°C (-80°F)		
H-14	530 (76,900)	580 (84,200)	30	-	-	120 (88)	SS400	25
	510 (74,000)	570 (82,800)	32	-	150 (110)	110 (81)	EH36-TM	83

Typical Welding Parameters

Wire	Dia. (mm)	Th. (mm)	Groove Design (mm)	Pass	Amp. (A)	Volt. (V)	Speed (cm/min)	Remarks	
H-14	4.0	25		1~13	570	30	40	AWS A5.17	
H-14	4.8	83		1st	1	220	25	21	(FCAW) (FCAW) Both Side Multi-pass
				2	270	30	25		
				3	550	30	35		
				4~27	650	34	40		
				Back Gouging					
				2nd	28	550	30	35	
				29~51	650	34	40		

Superflux 787 X H-12K

Type : Neutral

Conformances

AWS A5.17/ ASME SFA5.17 F7A(P)8-EH12K
JIS Z3352 SA FB1
EN ISO 14174-S A FB 1 / EN ISO 14171-A-S3Si

ABS 4YM H5
AWS A5.17 F7A(P)8-EH12K

Applications

- Offshore
- Pressure vessels
- Pipeline

Features

- Low hydrogen content
- Tandem, multi-electrode applicable
- Good impact value at low temperature after heat treatment
- Density : 1.2g/cm³

Current

AC, DC +

Basicity Index

2.7

Packages (Flux)

Tin Can 20kg(44lbs)
PE Bag 20kg(44lbs)

Flux Composition

Consumable	Chemical Composition, wt%		
	MgO + MnO	CaF ₂ + CaO	Al ₂ O ₃ + SiO ₂
Superflux 787	35	35	30

Diameter / Packaging

Diameter mm (in)	Spool	Basket			Coil					Pac				
	20kg (44lbs)	25kg (55lbs)	100kg (220lbs)	25kg (55lbs)	100kg (220lbs)	200kg (440lbs)	250kg (551lbs)	300kg (661lbs)	500kg (1102lbs)	200kg (440lbs)	250kg (551lbs)	300kg (661lbs)	350kg (771lbs)	400kg (881lbs)
1.6 (1/16)	✓													
2.4 (3/32)				✓										
3.2 (1/8)				✓	✓	✓								
4.0 (5/32)				✓	✓	✓		✓	✓		✓	✓	✓	✓

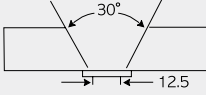
Typical Chemical Composition of All-Weld Metal(%)

Wire	C	Si	Mn	P	S	BM	Th.(mm)
H-12K	0.09	0.30	1.50	0.018	0.010	AH36	25

Typical Mechanical Properties of All-Weld Metal

Wire	YS MPa(lbs/in ²)	TS MPa(lbs/in ²)	EL (%)	PWHT condition	Temp °C(°F)	CVN-Impact Value J (ft.lbs)	BM	Th.(mm)
H-12K	540 (78,400)	580 (84,200)	32.0	-	-62 (-80)	101 (75)	AH36	25
	450 (45,300)	520 (75,500)	33.0	620°C×1hr	-62 (-80)	110 (81)	AH36	25

Typical Welding Parameters

Wire	Dia. (mm)	Th. (mm)	Groove Design (mm)	Pass	Amp. (A)	Volt. (V)	Speed (cm/min)	Remarks
H-12K	4.0	25		1~13	570	30	40	AWS A5.17

Superflux 787 X H-14

Type : Neutral

Conformances

AWS A5.17/ ASME SFA5.17 F7A(P)8-EH14
JIS Z3352 SA FB1
EN ISO 14174-S A FB 1 / EN ISO 14171-A-S4
KR 4YM
ABS 3M, 4YM
LR 4YM

BV A4YM
DNV-GL IVYM
NK KAW54M
CCS 4YM

Applications

- Offshore
- Pressure vessels
- Pipeline

Features

- Low hydrogen content
- Tandem, multi-electrode applicable
- Good impact value at low temperature after heat treatment
- Density : 1.2g/cm³

Current

AC, DC +

Basicity Index

2.7

Packages (Flux)

Tin Can 20kg(44lbs)
PE Bag 20kg(44lbs)

Flux Composition

Consumable	Chemical Composition, wt%		
	MgO + MnO	CaF ₂ + CaO	Al ₂ O ₃ + SiO ₂
Superflux 787	35	35	30

Diameter / Packaging

Diameter	Spool	Basket			Coil					Pac				
mm (in)	20kg (44lbs)	25kg (55lbs)	100kg (220lbs)	25kg (55lbs)	100kg (220lbs)	200kg (440lbs)	250kg (551lbs)	300kg (661lbs)	500kg (1102lbs)	200kg (440lbs)	250kg (551lbs)	300kg (661lbs)	350kg (771lbs)	400kg (881lbs)
1.6 (1/16)	✓			✓							✓			✓
2.0 (5/64)	✓			✓	✓	✓	✓					✓		
2.4 (3/32)	✓	✓		✓	✓	✓								
3.2 (1/8)		✓		✓	✓	✓	✓	✓			✓	✓	✓	
4.0 (5/32)		✓		✓	✓	✓		✓	✓	✓	✓	✓	✓	✓
4.8 (3/16)	✓			✓	✓			✓	✓					
6.4 (1/4)				✓	✓									

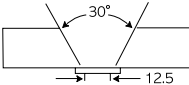
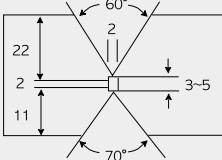
Typical Chemical Composition of All-Weld Metal(%)

Wire	C	Si	Mn	P	S	BM	Th.(mm)
H-14	0.10	0.07	1.43	0.018	0.010	SS400	25
	0.06	0.13	1.37	0.016	0.007	SM490	39

Typical Mechanical Properties of All-Weld Metal

Wire	YS MPa(lbs/in ²)	TS MPa(lbs/in ²)	EL (%)	Temp °C(°F)	CVN-Impact Value J (ft.-lbs)	BM	Th.(mm)
H-14	470 (68,200)	560 (81,300)	26	-62 (-80)	130 (96)	SS400	25
	-	550 (76,800)	-	-40 (-40)	80 (59)	SM490	39
	-	-	-	-62 (-80)	50 (37)		

Typical Welding Parameters

Wire	Dia. (mm)	Th. (mm)	Groove Design (mm)	Pass	Amp. (A)	Volt. (V)	Speed (cm/min)	Remarks
H-14	4.0	25		1~13	570	30	40	AWS A5.17
H-14	4.0	39		1 2~7	500 600	28 32	35 30	1st
				8 9~13	500 600	28 32	35 30	2nd

SWAW

SAW

GMWAW

GTAW

FCAW

Non-FERROUS

APPENDIX

Superflux 800T X M-12K [A-2]

Type : Neutral



Conformances

AWS A5.17/ ASME SFA5.17 F7A8-EM12K
 AWS A5.23/ ASME SFA5.23 F8A4-EA2-A3
 JIS Z3352 SA FB1
 EN ISO 14174-S A AB 1 / EN ISO 14171-A-S2Si [S2Mo]
 TÜV EN ISO 14174 - S A FB 1 / EN ISO 14171-A - S2Si
 EN 756 - S2 Mo

DB DIN EN ISO 14174-S A FB1
 DIN EN ISO 14171-A-S2Si (M-12K)
 DIN EN ISO 14171-A-S2Mo (A-2)
 CE

Applications

- Windtower
- Power plant

Features

- Good bead appearance
- Easy to remove slag
- Low consumption of flux
- Density : 1.1g/cm³

Current

AC, DC +

Basicity Index

2.4

Packages (Flux)

Tin Can 20kg(44lbs)
 PE Bag 20kg(44lbs)

Flux Composition

Consumable	Chemical Composition, wt%			
	SiO ₂ + TiO ₂	Al ₂ O ₃ + MnO	CaO + MgO	CaF ₂
Superflux 800T	10	30	40	15

Diameter / Packaging

- M-12K : √ • A-2 : ○

Diameter mm (in)	Spool	Basket			Coil					Pac				
	20kg (44lbs)	25kg (55lbs)	100kg (220lbs)	25kg (55lbs)	100kg (220lbs)	200kg (440lbs)	250kg (551lbs)	300kg (661lbs)	500kg (1102lbs)	200kg (440lbs)	250kg (551lbs)	300kg (661lbs)	350kg (771lbs)	400kg (881lbs)
1.6 (1/16)	√○			√									√	
2.0 (5/64)	√	○		√○							√	○	√	√
2.4 (3/32)		√○	√	√○	√									√
3.2 (1/8)		√○	√	√○	√			○		√				√
4.0 (5/32)		√○	√	√○	√○	√○	○		√○	√	√○	√○	○	√○
4.8 (3/16)				√	√			√	√	√				

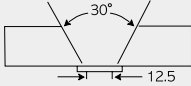
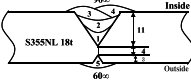
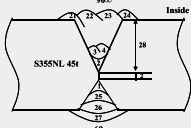
Typical Chemical Composition of All-Weld Metal(%)

Wire	C	Si	Mn	P	S	Mo	BM	Th.(mm)
M-12K	0.09	0.35	1.40	0.023	0.006	-	SM490	25
A-2	0.09	0.24	1.48	0.020	0.006	0.43	SM570	25
M-12K	0.10	0.35	1.40	0.020	0.007	-	S355NL	45

Typical Mechanical Properties of All-Weld Metal

Wire	YS MPa(lbs/in ²)	TS MPa(lbs/in ²)	EL (%)	Position of fracture	CVN-Impact Value J (ft-lbs)			BM	Th. (mm)
					-40°C (-40°F)	-50°C (-58°F)	-60°C (-76°F)		
M-12K	530 (76,700)	570 (82,700)	29	-	-	-	100 (74)	SM490	25
A-2	630 (91,400)	660 (95,700)	24	-	70 (52)	-	-	SM570	25
M-12K	-	550 (79,800)	-	BM	-	60 (44)	-	S355NL	45

Typical Welding Parameters

Wire	Dia. (mm)	Th. (mm)	Groove Design (mm)	Pass	Amp. (A)	Volt. (V)	Speed (cm/min)	Remarks
M-12K (A-2)	4.0	25		1~13	570	30	40	AWS A5.17/ A5.23
M-12K	4.0	18		In 1 2~4 Out 5	550 600 650	28 32 34	40 40 40	Both Side Multi- pass
M-12K	4.0	45		In 1 2~24 Out 25 26~27	600 600~650 650 650	30 30~32 30 32	40 40~45 40 35	Both Side Multi- pass Sealing : SM-70(1.2mm)

S-800WT X M-12K

Type : Neutral



Conformances

AWS A5.17/ ASME SFA5.17 F7A8-EM12K

JIS Z3352 SA FB1

EN ISO 14174-S A FB 1 / EN ISO 14171-A-S2Si

TÜV EN ISO 14174 - S A FB 1 / EN ISO 14171-A-S2Si

CWB CSA W48 F49A(P)6-EM12K

DB DIN EN ISO 14174-S A FB1

DIN EN ISO 14171-A-S2Si

CE

Applications

- Windtower
- Power plant

Features

- Good bead appearance
- Easy to remove slag
- Low consumption of flux
- Density : 1.1g/cm³

Current

AC, DC +

Basicity Index

2.7

Packages (Flux)

Tin Can 20kg(44lbs)

PE Bag 20kg(44lbs)

Flux Composition

Consumable	Chemical Composition, wt%			
	SiO ₂ + TiO ₂	Al ₂ O ₃ + MnO	CaO + MgO	CaF ₂
S-800WT	10	30	40	15

Diameter / Packaging

Diameter mm (in)	Spool	Basket			Coil					Pac				
	20kg (44lbs)	25kg (55lbs)	100kg (220lbs)	25kg (55lbs)	100kg (220lbs)	200kg (440lbs)	250kg (551lbs)	300kg (661lbs)	500kg (1102lbs)	200kg (440lbs)	250kg (551lbs)	300kg (661lbs)	350kg (771lbs)	400kg (881lbs)
1.6 (1/16)	✓			✓									✓	
2.0 (5/64)	✓			✓							✓		✓	✓
2.4 (3/32)		✓	✓	✓	✓									✓
3.2 (1/8)		✓	✓	✓	✓					✓				✓
4.0 (5/32)		✓	✓	✓	✓	✓			✓	✓	✓	✓		✓
4.8 (3/16)				✓	✓			✓	✓	✓				

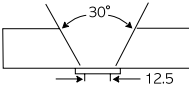
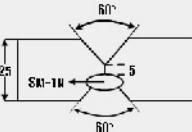
Typical Chemical Composition of All-Weld Metal(%)

Wire	C	Si	Mn	P	S	Ti	B	BM	Th.(mm)
M-12K	0.090	0.20	1.45	0.020	0.010	0.008	0.0020	SM490	25

Typical Mechanical Properties of All-Weld Metal

Wire	YS MPa(lbs/in ²)	TS MPa(lbs/in ²)	EL (%)	Position of fracture	Temp °C(°F)	CVN-Impact Value J (ft.lbs)	BM	Th.(mm)
M-12K	520 (75,400)	570 (82,700)	32.0	-	-60 (-76)	130 (95)	SM490	25
	-	550 (79,800)		BM	-60 (-76)	100 (74)	S355NL	25

Typical Welding Parameters

Wire	Dia. (mm)	Th. (mm)	Groove Design (mm)	Pass	Amp. (A)	Volt. (V)	Speed (cm/min)	Remarks
M-12K	4.0	25		1~13	570	30	40	AWS A5.17
M-12K	4.8	25		1	320	28	70	SM-1N
				1st	(L)750 (T)650	28 34	60 60	Both Side Single-pass
				2nd	(L)900 (T)650	32 38	65 65	pass (tandem)

Superflux 600 X H-14 [A-3]

Type : Neutral

Conformances

AWS A5.17/ ASME SFA5.17 F7A(P)6-EH14
JIS Z3183 S502-H
AWS A5.23/ ASME SFA5.23 F8A(P)4-EA3-G
JIS Z3352 SA FB1
EN ISO 14174-S A AB 1 / EN ISO 14171-A-S4 [S4Mo]

Applications

- Structure fabrication (HSB500(SM490) and HSB600(SM570))

Features

- Good bead appearance
- Easy to remove slag
- Good resistance to pockmarks and pits
- Density : 1.2g/cm³

Current

AC, DC +

Basicity Index

1.9

Packages (Flux)

Tin Can 20kg(44lbs)
PE Bag 20kg(44lbs)

Flux Composition

Consumable	Chemical Composition, wt%			
	SiO ₂ + TiO ₂	CaO + MgO	Al ₂ O ₃ + MnO	CaF ₂
Superflux 600	15	35	25	20

Diameter / Packaging

- H-14 : ✓ • A-3 : ○

Diameter mm (in)	Spool	Basket			Coil					Pac				
	20kg (44lbs)	25kg (55lbs)	100kg (220lbs)	25kg (55lbs)	100kg (220lbs)	200kg (440lbs)	250kg (551lbs)	300kg (661lbs)	500kg (1102lbs)	200kg (440lbs)	250kg (551lbs)	300kg (661lbs)	350kg (771lbs)	400kg (881lbs)
1.6 (1/16)	✓○			✓							✓		○	✓
2.0 (5/64)	✓○			✓○	✓	✓	✓					✓		
2.4 (3/32)	✓	✓		✓○	✓	✓								
3.2 (1/8)		✓		✓○	✓○	✓	✓	✓○			✓○	✓	✓	
4.0 (5/32)		✓		✓○	✓○	✓○		✓○	✓○	✓	✓○	✓	✓	✓
4.8 (3/16)	✓			✓○	✓○			✓○	✓					
6.4 (1/4)				✓	✓									

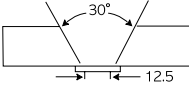
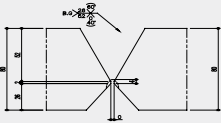
Typical Chemical Composition of All-Weld Metal(%)

Wire	C	Si	Mn	P	S	Mo	BM	Th.(mm)
H-14	0.08	0.20	1.50	0.020	0.006	-	SS400	25
A-3	0.07	0.21	1.45	0.018	0.006	0.45	SM570	25
A-3	0.05	0.28	1.50	0.017	0.003	0.42	HSB600	80

Typical Mechanical Properties of All-Weld Metal

Wire	YS MPa(lbs/in ²)	TS MPa(lbs/in ²)	EL (%)	Position of fracture	CVN-Impact Value J (ft-lbs)			BM	Th. (mm)
					-20°C (-4°F)	-40°C (-40°F)	-51°C (-60°F)		
H-14	516 (74,800)	558 (80,900)	31	-	-	-	150 (111)	SS400	25
A-3	621 (90,100)	660 (95,700)	27	-	-	120 (89)	-	SM570	25
A-3	-	632 (91,700)	-	B.M.	100 (74)	-	-	HSB600	45

Typical Welding Parameters

Wire	Dia. (mm)	Th. (mm)	Groove Design (mm)	Pass	Amp. (A)	Volt. (V)	Speed (cm/min)	Remarks
H-14 (A-3)	4.0	25		1~13	570	30	40	AWS A5.17/ A5.23
A-3	4.8	80		1 2~18 19~26	500 550~650 500~650	28 28~32 28~32	40 18~40 20~40	Both Side Multi- pass

S-800MX X A-G [A-3]

Type : Neutral

Conformances

AWS A5.23/ ASME SFA5.23 F8A0-EG-G
JIS Z3183 S502-H
AWS A5.23/ ASME SFA5.23 F8AZ-EA3-G
JIS Z3352 SA AR1
EN ISO 14174-S A AR 1 / EN ISO 14171-A-S4 [S4Mo]

Applications

- Structural fabrication

Features

- Easy to remove slag
- Tandem welding applicable (H-beam)
- Density : 1.0g/cm³

Current

AC, DC +

Basicity Index

0.8

Packages (Flux)

Tin Can 20kg(44lbs)
PE Bag 20kg(44lbs)

Flux Composition

Consumable	Chemical Composition, wt%		
	SiO ₂ + TiO ₂	CaO + MgO	Al ₂ O ₃ + MnO
S-800MX	40	20	35

Diameter / Packaging

- A-G : ✓ • A-3 : ○

Diameter mm (in)	Spool	Basket			Coil					Pac				
	20kg (44lbs)	25kg (55lbs)	100kg (220lbs)	25kg (55lbs)	100kg (220lbs)	200kg (440lbs)	250kg (551lbs)	300kg (661lbs)	500kg (1102lbs)	200kg (440lbs)	250kg (551lbs)	300kg (661lbs)	350kg (771lbs)	400kg (881lbs)
1.6 (1/16)	○												○	
2.0 (5/64)	○			○										
2.4 (3/32)				○										
3.2 (1/8)				○	○			○			○			
4.0 (5/32)				✓○	○	○		○	○		○			
4.8 (3/16)				✓○	✓○			✓○						

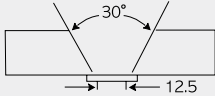
Typical Chemical Composition of All-Weld Metal(%)

Wire	C	Si	Mn	P	S	Mo	BM
A-G	0.09	0.40	1.20	0.025	0.010	-	SM520B
A-3	0.08	0.35	1.15	0.020	0.010	0.45	SM570

Typical Mechanical Properties of All-Weld Metal

Wire	YS MPa(lbs/in ²)	TS MPa(lbs/in ²)	EL (%)	CVN-Impact Value J (ft-lbs)		BM	Th.(mm)
				0°C (32°F)	-18°C (0°F)		
A-G	590 (85,600)	630 (91,400)	27	-	120 (89)	SM520B	25
A-3	650 (94,300)	690 (100,000)	25	80 (59)	-	SM570	25

Typical Welding Parameters

Wire	Dia. (mm)	Th. (mm)	Groove Design (mm)	Pass	Amp. (A)	Volt. (V)	Speed (cm/min)	Remarks
A-G (A-3)	4.0	25		1~13	570	30	40	AWS A5.23

S-800CM X B-2

Type : Neutral

Conformances

AWS A5.23/ ASME SFA5.23 F8P2-EB2-B2
JIS Z3352 SA FB1
EN ISO 14174-S A FB 1 / EN ISO 14171-A-S2CrMo1

Applications

- Heat resistant steels
- Boiler

Features

- Good resistance to porosity on rust, scales and primers
- Density : 1.0g/cm³

Current

AC, DC +

Basicity Index

3.2

Packages (Flux)

Tin Can 20kg(44lbs)
PE Bag 20kg(44lbs)

Flux Composition

Consumable	Chemical Composition, wt%			
	Al ₂ O ₃ + Fe ₂ O ₃	CaF ₂ + MgO	SiO ₂ + CaO	
S-800CM	20	55	25	

Diameter / Packaging

Diameter mm (in)	Spool	Basket		Coil						Pac				
	20kg (44lbs)	25kg (55lbs)	100kg (220lbs)	25kg (55lbs)	100kg (220lbs)	200kg (440lbs)	250kg (551lbs)	300kg (661lbs)	500kg (1102lbs)	200kg (440lbs)	250kg (551lbs)	300kg (661lbs)	350kg (771lbs)	400kg (881lbs)
2.0 (5/64)				✓	✓							✓	✓	
2.4 (3/32)		✓		✓	✓							✓		
3.2 (1/8)				✓								✓		
4.0 (5/32)				✓	✓							✓		

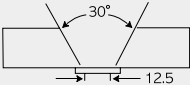
Typical Chemical Composition of All-Weld Metal(%)

Wire	C	Si	Mn	P	S	Cr	Mo	BM	Th.(mm)
B-2	0.08	0.25	0.84	0.017	0.004	1.21	0.45	A387 Grade II	25

Typical Mechanical Properties of All-Weld Metal

Wire	YS MPa(lbs/in ²)	TS MPa(lbs/in ²)	EL (%)	Temp °C(°F)	CVN-Impact Value J (ft.-lbs)	BM	Th.(mm)
B-2	610 (88,500)	665 (96,400)	25.6	-29 (-20)	40 (34)	A387 Grade II	25

Typical Welding Parameters

Wire	Dia. (mm)	Th. (mm)	Groove Design (mm)	Pass	Amp. (A)	Volt. (V)	Speed (cm/min)	Remarks
B-2	4.0	25		1-13	570	30	40	AWS A5.23

SMW

SAW

GMW

GTAW

FCAW

Non-FERROUS

APPENDIX

S-800SP X M-12K [A-2]

Type : Neutral

Conformances

AWS A5.17/ ASME SFA5.17 F7A4-EM12K
 JIS Z3183 S502-H
 AWS A5.23/ ASME SFA5.23 F9TA4G-A2 / F8A2-EA2-G
 JIS Z3352 SA AB1
 EN ISO 14174-S A AB 1 / EN ISO 14171-A-S2Si [S2Mo]

Applications

- Pipe line

Features

- Good resistance to porosity on rust, scales and primers
- High speed welding (Spiral pipes)
- Density : 1.2g/cm³

Current

AC, DC +

Basicity Index

1.2

Packages (Flux)

Tin Can 20kg(44lbs)
 PE Bag 20kg(44lbs)

Flux Composition

Consumable	Chemical Composition, wt%			
	SiO ₂ + TiO ₂	CaO + MgO	Al ₂ O ₃ + MnO	CaF ₂
S-800SP	20	25	30	20

Diameter / Packaging

- M-12K : √
- A-2 : ○

Diameter mm (in)	Spool	Basket			Coil					Pac				
	20kg (44lbs)	25kg (55lbs)	100kg (220lbs)	25kg (55lbs)	100kg (220lbs)	200kg (440lbs)	250kg (551lbs)	300kg (661lbs)	500kg (1102lbs)	200kg (440lbs)	250kg (551lbs)	300kg (661lbs)	350kg (771lbs)	400kg (881lbs)
1.6 (1/16)	√○			√									√	
2.0 (5/64)	√	○		√○							√	○	√	√
2.4 (3/32)		√○	√	√○	√									√
3.2 (1/8)		√○	√	√○	√			○		√				√
4.0 (5/32)		√○	√	√○	√○	√○	○		√○	√	√○	√○	○	√○
4.8 (3/16)				√	√			√	√	√				

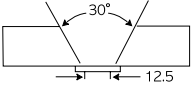
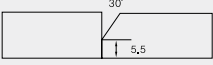
Typical Chemical Composition of All-Weld Metal(%)

Wire	C	Si	Mn	P	S	Mo	BM	Th.(mm)
M-12K	0.07	0.35	1.30	0.020	0.006	-	SS400	25
A-2	0.09	0.27	1.20	0.018	0.007	0.39	SM570	25
A-2	0.08	0.23	1.40	0.013	0.004	0.14	API 5L X65	11.1

Typical Mechanical Properties of All-Weld Metal

Wire	YS MPa(lbs/in ²)	TS MPa(lbs/in ²)	EL (%)	Position of fracture	CVN-Impact Value J (ft.lbs)			BM	Th. (mm)
					-20°C (-4°F)	-30°C (-22°F)	-40°C (-40°F)		
M-12K	505 (73,200)	587 (85,100)	28	-	-	-	70 (52)	SS400	25
A-2	580 (84,200)	654 (94,900)	26	-	-	80 (59)	-	SM570	25
A-2	-	590 (85,600)	-	BM	80 (59)	70 (52)	-	API 5L X65	11.1

Typical Welding Parameters

Wire	Dia. (mm)	Th. (mm)	Groove Design (mm)	Pass	Amp. (A)	Volt. (V)	Speed (cm/min)	Remarks
M-12K (A-2)	4.0	25		1~13	570	30	40	AWS A5.17/ A5.23
A-2	L(DC+):4.0 T(AC):4.0	11.1		In side 1st Out side 2nd	(L)1050 (T)620 (L)1000 (T)660	34 40 34 40	200 200	Both Side Single- pass (tandem)

S-900SP X M-12K [A-2]

Type : Neutral

Conformances

AWS A5.17/ ASME SFA5.17 F7A4(P2)-EM12K

AWS A5.23/ ASME SFA5.23 F9A2-EA2-G

JIS Z3352 SA CS1

EN ISO 14174-S A CS 1 / EN ISO 14171-A-S2Si [S2Mo]

ABS AWS A5.17 F7A(P)4-EM12K [M-12K]

AWS A5.23 F9A(P)2-EA2-G [A-2]

NAKS (S-900SPxA-2)

Applications

- Pipe line

Features

- Good resistance to porosity on rust, scales and primers
- High speed welding (Longitudinal pipes)
- Density : 1.2g/cm³

Current

AC, DC +

Basicity Index

1.5

Packages (Flux)

Tin Can 20kg(44lbs)

PE Bag 20kg(44lbs)

Flux Composition

Consumable	Chemical Composition, wt%			
	SiO ₂ + TiO ₂	CaO + MgO	Al ₂ O ₃ + MnO	CaF ₂
S-900SP	15	50	25	10

Diameter / Packaging

- M-12K : √
- A-2 : ○

Diameter mm (in)	Spool	Basket			Coil					Pac				
	20kg (44lbs)	25kg (55lbs)	100kg (220lbs)	25kg (55lbs)	100kg (220lbs)	200kg (440lbs)	250kg (551lbs)	300kg (661lbs)	500kg (1102lbs)	200kg (440lbs)	250kg (551lbs)	300kg (661lbs)	350kg (771lbs)	400kg (881lbs)
1.6 (1/16)	√○			√									√	
2.0 (5/64)	√	○		√○							√	○	√	√
2.4 (3/32)		√○	√	√○	√									√
3.2 (1/8)		√○	√	√○	√			○		√				√
4.0 (5/32)		√○	√	√○	√○	√○	○		√○	√	√○	√○	○	√○
4.8 (3/16)				√	√			√	√	√				

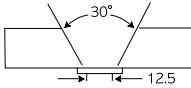
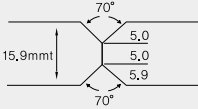
Typical Chemical Composition of All-Weld Metal(%)

Wire	C	Si	Mn	P	S	Mo	BM	Th.(mm)
M-12K	0.09	0.35	1.55	0.024	0.004	-	SS400	25
A-2	0.11	0.26	1.51	0.019	0.006	0.39	SM570	25
A-2	0.08	0.23	1.54	0.013	0.004	0.15	API 5L X70	15.9

Typical Mechanical Properties of All-Weld Metal

Wire	YS MPa(lbs/in ²)	TS MPa(lbs/in ²)	EL (%)	Position of fracture	CVN-Impact Value J (ft-lbs)			BM	Th. (mm)
					-20°C (-4°F)	-30°C (-22°F)	-40°C (-40°F)		
M-12K	525 (76,100)	575 (83,400)	28	-	-	-	70 (52)	SS400	25
A-2	650 (94,300)	710 (103,000)	24	-	-	60 (44)	-	SM570	25
A-2	-	620 (89,900)	-	BM	60 (44)	-	-	API 5L X70	15.9

Typical Welding Parameters

Wire	Dia. (mm)	Th. (mm)	Groove Design (mm)	Pass	Amp. (A)	Volt. (V)	Speed (cm/min)	Remarks
M-12K (A-2)	4.0	25		1~13	570	30	40	AWS A5.17/ A5.23
A-2	L(DC+):4.0 T(AC):4.0	15.9		In side 1st	(L)980 (T)800	34 38	100	Both Side Single- pass (tandem)
				Out side 2nd	(L)1000 (T)780	39 40	110	

S-950S X M-12K [A-2, A-2TiB]

Type : Neutral

Conformances

AWS A5.17/ ASME SFA5.17 F7A4(P8)-EM12K
AWS A5.23/ ASME SFA5.23 F8A(P)5-EA2-EA3
AWS A5.23/ ASME SFA5.23 F8TA(P)8-EA2
AWS A5.23/ ASME SFA5.23 F8TA(P)8-EA2TiB

Applications

- Pipe line

Features

- Good resistance to porosity on rust, scales and primers
- High speed welding (Longitudinal pipes)
- Good impact value at low temperature
- Density : 1.2g/cm³

Current

AC, DC +

Basicity Index

2.2

Packages (Flux)

Tin Can 20kg(44lbs)
PE Bag 20kg(44lbs)

Flux Composition

Consumable	Chemical Composition, wt%			
	SiO ₂ + TiO ₂	CaO + MgO	Al ₂ O ₃ + MnO	CaF ₂
S-950S	15	35	30	20

Diameter / Packaging

- M-12K : √ • A-2 : ○

Diameter mm (in)	Spool	Basket			Coil					Pac				
	20kg (44lbs)	25kg (55lbs)	100kg (220lbs)	25kg (55lbs)	100kg (220lbs)	200kg (440lbs)	250kg (551lbs)	300kg (661lbs)	500kg (1102lbs)	200kg (440lbs)	250kg (551lbs)	300kg (661lbs)	350kg (771lbs)	400kg (881lbs)
1.6 (1/16)	√○			√									√	
2.0 (5/64)	√	○		√○							√	○	√	√
2.4 (3/32)		√○	√	√○	√									√
3.2 (1/8)		√○	√	√○	√			○		√				√
4.0 (5/32)		√○	√	√○	√○	√○	○		√○	√	√○	√○	○	√○
4.8 (3/16)				√	√			√	√	√				

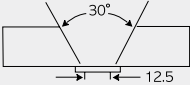
Typical Chemical Composition of All-Weld Metal(%)

Wire	C	Si	Mn	P	S	Mo	BM	Th.(mm)
M-12K	0.06	0.20	1.50	0.016	0.003	-	SS400	25
A-2	0.06	0.20	1.51	0.016	0.003	0.43	SM570	25

Typical Mechanical Properties of All-Weld Metal

Wire	YS MPa(lbs/in ²)	TS MPa(lbs/in ²)	EL (%)	Position of fracture	CVN-Impact Value J (ft.lbs)			BM	Th. (mm)
					40°C (-40°F)	46°C (-50°F)	-60°C (-76°F)		
M-12K	470 (68,200)	540 (78,400)	30	-	-	-	150 (110)	SS400	25
A-2	570 (82,700)	640 (92,800)	28	-	-	70 (52)	-	SM570	25

Typical Welding Parameters

Wire	Dia. (mm)	Th. (mm)	Groove Design (mm)	Pass	Amp. (A)	Volt. (V)	Speed (cm/min)	Remarks
M-12K (A-2)	4.0	25		1~13	570	30	40	AWS A5.17/ A5.23

S-460Y X H-14

Type : Neutral



Conformances

AWS A5.23/ ASME SFA5.23 F8A8-EH14-G
JIS Z3352 SA FB1
EN ISO 14174-S A FB 1 / EN ISO 14171-A-S4
KR 5Y46M H5
ABS 5YQ460M H5, 5YQ500M H5, 4YQ500T
LR 5Y46M H5
BV A5Y46M HHH

DNV-GL VY46M (H5)
NK KAW5Y46M H5,
KAW63Y47M H5
(-20°C ≥53J)
CE

Applications

- Shipbuilding
- High strength steels (EH47)

Features

- Good impact value at low temperature and high tensile strength
- Single and multi electrode welding applicable
- Density : 1.2g/cm³

Current

AC, DC +

Basicity Index

2.5

Packages (Flux)

Tin Can 20kg(44lbs)
PE Bag 20kg(44lbs)

Flux Composition

Consumable	Chemical Composition, wt%			
	SiO ₂ + TiO ₂	CaO + MgO	Al ₂ O ₃ + MnO	CaF ₂
S-460Y	20	40	20	15

Diameter / Packaging

Diameter mm (in)	Spool	Basket			Coil					Pac				
	20kg (44lbs)	25kg (55lbs)	100kg (220lbs)	25kg (55lbs)	100kg (220lbs)	200kg (440lbs)	250kg (551lbs)	300kg (661lbs)	500kg (1102lbs)	200kg (440lbs)	250kg (551lbs)	300kg (661lbs)	350kg (771lbs)	400kg (881lbs)
1.6 (1/16)	✓			✓							✓			✓
2.0 (5/64)	✓			✓	✓	✓	✓					✓		
2.4 (3/32)	✓	✓		✓	✓	✓								
3.2 (1/8)		✓		✓	✓	✓	✓	✓			✓	✓	✓	
4.0 (5/32)		✓		✓	✓	✓		✓	✓	✓	✓	✓	✓	✓
4.8 (3/16)	✓			✓	✓			✓	✓					
6.4 (1/4)				✓	✓									

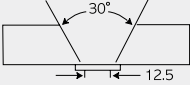
Typical Chemical Composition of All-Weld Metal(%)

Wire	C	Si	Mn	P	S	BM
H-14	0.10	0.28	1.50	0.020	0.005	SM570

Typical Mechanical Properties of All-Weld Metal

Wire	YS MPa(lbs/in²)	TS MPa(lbs/in²)	EL (%)	Temp °C(°F)	CVN-Impact Value J (ft-lbs)	BM	Th.(mm)
H-14	610 (88,500)	640 (92,800)	27.0	-60 (-76)	100 (74)	SM570	25

Typical Welding Parameters

Wire	Dia. (mm)	Th. (mm)	Groove Design (mm)	Pass	Amp. (A)	Volt. (V)	Speed (cm/min)	Remarks
H-14	4.0	25		1~13	570	30	40	AWS A5.23

SWAW

SAW

GMWAW

GTAW

FCAW

Non-FERROUS

APPENDIX

S-100 X F-3 [M-4]

Type : Neutral

Conformances

AWS A5.23/ ASME SFA5.23 F9A(P)8-EF3-F3
AWS A5.23/ ASME SFA5.23 F11A(P)8-EG-M4
EN ISO 14174-S A FB 1 / EN ISO 14171-A-S3Ni1Mo
KR 3Y69M H5 [M-4]

Applications

- Shipbuilding
- Offshore structure

Features

- Good impact value at low temperature and high tensile strength
- Density : 1.1g/cm³

Current

AC, DC +

Basicity Index

3.0

Packages (Flux)

Tin Can 20kg(44lbs)
PE Bag 20kg(44lbs)

Flux Composition

Consumable	Chemical Composition, wt%			
	Al ₂ O ₃ + MnO	CaF ₂	CaO + MgO	SiO ₂ + TiO ₂
S-100	20	25	40	15

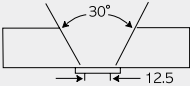
Typical Chemical Composition of All-Weld Metal(%)

Wire	C	Si	Mn	P	S	Cr	Ni	Mo	BM	Th.(mm)
F-3	0.09	0.27	1.71	0.014	0.004	0.05	0.98	0.44	A516 Gr.70	25
M-4	0.08	0.28	1.55	0.015	0.008	0.48	2.26	0.47	A516 Gr.70	25

Typical Mechanical Properties of All-Weld Metal

Wire	YS MPa(lbs/in ²)	TS MPa(lbs/in ²)	EL (%)	PWHT condition	Temp °C(°F)	CVN-Impact Value J (ft.-lbs)	BM	Th.(mm)
F-3	660 (95,700)	709 (102,800)	25	As welded	-62 (-80)	46 (34)	A516 Gr.70	25
	641 (93,000)	698 (101,200)	28	620°C×1hr	-62 (-80)	38 (28)	A516 Gr.70	25
M-4	771 (111,800)	803 (116,500)	24	As welded	-62 (-80)	83 (61)	A516 Gr.70	25
	706 (102,400)	796 (115,400)	25	620°C×1hr	-62 (-80)	41 (30)	A516 Gr.70	25

Typical Welding Parameters

Wire	Dia. (mm)	Th. (mm)	Groove Design (mm)	Pass	Amp. (A)	Volt. (V)	Speed (cm/min)	Remarks
F-3 (M-4)	4.0	25		1~13	570	30	40	AWS A5.23

S-705EF X H-14

Conformances

JIS Z3352 S A CG-I 1
 EN ISO 14174-S A CG-I 1 / EN ISO 14171-A-S4
 KR 2SMR, 2YSMR
 2SR, 2YSR (Max. thick. 25mm)
 ABS 2, 2Y
 LR 2A, 2YA

BV A2M, A2YM
 DNV-GL ILYM ($t \leq 25\text{mm}$)
 NK KAW2SMP, KAW52SMP
 KAW52SP

Applications

- Shipbuilding (one-side welding)

Features

- High deposition rate with high input use
- Suitable for one side welding of TMCP steel
- Density : 1.3g/cm³

Current

AC, DC +

Basicity Index

4.5

Packages (Flux)

Tin Can 20kg(44lbs)
 PE Bag 20kg(44lbs)

Flux Composition

Consumable	Chemical Composition, wt%				
	SiO ₂ + TiO ₂	Al ₂ O ₃ + MnO	MgO + CaO	CaF ₂	FeO
S-705EF	15	10	35	10	30

Diameter / Packaging

Diameter mm (in)	Spool	Basket			Coil					Pac				
	20kg (44lbs)	25kg (55lbs)	100kg (220lbs)	25kg (55lbs)	100kg (220lbs)	200kg (440lbs)	250kg (551lbs)	300kg (661lbs)	500kg (1102lbs)	200kg (440lbs)	250kg (551lbs)	300kg (661lbs)	350kg (771lbs)	400kg (881lbs)
1.6 (1/16)	✓			✓							✓			✓
2.0 (5/64)	✓			✓	✓	✓	✓					✓		
2.4 (3/32)	✓	✓		✓	✓	✓								
3.2 (1/8)		✓		✓	✓	✓	✓	✓			✓	✓	✓	
4.0 (5/32)		✓		✓	✓	✓		✓	✓	✓	✓	✓	✓	✓
4.8 (3/16)	✓			✓	✓			✓	✓					
6.4 (1/4)				✓	✓									

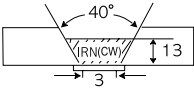
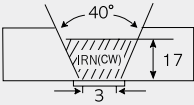
Typical Chemical Composition of All-Weld Metal(%)

Wire	C	Si	Mn	P	S	Mo	BM	Th.(mm)
H-14	0.10	0.20	1.23	0.017	0.011	0.80	AH36	15
	0.10	0.21	1.29	0.014	0.010	0.90	AH36	20

Typical Mechanical Properties of All-Weld Metal

Wire	YS MPa(lbs/in ²)	TS MPa(lbs/in ²)	EL (%)	Temp °C(°F)	CVN-Impact Value J (ft.-lbs)	BM	Th.(mm)
H-14	430 (62,400)	560 (81,300)	23	0 (32)	60 (44)	AH36	15
	400 (58,000)	550 (79,800)	23	0 (32)	60 (44)	AH36	20

Typical Welding Parameters

Wire	Dia. (mm)	Th. (mm)	Groove Design (mm)	Pass	Amp. (A)	Volt. (V)	Speed (cm/min)	Remarks
H-14	4.8	15		1	900	35	22	
H-14	4.8	20		1	1000	36	20	

SWAW

SAW

GMW/

GTAW

FCAW

Non-FERROUS

APPENDIX

S-705HF X H-14

Conformances

JIS Z3352 S A CG-I 1
 EN ISO 14174-S A CG-I 1 / EN ISO 14171-A-S4
 KR 3YSMR ($t \leq 25\text{mm}$)
 3YSR
 ABS 3Y
 LR 3YA

BV A3YM, A3YU
 DNV-GL IIIYM ($t \leq 25\text{mm}$)
 NK KAW53SMP ($t \leq 25\text{mm}$)
 KAW53SP ($t \leq 25\text{mm}$)

Applications

- Shipbuilding (one-side welding)

Features

- High deposition rate with high input use
- Suitable for one side welding of TMCP steel
- Density : 1.3g/cm^3

Current

AC, DC +

Basicity Index

4.2

Packages (Flux)

Tin Can 20kg(44lbs)
 PE Bag 20kg(44lbs)

Flux Composition

Consumable	Chemical Composition, wt%				
	SiO ₂ + TiO ₂	Al ₂ O ₃ + MnO	MgO + CaO	CaF ₂	FeO
S-705HF	15	8	37	10	30

Diameter / Packaging

Diameter	Spool	Basket			Coil					Pac				
mm (in)	20kg (44lbs)	25kg (55lbs)	100kg (220lbs)	25kg (55lbs)	100kg (220lbs)	200kg (440lbs)	250kg (551lbs)	300kg (661lbs)	500kg (1102lbs)	200kg (440lbs)	250kg (551lbs)	300kg (661lbs)	350kg (771lbs)	400kg (881lbs)
1.6 (1/16)	✓			✓							✓			✓
2.0 (5/64)	✓			✓	✓	✓	✓					✓		
2.4 (3/32)	✓	✓		✓	✓	✓								
3.2 (1/8)		✓		✓	✓	✓	✓	✓			✓	✓	✓	
4.0 (5/32)		✓		✓	✓	✓		✓	✓	✓	✓	✓	✓	✓
4.8 (3/16)	✓			✓	✓			✓	✓					
6.4 (1/4)				✓	✓									

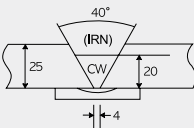
Typical Chemical Composition of All-Weld Metal(%)

Wire	C	Si	Mn	P	S	Mo	Ti	B	BM	Th.(mm)
H-14	0.103	0.26	1.44	0.014	0.006	0.021	0.028	0.0045	EH36	25

Typical Mechanical Properties of All-Weld Metal

Wire	YS MPa(lbs/in ²)	TS MPa(lbs/in ²)	EL (%)	Temp °C(°F)	CVN-Impact Value J (ft-lbs)	BM	Th.(mm)
H-14	509 (73,800)	618 (89,600)	22.6	-20 (-4)	80 (59)	EH36	25

Typical Welding Parameters

Wire	Dia. (mm)	Th. (mm)	Groove Design (mm)	Pass	Amp. (A)	Volt. (V)	Speed (cm/min)	Remarks
H-14	4.8	25		1	1000	36	16	

S-401HF X SC-414S [SC-423S, SC-420S, SC-420SG]

Type : Neutral

Conformances

EN ISO 14174-S A AB 3

Applications

- Cladding flux for hardfacing products

Features

- Smooth and uniform bead appearance
- Good recovery of alloying element of the hardfacing wire
- Density : 1.1g/cm³

Current

AC, DC +

Basicity Index

Packages (Flux)

Tin Can 20kg(44lbs)

PE Bag 20kg(44lbs)

Flux Composition

Consumable	Chemical Composition, wt%			
	SiO ₂ + TiO ₂	Al ₂ O ₃ + MnO	CaO + MgO	CaF ₂
S-401HF	15	25	35	20

Typical Chemical Composition of All-Weld Metal(%)

Wire	C	Si	Mn	Cr	Ni	Mo	Nb	W	V
SC-414S	0.10	0.5	1.4	14.9	2.7	1.0	0.20	-	0.4
SC-423S	0.04	0.4	1.3	17.5	3.0	1.2	0.20	-	0.4
SC-420S	0.33	0.8	1.8	12.6	0.5	1.9	0.18	1.4	0.4
SC-420SG	0.29	0.7	1.5	13.9	0.2	-	0.17	-	-

Hardness of All-Weld Metal

Wire	Dia.(mm)	Hardness (HRc)
SC-414S	2.4/3.2	43-47
SC-423S	3.2	-
SC-420S	3.2	52-56
SC-420SG	3.2	52-56

Superflux 300S X YS-308L [YS-309L, YS-316L]

Type : Neutral

Conformances

JIS Z3352 SA AB2

EN ISO 14174-S A AB 2

KR RV308L TM, RV316L TM

ABS AWS A5.9 ER316L [Wire]

BV UP (-60°C ≥ 27 J)

Applications

- 18%Cr-8%Ni stainless steel

Features

- Good resistance to crack and corrosion
- Easy to remove slag
- Good bead appearance
- Density : 1.2g/cm³

Current

AC, DC +

Basicity Index

1.0

Packages (Flux)

Tin Can 20kg(44lbs)

PE Bag 20kg(44lbs)

Flux Composition

Consumable	Chemical Composition, wt%			
	SiO ₂ + TiO ₂	Al ₂ O ₃ + MnO	MgO + CaO	CaF ₂
Superflux 300S	30	20	40	10

SMW

SAW

GMW

GTAW

FCAW

Non-FERROUS

APPENDIX

Superflux 300S X YS-308L [YS-309L, YS-316L]

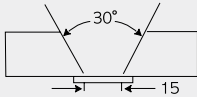
Typical Chemical Composition of All-Weld Metal(%)

Wire	C	Si	Mn	Cr	Ni	Mo
YS-308L	0.03	0.90	1.30	20.3	9.8	
YS-309L	0.03	0.93	1.40	22.5	12.8	
YS-316L	0.03	0.90	1.40	19.2	12.1	2.1

Typical Mechanical Properties of All-Weld Metal

Wire	TS MPa(lbs/in ²)	EL (%)	Temp °C(°F)	CVN-Impact Value J (ft-lbs)
YS-308L	600 (87,000)	42	-196 (-321)	40 (30)
YS-309L	570 (82,700)	38		
YS-316L	550 (79,800)	38	-196 (-321)	40 (30)

Typical Welding Parameters

Wire	Dia. (mm)	Th. (mm)	Groove Design (mm)	Pass	Amp. (A)	Volt. (V)	Speed (cm/min)	Remarks
YS-308L YS-309L YS-316L	4.0	20		1~10	550	32 30	50	JIS Z3324

S-300B X YS-308L [YS-309L, YS-316L, YS-347]

Type : Neutral

Conformances

JIS Z3352 SA AF2
EN ISO 14174-S A AF 2

Applications

- 18%Cr-8%Ni , 22%Cr-12%Ni , 18%Cr-12%Ni-2%Mo stainless steel

Features

- Good resistance to crack and corrosion
- Easy to remove slag
- Good bead appearance
- Density : 1.2g/cm³

Current

AC, DC +

Basicity Index

1.7

Packages (Flux)

Tin Can 20kg(44lbs)
PE Bag 20kg(44lbs)

Flux Composition

Consumable	Chemical Composition, wt%			
	SiO ₂ + TiO ₂	Al ₂ O ₃ + MnO	MgO + CaO	CaF ₂
S-300B	10	35	3	45

SMW

SAW

GMW

GTAW

FCAW

Non-FERROUS

APPENDIX

S-300B X YS-308L [YS-309L, YS-316L, YS-347]

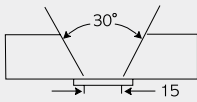
Typical Chemical Composition of All-Weld Metal(%)

Wire	C	Si	Mn	Cr	Ni	Mo	Nb
YS-308L	0.03	0.70	1.80	19.2	9.8		
YS-309L	0.03	0.70	1.80	23.8	12.6		
YS-316L	0.03	0.70	1.60	18.3	11.6	2.1	
YS-347	0.05	0.60	1.30	18.7	8.6		0.60

Typical Mechanical Properties of All-Weld Metal

Wire	TS MPa(lbs/in ²)	EL (%)	Temp °C(°F)	CVN-Impact Value J (ft.lbs)
YS-308L	600 (87,000)	42	-196 (-321)	40 (30)
YS-309L	570 (82,700)	38		
YS-316L	580 (84,200)	38		
YS-347	660 (95,000)	41	-196 (-321)	40 (30)

Typical Welding Parameters

Wire	Dia. (mm)	Th. (mm)	Groove Design (mm)	Pass	Amp. (A)	Volt. (V)	Speed (cm/min)	Remarks
YS-308L YS-309L YS-316L YS-347	4.0	20		1~10	550	32 30	50	JIS Z3324

Superflux 209 X YS-2209

SMW

SAW

GMW

GTAW

FCW

Non-FERROUS

APPENDIX

Conformances

EN ISO 14174-S A AF 2
KR AWS A5.9 ER2209 [Wire]
ABS AWS A5.9 ER2209 [Wire]
DNV Duplex Stainless Steel
NK Manufacturer's Spec.

Applications

- Offshore
- Petrochemical
- Chemical industry

Features

- Approximate 50:50 microstructure of austenite with a ferrite matrix
- Density : 1.0g/cm³

Current

AC, DC +

Basicity Index

1.8

Packages (Flux)

Tin Can 20kg(44lbs)
PE Bag 20kg(44lbs)

Flux Composition

Consumable	Chemical Composition, wt%		
	SiO ₂ + TiO ₂	Al ₂ O ₃	CaF ₂
Superflux 209	10	40	50

Typical Chemical Composition of All-Weld Metal(%)

C	Si	Mn	P	S	Cr	Ni	Mo	Cu	N
0.02	0.49	1.28	0.017	0.003	22.8	8.15	2.99	0.20	0.20

Typical Mechanical Properties of All-Weld Metal

TS MPa(lbs/in ²)	EL (%)	Temp °C(°F)	CVN-Impact Value J (ft-lbs)
805 (116,800)	28	-46 (-50)	70 (52)

S-300EM X Flux for ESW

Conformances

EN ISO 14174-S A AF 2

Applications

- Heat exchanger, pressure vessels

Features

- Good resistance to crack and corrosion
- Easy to remove slag
- Good bead appearance
- Density : 1.2g/cm³

Current

DC +

Basicity Index

Packages (Flux)

Tin Can 20kg(44lbs)

Flux Composition

Consumable	Chemical Composition, wt%		
	SiO ₂ + TiO ₂	Al ₂ O ₃ + MnO	CaF ₂
S-300EM	5	30	60

Typical Chemical Composition of Strip Band(%)

Wire	C	Mn	Si	S	P	Cr	Ni	Mo	Nb	N
YSB-308L	0.01	1.7	0.3	0.001	0.015	20.3	10.4			0.044
YSB-309L	0.01	1.6	0.4	0.002	0.01	24.2	13.4	0.1		0.054
YSB-347	0.02	1.1	0.4	0.001	0.018	19.7	10.5	0.1	0.5	0.043
YSB-316L	0.01	1.8	0.4	0.001	0.016	18.1	12.6	2.9		0.047
YSB-309LMo	0.01	2	0.3	0.001	0.018	20.3	13.8	2.7		0.081
YSB-309LNb	0.02	2	0.3	0.011	0.018	21.2	12.0	0.1	0.6	0.049

Typical Chemical Composition of All-Weld Metal(%)

Wire	C	Mn	Si	Cr	Ni	Mo	Nb	N	F.N
YSB-308L	0.02	1.45	0.55	19.3	10.9			0.054	8
YSB-309L	0.03	1.45	0.7	19.5	11			0.045	6
YSB-347	0.03	0.95	0.9	19.5	10.5			0.038	6
YSB-316L	0.03	1.5	0.63	18.5	12.5	2.5		0.045	7
YSB-309LMo	0.03	1.52	0.49	18.2	13.1	2.36	0.04	0.061	5
YSB-309LNb	0.03	1.36	0.37	18.9	10.4	0.05	0.48	0.024	5

GMAW

Solid Wire & Stainless MIG Wire



SM-70

Mild Steel & 490 MPa high tensile steels



Conformances

AWS A5.18 / ASME SFA5.18 ER70S-6

JIS Z3312 YGW12

EN ISO 14341-A G 42 2 C1 3Si1 / 14341-A G 42 4 M21 3Si1

KR 3SG, 3YSG(C), 3YSG(M2), 3YMG(M2)

ABS 3SA, 3YSA

LR 3YS, 3YM H15

TÜV EN ISO 14341-A - G42 2 C1 3Si1 / G42 4 M21 3Si1

DB DIN EN ISO 14341-A-G 42 2 C1 3Si1

DIN EN ISO 14341-A-G 42 4 M21 3Si1

BV SA3, SA3YM

DNV-GL IIIYMS

NK KSW53G(C), KSW53G(M2),
KSW53MG(M2)

CWB CSA W48 B-G 49A 3 C1 S6

NAKS

RINA 3YS

RS 3YSM

CE

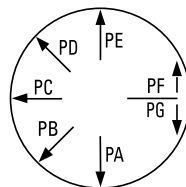
Applications

- Structural fabrication
- Automotive
- Machinery

Features

- All position welding by short-circuiting type transfer
- Stable arc and low spatter
- Good Bead Appearance

Welding Position



Current

DC +

Shielding Gas

100% CO₂

Ar + CO₂

Diameter / Packaging

Diameter mm (in)	Spool			Ball Pac		
	5kg (11lbs)	15kg (33lbs)	20kg (44lbs)	250kg (551lbs)	300kg (661lbs)	350kg (771lbs)
0.8 (0.033)	✓	✓	✓	✓	✓	✓
0.9 (0.035)	✓	✓	✓	✓	✓	✓
1.0 (0.040)	✓	✓	✓	✓	✓	✓
1.2 (0.045)	✓	✓	✓	✓	✓	✓
1.4 (0.052)	✓	✓	✓	✓	✓	✓
1.6 (1/16)	✓	✓	✓	✓	✓	✓

Typical Chemical Composition of the Wire(%)

C	Si	Mn	P	S
0.07	0.83	1.48	0.011	0.015

Typical Mechanical Properties of All-Weld Metal

	YS MPa(lbs/in ²)	TS MPa(lbs/in ²)	EL (%)	Temp °C(°F)	CVN-Impact Value J (ft-lbs)
As welded with 100% CO ₂	460 (67,000)	555 (80,000)	29.3	-29 (-20)	85 (63)
As welded with 80% Ar + CO ₂	495 (72,000)	585 (85,000)	27.5	-29 (-20)	113 (83)
As welded with 90% Ar + CO ₂	495 (72,000)	590 (85,600)	26.4	-29 (-20)	101 (74)

Typical Welding Parameters

Diameter, Polarity Shielding Gas	CTWD mm(in)	Wire Feed Speed m/min (in/min)	Amp. (A)	Volt. (V)	Deposition Rate kg/hr (lb/hr)
1.0mm (0.040in), DC +					
100% CO ₂ Gas	15 (3/4)	4.2 (165)	100	20.5	1.3 (2.9)
		7.8 (307)	150	23	2.4 (5.3)
		11.0 (433)	200	26	3.5 (7.7)
Mixed Gas (80%Ar + CO ₂)	15 (3/4)	3.3 (130)	100	16	1.0 (2.2)
		5.3 (209)	150	17	1.7 (3.7)
		8.6 (339)	200	321	2.7 (6.0)
1.2mm (0.045in), DC +					
100% CO ₂ Gas	20 (3/4)	5.8 (230)	100	18.5	2.9 (6.4)
		9.0 (350)	150	25	4.5 (9.9)
		14.5 (570)	200	31	7.3 (16.1)
Mixed Gas (80%Ar + CO ₂)	20 (3/4)	3.7 (145)	100	17.5	1.9 (4.2)
		6.2 (244)	150	24	3.1 (6.8)
		11.2 (440)	200	30	5.6 (12.3)

SM-70EN

Mild Steel & 490 MPa high tensile steels



Conformances

AWS A5.18/ ASME SFA5.18 ER70S-6

JIS Z3312 YGW12

EN ISO 14341-A G 42 2 C1 4Si1

EN ISO 14341-A G 46 4 M21 4Si1

TÜV EN ISO 14341-A - G42 2 C1 4Si1 / G46 4 M21 4Si1

DB DIN EN ISO 14341-A-G 42 2 C1 4Si1

DIN EN ISO 14341-A-G 46 4 M21 4Si1

CE

DNV-GL IIIV40MS, IVY40MS(M21)

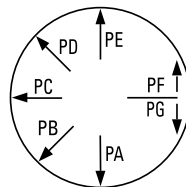
Applications

- Structural fabrication
- Automotive
- Machinery

Features

- All position welding by short-circuiting type transfer
- Mixed gas
- Good bead appearance and low spatter

Welding Position



Current

DC +

Shielding Gas

Ar + CO₂

Diameter / Packaging

Diameter mm (in)	Spool			Ball Pac		
	5kg (11lbs)	15kg (33lbs)	20kg (44lbs)	250kg (551lbs)	300kg (661lbs)	350kg (771lbs)
0.8 (0.033)	✓	✓	✓	✓	✓	✓
0.9 (0.035)	✓	✓	✓	✓	✓	✓
1.0 (0.040)	✓	✓	✓	✓	✓	✓
1.2 (0.045)	✓	✓	✓	✓	✓	✓
1.4 (0.052)	✓	✓	✓	✓	✓	✓
1.6 (1/16)	✓	✓	✓	✓	✓	✓

Typical Chemical Composition of the Wire(%)

C	Si	Mn	P	S
0.08	0.95	1.7	0.012	0.015

Typical Mechanical Properties of All-Weld Metal

	YS MPa(lbs/in ²)	TS MPa(lbs/in ²)	EL (%)	Temp °C(°F)	CVN-Impact Value J (ft.-lbs)
As welded with 80% Ar + CO ₂	477 (69,000)	540 (86,000)	28.5	-29 (-20)	101 (75)
As welded with 90% Ar + CO ₂	492 (71,300)	585 (85,000)	27.9	-29 (-20)	100 (74)

Typical Welding Parameters

Diameter, Polarity Shielding Gas	CTWD mm(in)	Wire Feed Speed m/min (in/min)	Amp. (A)	Volt. (V)	Deposition Rate kg/hr (lb/hr)
1.2mm (0.045in), DC +					
Mixed Gas (Ar + CO ₂)	20 (3/4)	3.7 (145)	150	17.5	1.9 (4.2)
		6.2 (244)	200	24	3.1 (6.8)
		11.2 (440)	280	30	5.6 (12.3)

SWAW

SAW

GMAW

GTAW

FCAW

Non-FERROUS

APPENDIX

SM-70G

Mild Steel & 490 MPa high tensile steels

Conformances

AWS A5.18/ ASME SFA5.18 ER70S-G

JIS Z3312 YGW11

EN ISO 14341-A G3Si1

KR 3SG, 3YSG, 3MG, 3YMG (C1)

ABS 3SA, 3YSA

LR 3YSH15

BV SA3, 3YM

DNV-GL IIIYMS

NK KSW53G, KAW53MG(C)

KSW3G, KSW53G(M2)

KAW3MG, KAW53MG(M2)

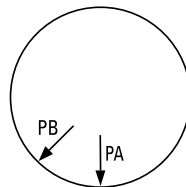
Applications

- Structural fabrication
- Shipbuilding
- Automotive
- Machinery

Features

- Good performance with high current
- High deposition rate
- Deep penetration

Welding Position



Current

DC +

Shielding Gas

100% CO₂

Ar + 20~25% CO₂

Diameter / Packaging

Diameter mm (in)	Spool			Ball Pac		
	5kg (11lbs)	15kg (33lbs)	20kg (44lbs)	250kg (551lbs)	300kg (661lbs)	350kg (771lbs)
0.8 (0.033)	✓	✓	✓	✓	✓	✓
0.9 (0.035)	✓	✓	✓	✓	✓	✓
1.0 (0.040)	✓	✓	✓	✓	✓	✓
1.2 (0.045)	✓	✓	✓	✓	✓	✓
1.4 (0.052)	✓	✓	✓	✓	✓	✓
1.6 (1/16)	✓	✓	✓	✓	✓	✓

Typical Chemical Composition of the Wire(%)

C	Si	Mn	P	S	Ti
0.05	0.82	1.5	0.011	0.010	0.18

Typical Mechanical Properties of All-Weld Metal

	YS MPa(lbs/in ²)	TS MPa(lbs/in ²)	EL (%)	Temp °C(°F)	CVN-Impact Value J (ft-lbs)
As welded with 100% CO ₂	518 (75,000)	591 (86,000)	30.4	-29 (-20)	92 (68)
As welded with 80% Ar + CO ₂	534 (77,400)	600 (87,000)	28.6	-29 (-20)	102 (76)
As welded with 90% Ar + CO ₂	554 (80,300)	630 (91,400)	27.4	-29 (-20)	95 (70)

Typical Welding Parameters

Diameter, Polarity Shielding Gas	CTWD mm(in)	Wire Feed Speed m/min (in/min)	Amp. (A)	Volt. (V)	Deposition Rate kg/hr (lb/hr)
1.2mm (0.045in), DC +					
100% CO ₂ Gas	20 (3/4)	14.5 (570)	280	31	7.3 (16.1)
		17.0 (670)	320	34	8.6 (19.0)
		21.0 (830)	350	37	10.6 (23.3)
Mixed Gas (Ar + CO ₂)	20 (3/4)	11.2 (440)	280	30	5.6 (12.3)
		12.8 (503)	320	33	6.5 (14.3)
		14.0 (551)	350	36	7.1 (15.7)

SM-70S

Mild Steel & 490 MPa high tensile steels

Conformances

AWS A5.18/ ASME SFA5.18 ER70S-3
JIS Z3312 YGW16
EN ISO 14341-A G2Si

ABS 3SA, 3YSA
LR 3YSH15

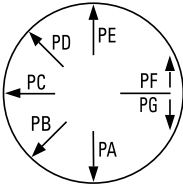
Applications

- Automotive
- Shipbuilding
- Machinery

Features

- All position welding by short-circuiting type transfer
- Mixed gas
- Galvanized steel applicable
- Stable arc and low spatter
- Good bead appearance

Welding Position



Current

DC +

Shielding Gas

Ar + CO₂

Diameter / Packaging

Diameter mm (in)	Spool			Ball Pac		
	5kg (11lbs)	15kg (33lbs)	20kg (44lbs)	250kg (551lbs)	300kg (661lbs)	350kg (771lbs)
0.8 (0.033)	✓	✓	✓	✓	✓	✓
0.9 (0.035)	✓	✓	✓	✓	✓	✓
1.0 (0.040)	✓	✓	✓	✓	✓	✓
1.2 (0.045)	✓	✓	✓	✓	✓	✓
1.4 (0.052)	✓	✓	✓	✓	✓	✓
1.6 (1/16)	✓	✓	✓	✓	✓	✓

Typical Chemical Composition of the Wire(%)

C	Si	Mn	P	S
0.07	0.65	1.14	0.011	0.008

Typical Mechanical Properties of All-Weld Metal

	YS MPa(lbs/in ²)	TS MPa(lbs/in ²)	EL (%)	Temp °C(°F)	CVN-Impact Value J (ft-lbs)
As welded with 80% Ar + CO ₂	455 (66,000)	533 (77,300)	31.2	-20 (-4)	168 (124)
As welded with 90% Ar + CO ₂	467 (67,700)	551 (79,800)	30.6	-20 (-4)	166 (123)

Typical Welding Parameters

Diameter, Polarity Shielding Gas	CTWD mm(in)	Wire Feed Speed m/min (in/min)	Amp. (A)	Volt. (V)	Deposition Rate kg/hr (lb/hr)
1.0mm (0.040in), DC +					
Mixed Gas (80%Ar + CO ₂)	15 (3/4)	3.3 (130)	100	17	1.0 (2.2)
		5.3 (209)	150	18	1.7 (3.7)
		8.6 (339)	200	22	2.7 (6.0)
1.2mm (0.045in), DC +					
Mixed Gas (Ar + CO ₂)	20 (3/4)	3.7 (145)	150	17.5	1.9 (4.2)
		6.2 (244)	200	24	3.1 (6.8)
		11.2 (440)	280	30	5.6 (12.3)

SM-70GS

Mild Steel & 490 MPa high tensile steels

Conformances

AWS A5.18/ ASME SFA5.18 ER70S-G
JIS Z3312 YGW15
EN ISO 14341-A G2Si

LR 3YSH15

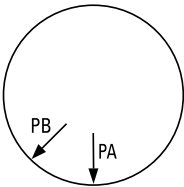
Applications

- Shipbuilding
- Structural fabrication
- Machinery

Features

- Mixed gas
- Good performance high-current

Welding Position



Current

DC +

Shielding Gas

Ar + CO₂

Diameter / Packaging

Diameter mm (in)	Spool			Ball Pac		
	5kg (11lbs)	15kg (33lbs)	20kg (44lbs)	250kg (551lbs)	300kg (661lbs)	350kg (771lbs)
0.8 (0.033)	✓	✓	✓	✓	✓	✓
0.9 (0.035)	✓	✓	✓	✓	✓	✓
1.0 (0.040)	✓	✓	✓	✓	✓	✓
1.2 (0.045)	✓	✓	✓	✓	✓	✓
1.4 (0.052)	✓	✓	✓	✓	✓	✓
1.6 (1/16)	✓	✓	✓	✓	✓	✓

Typical Chemical Composition of the Wire(%)

C	Si	Mn	P	S	Ti
0.06	0.62	1.21	0.013	0.007	0.10

Typical Mechanical Properties of All-Weld Metal

	YS MPa(lbs/in ²)	TS MPa(lbs/in ²)	EL (%)	Temp °C(°F)	CVN-Impact Value J (ft.-lbs)
As welded with 80% Ar + CO ₂	480 (69,600)	550 (79,700)	28.0	-20 (-4)	186 (128)
As welded with 90% Ar + CO ₂	515 (74,600)	556 (80,600)	27.4	-20 (-4)	173 (119)

Typical Welding Parameters

Diameter, Polarity Shielding Gas	CTWD mm(in)	Wire Feed Speed m/min (in/min)	Amp. (A)	Volt. (V)	Deposition Rate kg/hr (lb/hr)
1.2mm (0.045in), DC +					
Mixed Gas (Ar + CO ₂)	20 (3/4)	10.1 (397)	250	28	5.1 (11.2)
		11.2 (440)	280	30	5.6 (12.3)
		12.8 (503)	320	33	6.5 (14.3)

SM-55H

High tensile steels

Conformances

JIS Z3312 YGW18
EN ISO 14341-B G S18

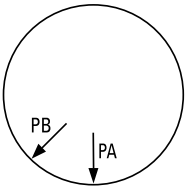
Applications

- Shipbuilding
- Automotive
- Structural fabrication

Features

- Good performance with high-current
- CO₂ gas
- High Efficiency
- Deep penetration

Welding Position



Current

DC +

Shielding Gas

100% CO₂

Diameter / Packaging

Diameter	Spool			Ball Pac		
	5kg (11lbs)	15kg (33lbs)	20kg (44lbs)	250kg (551lbs)	300kg (661lbs)	350kg (771lbs)
mm (in)						
0.8 (0.033)	✓	✓	✓	✓	✓	✓
0.9 (0.035)	✓	✓	✓	✓	✓	✓
1.0 (0.040)	✓	✓	✓	✓	✓	✓
1.2 (0.045)	✓	✓	✓	✓	✓	✓
1.4 (0.052)	✓	✓	✓	✓	✓	✓
1.6 (1/16)	✓	✓	✓	✓	✓	✓

Typical Chemical Composition of the Wire(%)

C	Si	Mn	P	S	Ti
0.07	0.89	1.95	0.013	0.007	0.18

Typical Mechanical Properties of All-Weld Metal

	YS MPa(lbs/in ²)	TS MPa(lbs/in ²)	EL (%)	Temp °C(°F)	CVN-Impact Value J (ft-lbs)
As welded with 100% CO ₂	550 (79,800)	630 (91,500)	28	0 (32)	110 (81)

Typical Welding Parameters

Diameter, Polarity Shielding Gas	CTWD mm(in)	Wire Feed Speed m/min (in/min)	Amp. (A)	Volt. (V)	Deposition Rate kg/hr (lb/hr)
1.2mm (0.045in), DC +					
100% CO ₂ Gas	20 (3/4)	14.5 (570)	280	31	7.3 (16.1)
		17.0 (670)	320	34	8.6 (19.0)
		21.0 (830)	350	37	10.6 (23.3)

SM-80G

High tensile steels

Conformances

AWS A5.28/ ASME SFA5.28 ER80S-G
JIS Z3312 G 59J A 1 U C 3M1T
EN ISO 14341-B G S3M1T
ABS AWS A5.28 ER80S-G (-20°C ≥47J)

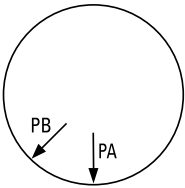
Applications

- General fabrication
- Pressure vessels
- Machinery

Features

- High deposition rate
- Special alloying elements added

Welding Position



Current

DC +

Shielding Gas

100% CO₂
Ar + CO₂

Diameter / Packaging

Diameter mm (in)	Spool			Ball Pac		
	5kg (11lbs)	15kg (33lbs)	20kg (44lbs)	250kg (551lbs)	300kg (661lbs)	350kg (771lbs)
0.8 (0.033)	✓	✓	✓	✓	✓	✓
0.9 (0.035)	✓	✓	✓	✓	✓	✓
1.0 (0.040)	✓	✓	✓	✓	✓	✓
1.2 (0.045)	✓	✓	✓	✓	✓	✓
1.4 (0.052)	✓	✓	✓	✓	✓	✓
1.6 (1/16)	✓	✓	✓	✓	✓	✓

Typical Chemical Composition of the Wire(%)

C	Si	Mn	P	S	Mo	Ti
0.06	0.81	1.85	0.013	0.007	0.27	0.15

Typical Mechanical Properties of All-Weld Metal

	YS MPa(lbs/in ²)	TS MPa(lbs/in ²)	EL (%)	Temp °C(°F)	CVN-Impact Value J (ft-lbs)
As welded with 100% CO ₂	571 (77,100)	645 (93,500)	26.6	-20 (-4)	117 (86)
As welded with 80% Ar + CO ₂	651 (94,400)	715 (103,600)	25.6	-20 (-4)	72 (53)
As welded with 90% Ar + CO ₂	668 (96,800)	732 (106,140)	22.8	-20 (-4)	65 (48)

Typical Welding Parameters

Diameter, Polarity Shielding Gas	CTWD mm(in)	Wire Feed Speed m/min (in/min)	Amp. (A)	Volt. (V)	Deposition Rate kg/hr (lb/hr)
1.2mm (0.045in), DC +					
100% CO ₂ Gas	20 (3/4)	17.0 (670)	320	34	8.6 (19.0)
		21.0 (830)	350	37	10.6 (23.3)
		31.0 (1220)	400	40	15.6 (34.3)
Mixed Gas (80%Ar + CO ₂)	20 (3/4)	12.8 (503)	320	33	6.5 (14.3)
		14.0 (551)	350	36	7.1 (15.7)
		16.0 (630)	400	39	8.1 (17.8)

SM-80D2

High tensile steels

Conformances

AWS A5.28/ ASME SFA5.28 ER80S-D2

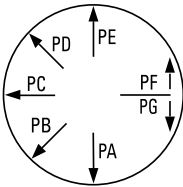
Applications

- High tensile welded structure
- Building and Pressure vessels
- Construction Machinery

Features

- High deposition rate
- Contains 0.50% Molybdenum
- Stable arc with high current

Welding Position



Current

DC +

Shielding Gas

100% CO₂

Ar + 15~25% CO₂

Diameter / Packaging

Diameter mm (in)	Spool			Ball Pac		
	5kg (11lbs)	15kg (33lbs)	20kg (44lbs)	250kg (551lbs)	300kg (661lbs)	350kg (771lbs)
0.8 (0.033)	✓	✓	✓	✓	✓	✓
0.9 (0.035)	✓	✓	✓	✓	✓	✓
1.0 (0.040)	✓	✓	✓	✓	✓	✓
1.2 (0.045)	✓	✓	✓	✓	✓	✓
1.4 (0.052)	✓	✓	✓	✓	✓	✓
1.6 (1/16)	✓	✓	✓	✓	✓	✓

Typical Chemical Composition of the Wire(%)

C	Si	Mn	P	S	Mo
0.09	0.62	1.85	0.015	0.008	0.50

Typical Mechanical Properties of All-Weld Metal

	YS Mpa(lbs/in ²)	TS Mpa(lbs/in ²)	EL (%)	Temp °C(°F)	CVN-Impact Value J (ft.-lbs)
As welded with 100% CO ₂	620 (89,923)	697 (101,091)	23.6	-30 (-22)	50 (37)
As welded with 80% Ar + CO ₂	650 (94,275)	710 (102,977)	26.0	-30 (-22)	100 (74)

Typical Welding Parameters

Diameter, Polarity Shielding Gas	CTWD mm(in)	Wire Feed Speed m/min (in/min)	Amp. (A)	Volt. (V)	Deposition Rate kg/hr (lb/hr)
1.2mm (0.045in), DC +					
100% CO ₂ Gas	20 (3/4)	14.5 (570)	280	31	7.3 (16.1)
		17.0 (670)	320	34	8.6 (19.0)
		21.0 (830)	350	37	10.6 (23.3)
Mixed Gas (Ar + CO ₂)	20 (3/4)	11.2 (440)	280	30	5.6 (12.3)
		12.8 (503)	320	33	6.5 (14.3)
		14.0 (551)	350	36	7.1 (15.7)
1.4mm (0.052in), DC +					
100% CO ₂ Gas	20 (3/4)	12.0 (472)	300	34	8.3 (18.3)
		14.6 (575)	340	36	10.1 (22.2)
		15.8 (622)	360	39	11.0 (24.2)
Mixed Gas (Ar + CO ₂)	20 (3/4)	8.7 (343)	300	32	6.0 (13.2)
		9.5 (374)	340	34	6.6 (14.5)
		10.0 (394)	360	35	6.9 (15.3)
1.6mm (1/16in), DC +					
100% CO ₂ Gas	20 (3/4)	9.4 (370)	340	37	8.5 (18.7)
		11.7 (460)	390	43	10.6 (23.3)
		12.2 (480)	400	44	11.1 (24.4)
Mixed Gas (Ar + CO ₂)	20 (3/4)	6.6 (260)	340	34	6.0 (13.2)
		8.2 (322)	390	38	7.4 (16.3)
		8.6 (339)	400	38	7.8 (17.2)

SM-100

High tensile steels

Conformances

AWS A5.28/ ASME SFA5.28 ER100S-G

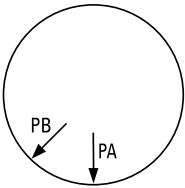
Applications

- 0.3Cr-1.7Ni-0.25Mo-alloyed, High strength steel

Features

- Excellent TS and impact value at low temperature
- Stable arc with High-Current
- Low spatter

Welding Position



Current

DC +

Shielding Gas

Ar + CO₂

Diameter / Packaging

Diameter mm (in)	Spool			Ball Pac		
	5kg (11lbs)	15kg (33lbs)	20kg (44lbs)	250kg (551lbs)	300kg (661lbs)	350kg (771lbs)
0.8 (0.033)	✓	✓	✓	✓	✓	✓
0.9 (0.035)	✓	✓	✓	✓	✓	✓
1.0 (0.040)	✓	✓	✓	✓	✓	✓
1.2 (0.045)	✓	✓	✓	✓	✓	✓
1.4 (0.052)	✓	✓	✓	✓	✓	✓
1.6 (1/16)	✓	✓	✓	✓	✓	✓

Typical Chemical Composition of the Wire(%)

C	Si	Mn	P	S	Cr	Ni	Mo	V
0.081	0.48	1.76	0.013	0.012	0.28	1.76	0.23	0.09

Typical Mechanical Properties of All-Weld Metal

	YS MPa(lbs/in ²)	TS MPa(lbs/in ²)	EL (%)	Temp °C(°F)	CVN-Impact Value J (ft-lbs)
As welded with 80% Ar + CO ₂	711 (103,100)	756 (109,600)	20.4	-20 (-4) -40 (-40)	114 (84) 83 (61)
As welded with 90% Ar + CO ₂	724 (105,000)	766 (111,100)	18.9	-20 (-4) -40 (-40)	106 (79) 78 (57)

Typical Welding Parameters

Diameter, Polarity Shielding Gas	CTWD mm(in)	Wire Feed Speed m/min (in/min)	Amp. (A)	Volt. (V)	Deposition Rate kg/hr (lb/hr)
1.2mm (0.045in), DC +					
Mixed Gas (80%Ar + CO ₂)	20 (3/4)	3.7 (145)	150	17.5	1.9 (4.2)
		6.2 (244)	200	24	3.1 (6.8)
		11.2 (440)	280	30	5.6 (12.3)

SMW

SAW

GMW

GTAW

FCAW

Non-FERROUS

APPENDIX

SM-110

High tensile steels

Conformances

AWS A5.28/ ASME SFA5.28 ER110S-G

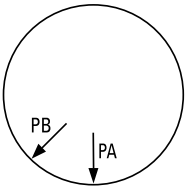
Applications

- 0.3Cr-1.9Ni-0.5Mo-alloyed, High strength steel

Features

- Excellent TS and impact value at low temperature
- Stable arc with High-Current
- Low spatter

Welding Position



Current

DC +

Shielding Gas

Ar + CO₂

Diameter / Packaging

Diameter mm (in)	Spool			Ball Pac		
	5kg (11lbs)	15kg (33lbs)	20kg (44lbs)	250kg (551lbs)	300kg (661lbs)	350kg (771lbs)
0.8 (0.033)	✓	✓	✓	✓	✓	✓
0.9 (0.035)	✓	✓	✓	✓	✓	✓
1.0 (0.040)	✓	✓	✓	✓	✓	✓
1.2 (0.045)	✓	✓	✓	✓	✓	✓
1.4 (0.052)	✓	✓	✓	✓	✓	✓
1.6 (1/16)	✓	✓	✓	✓	✓	✓

Typical Chemical Composition of the Wire(%)

C	Si	Mn	P	S	Cr	Ni	Mo
0.089	0.75	1.83	0.011	0.012	0.30	1.9	0.52

Typical Mechanical Properties of All-Weld Metal

	YS MPa(lbs/in²)	TS MPa(lbs/in²)	EL (%)	Temp °C(°F)	CVN-Impact Value J (ft-lbs)
As welded with 80% Ar + CO ₂	700 (103,000)	858 (124,400)	19.4	-40 (-40) 60 (-76)	82 (60) 69 (51)
As welded with 90% Ar + CO ₂	725 (105,100)	871 (126,300)	17.2	-40 (-40) 60 (-76)	71 (53) 60 (45)

Typical Welding Parameters

Diameter, Polarity Shielding Gas	CTWD mm(in)	Wire Feed Speed m/min (in/min)	Amp. (A)	Volt. (V)	Deposition Rate kg/hr (lb/hr)
1.2mm (0.045in), DC +					
Mixed Gas (80%Ar + CO ₂)	20 (3/4)	3.7 (145)	150	17.5	1.9 (4.2)
		6.2 (244)	200	24	3.1 (6.8)
		11.2 (440)	280	30	5.6 (12.3)

SMW

SAW

GMW

GTAW

FCAW

Non-FERROUS

APPENDIX

SM-80CM

Heat resistance – low alloy steel

Conformances

AWS A5.28/ ASME SFA5.28 ER80S-G
JIS Z3317 YG1CM-A
EN ISO 14341-B G S2M3

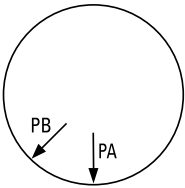
Applications

- Structural fabrication
- Offshore
- Pressure vessels
- Machinery
- Chemical industry

Features

- MIG welding for boiler steam pipe of Steam power generation and 1.0~1.25%Cr-0.5%Mo heat resisting steel using for refining oil & chemical industrial machine tool.
- Good TS and Impact value in a high temperature after heat treatment.

Welding Position



Current

DC +

Shielding Gas

100% Ar
Ar + 2% O₂

Diameter / Packaging

Diameter mm (in)	Spool			Ball Pac		
	5kg (11lbs)	15kg (33lbs)	20kg (44lbs)	250kg (551lbs)	300kg (661lbs)	350kg (771lbs)
0.8 (0.033)	✓	✓	✓	✓	✓	✓
0.9 (0.035)	✓	✓	✓	✓	✓	✓
1.0 (0.040)	✓	✓	✓	✓	✓	✓
1.2 (0.045)	✓	✓	✓	✓	✓	✓
1.4 (0.052)	✓	✓	✓	✓	✓	✓
1.6 (1/16)	✓	✓	✓	✓	✓	✓

Typical Chemical Composition of the Wire(%)

C	Si	Mn	Cr	Mo
0.09	0.67	1.02	1.19	0.45

Typical Mechanical Properties of All-Weld Metal

	YS MPa(lbs/in ²)	EL (%)	Temp °C(°F)	CVN-Impact Value J (ft-lbs)	PWHT
As welded with 100% Ar	630 (91,500)	27	0 (32) -20 (-4)	140 (103) 120 (88)	690°C × 1Hr

Typical Welding Parameters

Diameter, Polarity Shielding Gas	CTWD mm(in)	Wire Feed Speed m/min (in/min)	Amp. (A)	Volt. (V)	Deposition Rate kg/hr (lb/hr)
1.2mm (0.045in), DC +					
100%Ar	20 (3/4)	4.2 (165)	150	16	1.9 (4.2)
		7.4 (291)	200	22	3.1 (6.8)
		12.1 (480)	280	29	5.6 (12.3)

SMAW

SAW

GMAW

GTAW

FCAW

Non-FERROUS

APPENDIX

SM-307Si

STS 304 & high Mn steels

Conformances

EN ISO 14343-A G 18 8 Mn

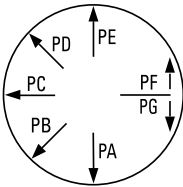
Applications

- Steel Structures - Vehicles, Machinery and Bridges

Features

- Resistance to crack
- High Efficiency
- Resistance to corrosion

Welding Position



Current

DC +

Shielding Gas

Ar / Ar + O₂

Diameter / Packaging

Diameter	Spool			Ball Pac		
mm (in)	12.5kg (28lbs)	15kg (33 lbs)	20kg (44lbs)	150kg (330lbs)	200kg (440lbs)	250kg (551lbs)
0.8 (0.033)	✓					
0.9 (0.035)	✓					
1.0 (0.040)	✓					
1.2 (0.045)	✓					✓
1.4 (0.052)						
1.6 (1/16)	✓					

Typical Chemical Composition of the Wire(%)

C	Si	Mn	Cr	Ni	Mo
0.08	0.87	7.17	19.6	9.3	0.12

Typical Mechanical Properties of All-Weld Metal

TS MPa(lbs/in ²)	EL (%)	Temp °C(°F)	CVN-Impact Value J (ft-lbs)	PWHT
610 (88,600)	42	0 (32) -20 (-4)	83 (63) 59 (43)	690°C × 1Hr

Typical Welding Parameters

Diameter, Polarity Shielding Gas	CTWD mm(in)	Wire Feed Speed m/min (in/min)	Amp. (A)	Volt. (V)	Deposition Rate kg/hr (lb/hr)
1.0mm (0.040 in), DC +					
100% Ar Gas	15~20 (0.59~0.78)	6.0 (236)	140	24	2.1 (4.6)
		7.1 (280)	160	24	2.5 (5.5)
		9.2 (362)	190	24	3.2 (7.1)
Mixed Gas (Ar + 2% O ₂)	15~20 (0.59~0.78)	5.2 (204)	160	26	1.8 (4.0)
		7.0 (276)	190	26	2.4 (5.3)
		8.3 (327)	220	26	2.9 (6.4)
1.2mm (0.045 in), DC +					
100% Ar Gas	15~20 (0.59~0.78)	9.2 (362)	190	27	4.6 (10.1)
		11.9 (469)	220	27	6.0 (13.2)
		15.5 (610)	260	27	7.8 (17.2)
Mixed Gas (Ar + 2% O ₂)	15~20 (0.59~0.78)	7.7 (303)	200	28	3.9 (8.6)
		8.6 (339)	230	28	4.3 (9.5)
		10.1 (398)	260	28	5.1 (11.2)

SM-308

Stainless steel

Conformances

AWS A5.9/ ASME SFA5.9 ER308
JIS Z3321 YS308
EN ISO 14343-A G 19 9

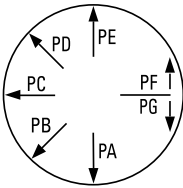
Applications

- Steel Structures - Oil, Textile industries, Nuclear reactor

Features

- Resistance to crack
- High Efficiency
- Resistance to corrosion

Welding Position



Current

DC +

Shielding Gas

Ar / Ar + O₂

Diameter / Packaging

Diameter	Spool			Ball Pac		
mm (in)	12.5kg (28lbs)	15kg (33 lbs)	20kg (44lbs)	150kg (330lbs)	200kg (440lbs)	250kg (551lbs)
0.8 (0.033)	✓					
0.9 (0.035)	✓					
1.0 (0.040)	✓					
1.2 (0.045)	✓				✓	
1.4 (0.052)						
1.6 (1/16)	✓					

Typical Chemical Composition of the Wire(%)

C	Si	Mn	Cr	Ni
0.04	0.41	1.65	19.9	9.8

Typical Mechanical Properties of All-Weld Metal

TS MPa(lbs/in ²)	EL (%)	Temp °C(°F)	CVN-Impact Value J (ft-lbs)
590 (85,600)	40	0 (32) -20 (-4)	100 (74) 50 (37)

Typical Welding Parameters

Diameter, Polarity Shielding Gas	CTWD mm(in)	Wire Feed Speed m/min (in/min)	Amp. (A)	Volt. (V)	Deposition Rate kg/hr (lb/hr)
1.0mm (0.040 in), DC +					
100% Ar Gas	15-20 (0.59-0.78)	6.0 (236)	140	24	2.1 (4.6)
		7.1 (280)	160	24	2.5 (5.5)
		9.2 (362)	190	24	3.2 (7.1)
Mixed Gas (Ar + 2% O ₂)	15-20 (0.59-0.78)	5.2 (204)	160	26	1.8 (4.0)
		7.0 (276)	190	26	2.4 (5.3)
		8.3 (327)	220	26	2.9 (6.4)
1.2mm (0.045 in), DC +					
100% Ar Gas	15-20 (0.59-0.78)	9.2 (362)	190	27	4.6 (10.1)
		11.9 (469)	220	27	6.0 (13.2)
		15.5 (610)	260	27	7.8 (17.2)
Mixed Gas (Ar + 2% O ₂)	15-20 (0.59-0.78)	7.7 (303)	200	28	3.9 (8.6)
		8.6 (339)	230	28	4.3 (9.5)
		10.1 (398)	260	28	5.1 (11.2)

SM-308L

Low carbon 18%Cr-8%Ni steel



Conformances

AWS A5.9/ ASME SFA5.9 ER308L
JIS Z3321 YS308L
EN ISO 14343-A G 19 9L
CE

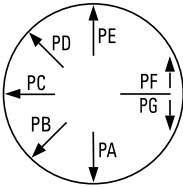
Applications

- Steel Structures - Oil, Textile industries, Nuclear reactor

Features

- Resistance to crack
- High Efficiency
- Resistance to corrosion

Welding Position



Current

DC +

Shielding Gas

Ar / Ar + O₂

Diameter / Packaging

Diameter	Spool			Ball Pac		
mm (in)	12.5kg (28lbs)	15kg (33 lbs)	20kg (44lbs)	150kg (330lbs)	200kg (440lbs)	250kg (551lbs)
0.8 (0.033)	✓					
0.9 (0.035)	✓					
1.0 (0.040)	✓	✓				
1.2 (0.045)	✓	✓				
1.4 (0.052)						✓
1.6 (1/16)	✓					✓

Typical Chemical Composition of the Wire(%)

C	Si	Mn	Cr	Ni
0.02	0.35	1.60	19.9	10.1

Typical Mechanical Properties of All-Weld Metal

TS MPa(lbs/in ²)	EL (%)	Temp °C(°F)	CVN-Impact Value J (ft-lbs)
560 (81,300)	42	0 (32) -20 (-4)	90 (66) 50 (37)

Typical Welding Parameters

Diameter, Polarity Shielding Gas	CTWD mm(in)	Wire Feed Speed m/min (in/min)	Amp. (A)	Volt. (V)	Deposition Rate kg/hr (lb/hr)
1.0mm (0.040 in), DC +					
100% Ar Gas	15~20 (0.59~0.78)	6.0 (236)	140	24	2.1 (4.6)
		7.1 (280)	160	24	2.5 (5.5)
		9.2 (362)	190	24	3.2 (7.1)
Mixed Gas (Ar + 2% O ₂)	15~20 (0.59~0.78)	5.2 (204)	160	26	1.8 (4.0)
		7.0 (276)	190	26	2.4 (5.3)
		8.3 (327)	220	26	2.9 (6.4)
1.2mm (0.045 in), DC +					
100% Ar Gas	15~20 (0.59~0.78)	9.2 (362)	190	27	4.6 (10.1)
		11.9 (469)	220	27	6.0 (13.2)
		15.5 (610)	260	27	7.8 (17.2)
Mixed Gas (Ar + 2% O ₂)	15~20 (0.59~0.78)	7.7 (303)	200	28	3.9 (8.6)
		8.6 (339)	230	28	4.3 (9.5)
		10.1 (398)	260	28	5.1 (11.2)

SM-308LSi

Low carbon 18%Cr-8%Ni steel



Conformances

AWS A5.9/ ASME SFA5.9 ER308LSi
JIS Z3321 YS308LSi
EN ISO 14343-A G 19 9L Si
CE

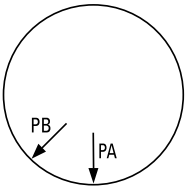
Applications

- Steel Structures - Oil, Textile industries, Nuclear reactor

Features

- Resistance to crack
- High Efficiency
- Resistance to corrosion
- Excellent Arc stability and bead wetting

Welding Position



Current

DC +

Shielding Gas

Ar / Ar + O₂

Diameter / Packaging

Diameter mm (in)	Spool			Ball Pac		
	12.5kg (28lbs)	15kg (33 lbs)	20kg (44lbs)	150kg (330lbs)	200kg (440lbs)	250kg (551lbs)
0.8 (0.033)	✓					
0.9 (0.035)	✓					
1.0 (0.040)	✓					
1.2 (0.045)	✓				✓	
1.4 (0.052)						
1.6 (1/16)	✓					

Typical Chemical Composition of the Wire(%)

C	Si	Mn	Cr	Ni	Mo
0.027	0.79	1.96	20.78	10.02	0.1

Typical Mechanical Properties of All-Weld Metal

TS MPa(lbs/in ²)	EL (%)
610 (88,500)	40.4

Typical Welding Parameters

Diameter, Polarity Shielding Gas	CTWD mm(in)	Wire Feed Speed m/min (in/min)	Amp. (A)	Volt. (V)	Deposition Rate kg/hr (lb/hr)
1.0mm (0.040 in), DC +					
100% Ar Gas	15-20 (0.59-0.78)	6.0 (236)	140	24	2.1 (4.6)
		7.1 (280)	160	24	2.5 (5.5)
		9.2 (362)	190	24	3.2 (7.1)
Mixed Gas (Ar + 2% O ₂)	15-20 (0.59-0.78)	5.2 (204)	160	26	1.8 (4.0)
		7.0 (276)	190	26	2.4 (5.3)
		8.3 (327)	220	26	2.9 (6.4)
1.2mm (0.045 in), DC +					
100% Ar Gas	15-20 (0.59-0.78)	9.2 (362)	190	27	4.6 (10.1)
		11.9 (469)	220	27	6.0 (13.2)
		15.5 (610)	260	27	7.8 (17.2)
Mixed Gas (Ar + 2% O ₂)	15-20 (0.59-0.78)	7.7 (303)	200	28	3.9 (8.6)
		8.6 (339)	230	28	4.3 (9.5)
		10.1 (398)	260	28	5.1 (11.2)

SM-309

22%Cr-12%Ni steel, 18%Cr-8%Ni clad steel, STS-CrMo, STS-Carbon steel

Conformances

AWS A5.9/ ASME SFA5.9 ER309
JIS Z3321 YS309
EN ISO 14343-A G 23 12
ABS AWS A5.9 ER309

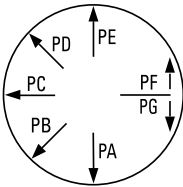
Applications

- Steel Structures - Oil, Textile industries, Nuclear reactor

Features

- Resistance to crack
- High Efficiency
- Excellent resistance to heat

Welding Position



Current

DC +

Shielding Gas

Ar / Ar + O₂

Diameter / Packaging

Diameter	Spool			Ball Pac		
mm (in)	12.5kg (28lbs)	15kg (33 lbs)	20kg (44lbs)	150kg (330lbs)	200kg (440lbs)	250kg (551lbs)
0.8 (0.033)	✓					
0.9 (0.035)	✓					
1.0 (0.040)	✓		✓		✓	✓
1.2 (0.045)	✓				✓	
1.4 (0.052)						
1.6 (1/16)	✓					

Typical Chemical Composition of the Wire(%)

C	Si	Mn	Cr	Ni
0.09	0.39	1.60	23.5	12.8

Typical Mechanical Properties of All-Weld Metal

TS MPa(lbs/in ²)	EL (%)
660 (95,700)	36

Typical Welding Parameters

Diameter, Polarity Shielding Gas	CTWD mm(in)	Wire Feed Speed m/min (in/min)	Amp. (A)	Volt. (V)	Deposition Rate kg/hr (lb/hr)
1.0mm (0.040 in), DC +					
100% Ar Gas	15-20 (0.59-0.78)	6.0 (236)	140	24	2.1 (4.6)
		7.1 (280)	160	24	2.5 (5.5)
		9.2 (362)	190	24	3.2 (7.1)
Mixed Gas (Ar + 2% O ₂)	15-20 (0.59-0.78)	5.2 (204)	160	26	1.8 (4.0)
		7.0 (276)	190	26	2.4 (5.3)
		8.3 (327)	220	26	2.9 (6.4)
1.2mm (0.045 in), DC +					
100% Ar Gas	15-20 (0.59-0.78)	9.2 (362)	190	27	4.6 (10.1)
		11.9 (469)	220	27	6.0 (13.2)
		15.5 (610)	260	27	7.8 (17.2)
Mixed Gas (Ar + 2% O ₂)	15-20 (0.59-0.78)	7.7 (303)	200	28	3.9 (8.6)
		8.6 (339)	230	28	4.3 (9.5)
		10.1 (398)	260	28	5.1 (11.2)

SM-309L

22%Cr-12%Ni steel, 18%Cr-8%Ni clad steel, STS-CrMo, STS-Carbon steel



Conformances

AWS A5.9/ ASME SFA5.9 ER309L
JIS Z3321 YS309L
EN ISO 14343-A G 23 12L
CE

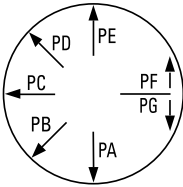
Applications

- Steel Structures - Oil, Textile industries, Nuclear reactor

Features

- Resistance to crack
- High Efficiency
- Excellent resistance to heat

Welding Position



Current

DC +

Shielding Gas

Ar / Ar + O₂

Diameter / Packaging

Diameter mm (in)	Spool			Ball Pac		
	5kg (11lbs)	12.5kg (28lbs)	15kg (33 lbs)	150kg (330lbs)	200kg (440lbs)	250kg (551lbs)
0.8 (0.033)		✓				
0.9 (0.035)		✓				
1.0 (0.040)		✓				
1.2 (0.045)	✓	✓		✓		
1.4 (0.052)						
1.6 (1/16)		✓				

Typical Chemical Composition of the Wire(%)

C	Si	Mn	Cr	Ni
0.03	0.41	1.58	23.5	12.8

Typical Mechanical Properties of All-Weld Metal

TS MPa(lbs/in ²)	EL (%)
640 (92,900)	38

Typical Welding Parameters

Diameter, Polarity Shielding Gas	CTWD mm(in)	Wire Feed Speed m/min (in/min)	Amp. (A)	Volt. (V)	Deposition Rate kg/hr (lb/hr)
1.0mm (0.040 in), DC +					
100% Ar Gas	15~20 (0.59~0.78)	6.0 (236)	140	24	2.1 (4.6)
		7.1 (280)	160	24	2.5 (5.5)
		9.2 (362)	190	24	3.2 (7.1)
Mixed Gas (Ar + 2% O ₂)	15~20 (0.59~0.78)	5.2 (204)	160	26	1.8 (4.0)
		7.0 (276)	190	26	2.4 (5.3)
		8.3 (327)	220	26	2.9 (6.4)
1.2mm (0.045 in), DC +					
100% Ar Gas	15~20 (0.59~0.78)	9.2 (362)	190	27	4.6 (10.1)
		11.9 (469)	220	27	6.0 (13.2)
		15.5 (610)	260	27	7.8 (17.2)
Mixed Gas (Ar + 2% O ₂)	15~20 (0.59~0.78)	7.7 (303)	200	28	3.9 (8.6)
		8.6 (339)	230	28	4.3 (9.5)
		10.1 (398)	260	28	5.1 (11.2)

SM-309LSi

22%Cr-12%Ni steel, 18%Cr-8%Ni clad steel, STS-CrMo, STS-Carbon steel



Conformances

AWS A5.9/ ASME SFA5.9 ER309LSi
JIS Z3321 YS309LSi
EN ISO 14343-A G 23 12L Si
CE

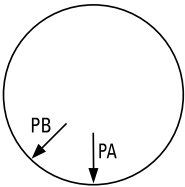
Applications

- Steel Structures - Oil, Textile industries, Nuclear reactor

Features

- Resistance to crack
- High Efficiency
- Excellent resistance to heat
- Excellent Arc stability and bead wetting

Welding Position



Current

DC +

Shielding Gas

Ar / Ar + O₂

Diameter / Packaging

Diameter	Spool			Ball Pac		
mm (in)	12.5kg (28lbs)	15kg (33 lbs)	20kg (44lbs)	150kg (330lbs)	200kg (440lbs)	250kg (551lbs)
0.8 (0.033)	✓					
0.9 (0.035)	✓					
1.0 (0.040)	✓					
1.2 (0.045)	✓			✓		
1.4 (0.052)						
1.6 (1/16)	✓					

Typical Chemical Composition of the Wire(%)

C	Si	Mn	Cr	Ni	Mo
0.022	0.79	1.61	24.11	13.97	0.1

Typical Mechanical Properties of All-Weld Metal

TS MPa(lbs/in ²)	EL (%)
571 (82,800)	40.2

Typical Welding Parameters

Diameter, Polarity Shielding Gas	CTWD mm(in)	Wire Feed Speed m/min (in/min)	Amp. (A)	Volt. (V)	Deposition Rate kg/hr (lb/hr)
1.0mm (0.040 in), DC +					
100% Ar Gas	15~20 (0.59~0.78)	6.0 (236)	140	24	2.1 (4.6)
		7.1 (280)	160	24	2.5 (5.5)
		9.2 (362)	190	24	3.2 (7.1)
Mixed Gas (Ar + 2% O ₂)	15~20 (0.59~0.78)	5.2 (204)	160	26	1.8 (4.0)
		7.0 (276)	190	26	2.4 (5.3)
		8.3 (327)	220	26	2.9 (6.4)
1.2mm (0.045 in), DC +					
100% Ar Gas	15~20 (0.59~0.78)	9.2 (362)	190	27	4.6 (10.1)
		11.9 (469)	220	27	6.0 (13.2)
		15.5 (610)	260	27	7.8 (17.2)
Mixed Gas (Ar + 2% O ₂)	15~20 (0.59~0.78)	7.7 (303)	200	28	3.9 (8.6)
		8.6 (339)	230	28	4.3 (9.5)
		10.1 (398)	260	28	5.1 (11.2)

SM-309MoL

Dissimilar metals such as stainless steels and carbon steels

Conformances

AWS A5.9/ ASME SFA5.9 ER309LMo
JIS Z3321 YS309LMo
EN ISO 14343-A G 23 12 2L
ABS AWS A5.9 ER309LMo

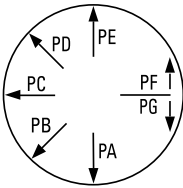
Applications

- Clad steel side welding of 316, 316L STS clad steel

Features

- Excellent corrosion resistance
- Excellent resistance to heat
- Excellent Arc stability and bead wetting

Welding Position



Current

DC +

Shielding Gas

Ar / Ar + O₂

Diameter / Packaging

Diameter	Spool			Ball Pac		
	12.5kg (28lbs)	15kg (33 lbs)	20kg (44lbs)	150kg (330lbs)	200kg (440lbs)	250kg (551lbs)
mm (in)						
0.8 (0.033)	✓					
0.9 (0.035)	✓					
1.0 (0.040)	✓					
1.2 (0.045)	✓					
1.4 (0.052)						
1.6 (1/16)	✓					

Typical Chemical Composition of the Wire(%)

C	Si	Mn	Cr	Ni	Mo
0.01	0.35	1.8	23.2	13.7	2.5

Typical Mechanical Properties of All-Weld Metal

TS MPa(lbs/in²)	EL (%)
660 (95,700)	34

Typical Welding Parameters

Diameter, Polarity Shielding Gas	CTWD mm(in)	Wire Feed Speed m/min (in/min)	Amp. (A)	Volt. (V)	Deposition Rate kg/hr (lb/hr)
1.0mm (0.040 in), DC +					
100% Ar Gas	15~20 (0.59~0.78)	6.0 (236)	140	24	2.1 (4.6)
		7.1 (280)	160	24	2.5 (5.5)
		9.2 (362)	190	24	3.2 (7.1)
Mixed Gas (Ar + 2% O ₂)	15~20 (0.59~0.78)	5.2 (204)	160	26	1.8 (4.0)
		7.0 (276)	190	26	2.4 (5.3)
		8.3 (327)	220	26	2.9 (6.4)
1.2mm (0.045 in), DC +					
100% Ar Gas	15~20 (0.59~0.78)	9.2 (362)	190	27	4.6 (10.1)
		11.9 (469)	220	27	6.0 (13.2)
		15.5 (610)	260	27	7.8 (17.2)
Mixed Gas (Ar + 2% O ₂)	15~20 (0.59~0.78)	7.7 (303)	200	28	3.9 (8.6)
		8.6 (339)	230	28	4.3 (9.5)
		10.1 (398)	260	28	5.1 (11.2)

SMW

SAW

GMW

GTAW

FCAW

Non-FERROUS

APPENDIX

SM-310

25%Cr-20%Ni STS

Conformances

AWS AWS A5.9/ ASME SFA5.9 ER310
JIS Z3321 YS310
EN ISO 14343-A G 25 20

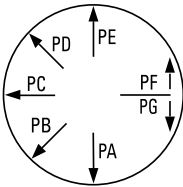
Applications

- Clad steel side welding of 316, 316L STS clad steel

Features

- Excellent corrosion resistance
- Excellent resistance to heat
- Excellent Arc stability and bead wetting

Welding Position



Current

DC +

Shielding Gas

Ar / Ar + O₂

Diameter / Packaging

Diameter	Spool			Ball Pac		
mm (in)	12.5kg (28lbs)	15kg (33 lbs)	20kg (44lbs)	150kg (330lbs)	200kg (440lbs)	250kg (551lbs)
0.8 (0.033)	✓					
0.9 (0.035)	✓					
1.0 (0.040)	✓					
1.2 (0.045)	✓					
1.4 (0.052)						
1.6 (1/16)	✓					

Typical Chemical Composition of the Wire(%)

C	Si	Mn	Cr	Ni
0.09	0.35	1.90	26.8	20.9

Typical Mechanical Properties of All-Weld Metal

TS MPa(lbs/in ²)	EL (%)
610 (88,500)	40

Typical Welding Parameters

Diameter, Polarity Shielding Gas	CTWD mm(in)	Wire Feed Speed m/min (in/min)	Amp. (A)	Volt. (V)	Deposition Rate kg/hr (lb/hr)
1.0mm (0.040 in), DC +					
100% Ar Gas	15-20 (0.59-0.78)	6.0 (236)	140	24	2.1 (4.6)
		7.1 (280)	160	24	2.5 (5.5)
		9.2 (362)	190	24	3.2 (7.1)
Mixed Gas (Ar + 2% O ₂)	15-20 (0.59-0.78)	5.2 (204)	160	26	1.8 (4.0)
		7.0 (276)	190	26	2.4 (5.3)
		8.3 (327)	220	26	2.9 (6.4)
1.2mm (0.045 in), DC +					
100% Ar Gas	15-20 (0.59-0.78)	9.2 (362)	190	27	4.6 (10.1)
		11.9 (469)	220	27	6.0 (13.2)
		15.5 (610)	260	27	7.8 (17.2)
Mixed Gas (Ar + 2% O ₂)	15-20 (0.59-0.78)	7.7 (303)	200	28	3.9 (8.6)
		8.6 (339)	230	28	4.3 (9.5)
		10.1 (398)	260	28	5.1 (11.2)

SMW

SAW

GMW

GTAW

FCAW

Non-FERROUS

APPENDIX

SM-312

29%Cr-9%Ni STS, joining of dissimilar-metal

Conformances

AWS A5.9 / ASME SFA5.9 ER312
JIS Z3321 YS312
EN ISO 14343-A G 25 20

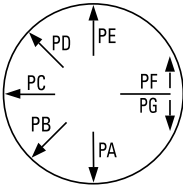
Applications

- Welding of Dissimilar-metal STS to ferritic steel or special steel

Features

- Excellent corrosion resistance
- Excellent resistance to heat
- Excellent Arc stability and bead wetting

Welding Position



Current

DC +

Shielding Gas

Ar / Ar + O₂

Diameter / Packaging

Diameter	Spool			Ball Pac		
	12.5kg (28lbs)	15kg (33 lbs)	20kg (44lbs)	150kg (330lbs)	200kg (440lbs)	250kg (551lbs)
mm (in)						
0.8 (0.033)	✓					
0.9 (0.035)	✓					
1.0 (0.040)	✓					
1.2 (0.045)	✓					
1.4 (0.052)						
1.6 (1/16)	✓					

Typical Chemical Composition of the Wire(%)

C	Si	Mn	Cr	Ni
0.10	0.38	1.68	30.0	8.8

Typical Mechanical Properties of All-Weld Metal

TS MPa(lbs/in ²)	EL (%)
720 (104,400)	32

Typical Welding Parameters

Diameter, Polarity Shielding Gas	CTWD mm(in)	Wire Feed Speed m/min (in/min)	Amp. (A)	Volt. (V)	Deposition Rate kg/hr (lb/hr)
1.0mm (0.040 in), DC +					
100% Ar Gas	15-20 (0.59-0.78)	6.0 (236)	140	24	2.1 (4.6)
		7.1 (280)	160	24	2.5 (5.5)
		9.2 (362)	190	24	3.2 (7.1)
Mixed Gas (Ar + 2% O ₂)	15-20 (0.59-0.78)	5.2 (204)	160	26	1.8 (4.0)
		7.0 (276)	190	26	2.4 (5.3)
		8.3 (327)	220	26	2.9 (6.4)
1.2mm (0.045 in), DC +					
100% Ar Gas	15-20 (0.59-0.78)	9.2 (362)	190	27	4.6 (10.1)
		11.9 (469)	220	27	6.0 (13.2)
		15.5 (610)	260	27	7.8 (17.2)
Mixed Gas (Ar + 2% O ₂)	15-20 (0.59-0.78)	7.7 (303)	200	28	3.9 (8.6)
		8.6 (339)	230	28	4.3 (9.5)
		10.1 (398)	260	28	5.1 (11.2)

SM-316

18%Cr-12%Ni-2%Mo STS

Conformances

AWS A5.9/ ASME SFA5.9 ER316
JIS Z3321 YS316
EN ISO 14343-A G 19 12 3

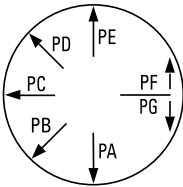
Applications

- Steel Structures - Chemical industries and nuclear reactors

Features

- Excellent corrosion resistance
- Excellent resistance to heat
- Excellent Arc stability and bead wetting

Welding Position



Current

DC +

Shielding Gas

Ar / Ar + O₂

Diameter / Packaging

Diameter	Spool			Ball Pac		
	12.5kg (28lbs)	15kg (33 lbs)	20kg (44lbs)	150kg (330lbs)	200kg (440lbs)	250kg (551lbs)
mm (in)						
0.8 (0.033)	✓					
0.9 (0.035)	✓					
1.0 (0.040)	✓					
1.2 (0.045)	✓					
1.4 (0.052)						
1.6 (1/16)	✓					

Typical Chemical Composition of the Wire(%)

C	Si	Mn	Cr	Ni	Mo
0.06	0.40	1.71	19.4	12.6	2.5

Typical Mechanical Properties of All-Weld Metal

TS MPa(lbs/in ²)	EL (%)
580 (84,200)	39

Typical Welding Parameters

Diameter, Polarity Shielding Gas	CTWD mm(in)	Wire Feed Speed m/min (in/min)	Amp. (A)	Volt. (V)	Deposition Rate kg/hr (lb/hr)
1.0mm (0.040 in), DC +					
100% Ar Gas	15-20 (0.59-0.78)	6.0 (236)	140	24	2.1 (4.6)
		7.1 (280)	160	24	2.5 (5.5)
		9.2 (362)	190	24	3.2 (7.1)
Mixed Gas (Ar + 2% O ₂)	15-20 (0.59-0.78)	5.2 (204)	160	26	1.8 (4.0)
		7.0 (276)	190	26	2.4 (5.3)
		8.3 (327)	220	26	2.9 (6.4)
1.2mm (0.045 in), DC +					
100% Ar Gas	15-20 (0.59-0.78)	9.2 (362)	190	27	4.6 (10.1)
		11.9 (469)	220	27	6.0 (13.2)
		15.5 (610)	260	27	7.8 (17.2)
Mixed Gas (Ar + 2% O ₂)	15-20 (0.59-0.78)	7.7 (303)	200	28	3.9 (8.6)
		8.6 (339)	230	28	4.3 (9.5)
		10.1 (398)	260	28	5.1 (11.2)

SM-316L

Low carbon 18%Cr-12%Ni-2%Mo STS



Conformances

AWS A5.9/ ASME SFA5.9 ER316L
JIS Z3321 YS316L
EN ISO 14343-A G 19 12 3L
CE

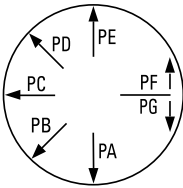
Applications

- Steel Structures - Chemical industries and nuclear reactors

Features

- Excellent corrosion resistance
- Excellent resistance to heat
- Excellent Arc stability and bead wetting

Welding Position



Current

DC +

Shielding Gas

Ar / Ar + O₂

Diameter / Packaging

Diameter	Spool			Ball Pac		
	12.5kg (28lbs)	15kg (33 lbs)	20kg (44lbs)	150kg (330lbs)	200kg (440lbs)	250kg (551lbs)
mm (in)						
0.8 (0.033)	✓					
0.9 (0.035)	✓					
1.0 (0.040)	✓	✓				
1.2 (0.045)	✓	✓				
1.4 (0.052)						
1.6 (1/16)	✓					

Typical Chemical Composition of the Wire(%)

C	Si	Mn	Cr	Ni	Mo
0.02	0.39	1.69	19.5	12.8	2.5

Typical Mechanical Properties of All-Weld Metal

TS MPa(lbs/in ²)	EL (%)
570 (82,700)	39

Typical Welding Parameters

Diameter, Polarity Shielding Gas	CTWD mm(in)	Wire Feed Speed m/min (in/min)	Amp. (A)	Volt. (V)	Deposition Rate kg/hr (lb/hr)
1.0mm (0.040 in), DC +					
100% Ar Gas	15~20 (0.59~0.78)	6.0 (236)	140	24	2.1 (4.6)
		7.1 (280)	160	24	2.5 (5.5)
		9.2 (362)	190	24	3.2 (7.1)
Mixed Gas (Ar + 2% O ₂)	15~20 (0.59~0.78)	5.2 (204)	160	26	1.8 (4.0)
		7.0 (276)	190	26	2.4 (5.3)
		8.3 (327)	220	26	2.9 (6.4)
1.2mm (0.045 in), DC +					
100% Ar Gas	15~20 (0.59~0.78)	9.2 (362)	190	27	4.6 (10.1)
		11.9 (469)	220	27	6.0 (13.2)
		15.5 (610)	260	27	7.8 (17.2)
Mixed Gas (Ar + 2% O ₂)	15~20 (0.59~0.78)	7.7 (303)	200	28	3.9 (8.6)
		8.6 (339)	230	28	4.3 (9.5)
		10.1 (398)	260	28	5.1 (11.2)

SM-316LSi

Low carbon 18%Cr-12%Ni-2%Mo STS

Conformances

AWS A5.9/ ASME SFA5.9 ER316LSi
JIS Z3321 YS316LSi
EN ISO 14343-A G 19 12 3L Si

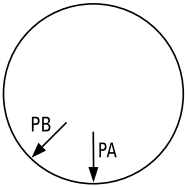
Applications

- Steel Structures - Chemical industries and nuclear reactors

Features

- Crack sensitivity is extremely good
- High Si content of wire improves the welding properties
- Excellent Arc stability and bead wetting

Welding Position



Current

DC +

Shielding Gas

Ar / Ar + O₂

Diameter / Packaging

Diameter mm (in)	Spool			Ball Pac		
	5kg (11lbs)	12.5kg (28lbs)	15kg (33 lbs)	150kg (330lbs)	200kg (440lbs)	250kg (551lbs)
0.8 (0.033)		✓	✓			
0.9 (0.035)		✓				
1.0 (0.040)	✓	✓	✓			
1.2 (0.045)		✓				
1.4 (0.052)						
1.6 (1/16)		✓				
2.0 (0.079)		✓				

Typical Chemical Composition of the Wire(%)

C	Si	Mn	Cr	Ni	Mo
0.030	0.65	2.36	19.76	11.62	2.50

Typical Mechanical Properties of All-Weld Metal

TS MPa(lbs/in ²)	EL (%)
597 (86,600)	37

Typical Welding Parameters

Diameter, Polarity Shielding Gas	CTWD mm(in)	Wire Feed Speed m/min (in/min)	Amp. (A)	Volt. (V)	Deposition Rate kg/hr (lb/hr)
1.0mm (0.040 in), DC +					
100% Ar Gas	15~20 (0.59~0.78)	6.0 (236)	140	24	2.1 (4.6)
		7.1 (280)	160	24	2.5 (5.5)
		9.2 (362)	190	24	3.2 (7.1)
Mixed Gas (Ar + 2% O ₂)	15~20 (0.59~0.78)	5.2 (204)	160	26	1.8 (4.0)
		7.0 (276)	190	26	2.4 (5.3)
		8.3 (327)	220	26	2.9 (6.4)
1.2mm (0.045 in), DC +					
100% Ar Gas	15~20 (0.59~0.78)	9.2 (362)	190	27	4.6 (10.1)
		11.9 (469)	220	27	6.0 (13.2)
		15.5 (610)	260	27	7.8 (17.2)
Mixed Gas (Ar + 2% O ₂)	15~20 (0.59~0.78)	7.7 (303)	200	28	3.9 (8.6)
		8.6 (339)	230	28	4.3 (9.5)
		10.1 (398)	260	28	5.1 (11.2)

SM-347

18%Cr-8%Ni-Nb(STS 347) & 18%Cr-8%Ni-Ti(STS 321)

Conformances

AWS A5.9/ ASME SFA5.9 ER347
JIS Z3321 YS347
EN ISO 14343-A G 19 9 Nb

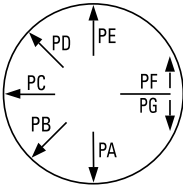
Applications

- Welding of boiler and gas turbine

Features

- Resistance to crack is good
- Nb contents improves corrosion resistance and heat resistance

Welding Position



Current

DC +

Shielding Gas

Ar / Ar + O₂

Diameter / Packaging

Diameter	Spool			Ball Pac		
mm (in)	12.5kg (28lbs)	15kg (33 lbs)	20kg (44lbs)	150kg (330lbs)	200kg (440lbs)	250kg (551lbs)
0.8 (0.033)	✓					
0.9 (0.035)	✓					
1.0 (0.040)	✓					
1.2 (0.045)	✓					
1.4 (0.052)						
1.6 (1/16)	✓					

Typical Chemical Composition of the Wire(%)

C	Si	Mn	Cr	Ni	Nb
0.05	0.43	1.66	20.0	9.6	0.7

Typical Mechanical Properties of All-Weld Metal

TS MPa(lbs/in ²)	EL (%)
680 (98,600)	30

Typical Welding Parameters

Diameter, Polarity Shielding Gas	CTWD mm(in)	Wire Feed Speed m/min (in/min)	Amp. (A)	Volt. (V)	Deposition Rate kg/hr (lb/hr)
1.0mm (0.040 in), DC +					
100% Ar Gas	15~20 (0.59~0.78)	6.0 (236)	140	24	2.1 (4.6)
		7.1 (280)	160	24	2.5 (5.5)
		9.2 (362)	190	24	3.2 (7.1)
Mixed Gas (Ar + 2% O ₂)	15~20 (0.59~0.78)	5.2 (204)	160	26	1.8 (4.0)
		7.0 (276)	190	26	2.4 (5.3)
		8.3 (327)	220	26	2.9 (6.4)
1.2mm (0.045 in), DC +					
100% Ar Gas	15~20 (0.59~0.78)	9.2 (362)	190	27	4.6 (10.1)
		11.9 (469)	220	27	6.0 (13.2)
		15.5 (610)	260	27	7.8 (17.2)
Mixed Gas (Ar + 2% O ₂)	15~20 (0.59~0.78)	7.7 (303)	200	28	3.9 (8.6)
		8.6 (339)	230	28	4.3 (9.5)
		10.1 (398)	260	28	5.1 (11.2)

SM-2209

22%Cr-5%Ni-2%Mo-0.15%N STS

Conformances

AWS A5.9/ ASME SFA5.9 ER2209
JIS Z3321 YS2209
EN ISO 14343-A G 22 9 3N L

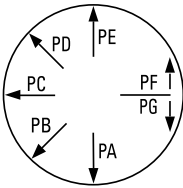
Applications

- Welding of offshore oil/gas, chemical and petrochemical industries

Features

- Good general corrosion resistance
- High resistance to chloride induced stress corrosion cracking(CSCC)

Welding Position



Current

DC +

Shielding Gas

Ar / Ar + O₂

Diameter / Packaging

Diameter	Spool			Ball Pac		
mm (in)	12.5kg (28lbs)	15kg (33 lbs)	20kg (44lbs)	150kg (330lbs)	200kg (440lbs)	250kg (551lbs)
0.8 (0.033)	✓					
0.9 (0.035)	✓					
1.0 (0.040)	✓					
1.2 (0.045)	✓					
1.4 (0.052)						
1.6 (1/16)	✓					

Typical Chemical Composition of the Wire(%)

C	Si	Mn	Cr	Ni	Mo
0.01	0.41	1.70	23.4	8.9	3.2

Typical Mechanical Properties of All-Weld Metal

TS MPa(lbs/in ²)	EL (%)	Temp °C(°F)	CVN-Impact Value J (ft.-lbs)	PREN
784 (113,700)	30	-20 (-4)	83 (61)	35

Typical Welding Parameters

Diameter, Polarity Shielding Gas	CTWD mm(in)	Wire Feed Speed m/min (in/min)	Amp. (A)	Volt. (V)	Deposition Rate kg/hr (lb/hr)
1.0mm (0.040 in), DC +					
100% Ar Gas	15~20 (0.59~0.78)	6.0 (236)	140	24	2.1 (4.6)
		7.1 (280)	160	24	2.5 (5.5)
		9.2 (362)	190	24	3.2 (7.1)
Mixed Gas (Ar + 2% O ₂)	15~20 (0.59~0.78)	5.2 (204)	160	26	1.8 (4.0)
		7.0 (276)	190	26	2.4 (5.3)
		8.3 (327)	220	26	2.9 (6.4)
1.2mm (0.045 in), DC +					
100% Ar Gas	15~20 (0.59~0.78)	9.2 (362)	190	27	4.6 (10.1)
		11.9 (469)	220	27	6.0 (13.2)
		15.5 (610)	260	27	7.8 (17.2)
Mixed Gas (Ar + 2% O ₂)	15~20 (0.59~0.78)	7.7 (303)	200	28	3.9 (8.6)
		8.6 (339)	230	28	4.3 (9.5)
		10.1 (398)	260	28	5.1 (11.2)

SM-410

13%Cr STS(STS 403, STS 410)

Conformances

AWS A5.9/ ASME SFA5.9 ER410
JIS Z3321 YS410
EN ISO 14343-A G 13

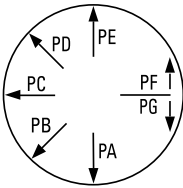
Applications

- Hardfacing application

Features

- Excellent resistance to corrosion resistance and abrasion
- Good anti-abrasive property

Welding Position



Current

DC +

Shielding Gas

Ar / Ar + O₂

Diameter / Packaging

Diameter	Spool			Ball Pac		
	5kg (11lbs)	12.5kg (28lbs)	15kg (33 lbs)	150kg (330lbs)	200kg (440lbs)	250kg (551lbs)
mm (in)						
0.8 (0.033)		✓				
0.9 (0.035)		✓				
1.0 (0.040)		✓				
1.2 (0.045)	✓	✓		✓		
1.4 (0.052)						
1.6 (1/16)		✓				

Typical Chemical Composition of the Wire(%)

C	Si	Mn	Cr	Ni
0.10	0.38	0.34	12.0	0.17

Typical Mechanical Properties of All-Weld Metal

TS MPa(lbs/in ²)	EL (%)
540 (78,300)	35

Typical Welding Parameters

Diameter, Polarity Shielding Gas	CTWD mm(in)	Wire Feed Speed m/min (in/min)	Amp. (A)	Volt. (V)	Deposition Rate kg/hr (lb/hr)
1.0mm (0.040 in), DC +					
100% Ar Gas	15-20 (0.59-0.78)	6.0 (236)	140	24	2.1 (4.6)
		7.1 (280)	160	24	2.5 (5.5)
		9.2 (362)	190	24	3.2 (7.1)
Mixed Gas (Ar + 2% O ₂)	15-20 (0.59-0.78)	5.2 (204)	160	26	1.8 (4.0)
		7.0 (276)	190	26	2.4 (5.3)
		8.3 (327)	220	26	2.9 (6.4)
1.2mm (0.045 in), DC +					
100% Ar Gas	15-20 (0.59-0.78)	9.2 (362)	190	27	4.6 (10.1)
		11.9 (469)	220	27	6.0 (13.2)
		15.5 (610)	260	27	7.8 (17.2)
Mixed Gas (Ar + 2% O ₂)	15-20 (0.59-0.78)	7.7 (303)	200	28	3.9 (8.6)
		8.6 (339)	230	28	4.3 (9.5)
		10.1 (398)	260	28	5.1 (11.2)

SMW

SAW

GMW

GTAW

FCAW

Non-FERROUS

APPENDIX

SM-430LNb

13%Cr STS(STS 403, STS 410)

Conformances

JIS Z3321 YS430LNb
EN ISO 14343-A G 18LNb

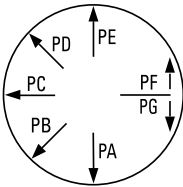
Applications

- Automotive exhaust applications

Features

- Excellent bead appearance
- Soft stable arc & Low spatter

Welding Position



Current

DC +

Shielding Gas

Ar / Ar + O₂

Diameter / Packaging

Diameter	Spool			Ball Pac		
mm (in)	12.5kg (28lbs)	15kg (33 lbs)	20kg (44lbs)	150kg (330lbs)	200kg (440lbs)	250kg (551lbs)
0.8 (0.033)	✓					
0.9 (0.035)	✓					
1.0 (0.040)	✓					
1.2 (0.045)	✓					✓
1.4 (0.052)						
1.6 (1/16)	✓					

Typical Chemical Composition of the Wire(%)

C	Si	Mn	Cr	Ni	Nb
0.01	0.41	0.33	18.4	0.27	0.45

Typical Mechanical Properties of All-Weld Metal

Dia (mm)	Amp (A)	Vol (V)	Cpm (cm/min)	Gas Flow (l/min)	Shielding Gas
1.2	250	26	30	25	100% Ar or Ar + 2% O ₂
1.6	300	29	35		

Typical Welding Parameters

Diameter, Polarity Shielding Gas	CTWD mm(in)	Wire Feed Speed m/min (in/min)	Amp. (A)	Volt. (V)	Deposition Rate kg/hr (lb/hr)
1.0mm (0.040 in), DC +					
100% Ar Gas	15-20 (0.59-0.78)	6.0 (236)	140	24	2.1 (4.6)
		7.1 (280)	160	24	2.5 (5.5)
		9.2 (362)	190	24	3.2 (7.1)
Mixed Gas (Ar + 2% O ₂)	15-20 (0.59-0.78)	5.2 (204)	160	26	1.8 (4.0)
		7.0 (276)	190	26	2.4 (5.3)
		8.3 (327)	220	26	2.9 (6.4)
1.2mm (0.045 in), DC +					
100% Ar Gas	15-20 (0.59-0.78)	9.2 (362)	190	27	4.6 (10.1)
		11.9 (469)	220	27	6.0 (13.2)
		15.5 (610)	260	27	7.8 (17.2)
Mixed Gas (Ar + 2% O ₂)	15-20 (0.59-0.78)	7.7 (303)	200	28	3.9 (8.6)
		8.6 (339)	230	28	4.3 (9.5)
		10.1 (398)	260	28	5.1 (11.2)

GTAW

TIG Rod



ST-50G

Mild Steel & 490 MPa high tensile steels

Conformances

AWS A5.18/ ASME SFA5.18 ER70S-G

JIS Z3316 YGT50

EN ISO 636-A-W3Si1

KR 3YSG

ABS AWS A5.18 ER70S-G (-50°C)

LR 3YH15

BV UP(-20°C)

DNV-GL IIIYMS

NK KSW53G

CCS 3YS

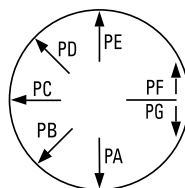
Applications

- Pressure vessels
- Nuclear reactors
- Rail road car
- Shipbuilding
- Pipeline

Features

- Good impact value at low temperature
- Good workability and Bead Appearance
- Good performance

Welding Position



Current

DC -

Shielding Gas

Ar

Diameter / Packaging

Diameter mm (in)	PVC TUVE 5kg (11lbs)
1.2 (0.045)	✓
1.6 (1/16)	✓
2.0 (5/64)	✓
2.4 (3/32)	✓
3.2 (1/8)	✓

Typical Chemical Composition of the Wire(%)

C	Si	Mn		
0.07	0.83	1.43		

Typical Mechanical Properties of All-Weld Metal

	YS MPa(lbs/in ²)	TS MPa(lbs/in ²)	EL (%)	Temp °C(°F)	CVN-Impact Value J (ft-lbs)
As welded with 100% Ar	460 (66,700)	530 (76,900)	27	-20 (-4)	170 (125)

ST-50.6

Mild Steel & 490 MPa high tensile steels

Conformances

AWS A5.18/ ASME SFA5.18 ER70S-6

JIS Z3316 YGT50

EN ISO 636-A-W3Si1

ABS AWS A5.18 ER70S-6 (-30°C)

TÜV ISO 636-A-W42 5 W3Si1

CWB ER48S-6 (ER70S-6)

CE

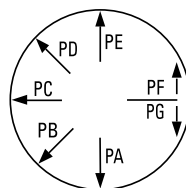
Applications

- Pressure vessels
- Nuclear reactors
- Rail road car
- Shipbuilding
- Pipeline

Features

- Good impact value at low temperature
- Good workability and Bead Appearance
- Good performance

Welding Position



Current

DC -

Shielding Gas

Ar

Diameter / Packaging

Diameter	PVC TUVE
mm (in)	5kg (11lbs)
1.2 (0.045)	✓
1.6 (1/16)	✓
2.0 (5/64)	✓
2.4 (3/32)	✓
3.2 (1/8)	✓

Typical Chemical Composition of the Wire(%)

C	Si	Mn		
0.07	0.85	1.5		

Typical Mechanical Properties of All-Weld Metal

	YS MPa(lbs/in²)	TS MPa(lbs/in²)	EL (%)	Temp °C(°F)	CVN-Impact Value J (ft-lbs)
As welded with 100% Ar	450 (65,300)	520 (75,500)	28	-20 (-4)	180 (132)



SMW

SAW

GMW

GTAW

FCW

Non-FERROUS

APPENDIX

ST-50.3

Mild Steel & 490 MPa high tensile steels

Conformances

AWS A5.18/ ASME SFA5.18 ER70S-3
EN ISO 636-A-W2Si
ABS AWS A5.18 ER70S-3 (-50°C)

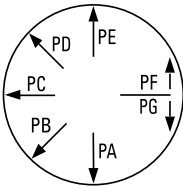
Applications

- Pressure vessels
- Nuclear reactors
- Rail road car
- Shipbuilding
- Pipeline

Features

- Good impact value at low temperature
- Good workability and Bead Appearance
- Good performance

Welding Position



Current

DC -

Shielding Gas

Ar

Diameter / Packaging

Diameter	PVC TUVE
mm (in)	5kg (11lbs)
1.2 (0.045)	✓
1.6 (1/16)	✓
2.0 (5/64)	✓
2.4 (3/32)	✓
3.2 (1/8)	✓

Typical Chemical Composition of the Wire(%)

C	Si	Mn		
0.07	0.65	1.15		

Typical Mechanical Properties of All-Weld Metal

	YS MPa(lbs/in²)	TS MPa(lbs/in²)	EL (%)	Temp °C(°F)	CVN-Impact Value J (ft-lbs)
As welded with 100% Ar	495 (71,800)	565 (81,950)	26	-20 (-4)	170 (125)

ST-72

Mild Steel & 490 MPa high tensile steels

Conformances

AWS A5.18/ ASME SFA5.18 ER70S-2

JIS Z3316 YGT50

CWB ER48S-2 (ER70S-2)

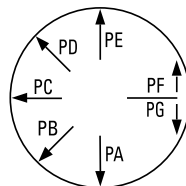
Applications

- Pressure vessels
- Shipbuilding

Features

- Good performance in all position
- One-side welding(tube)
- Ar 100% gas

Welding Position



Current

DC -

Shielding Gas

Ar

Diameter / Packaging

Diameter	PVC TUVE
mm (in)	5kg (11lbs)
1.2 (0.045)	✓
1.6 (1/16)	✓
2.0 (5/64)	✓
2.4 (3/32)	✓
3.2 (1/8)	✓

Typical Chemical Composition of the Wire(%)

C	Si	Mn		
0.05	0.52	1.15		

Typical Mechanical Properties of All-Weld Metal

	YS MPa(lbs/in²)	TS MPa(lbs/in²)	EL (%)	Temp °C(°F)	CVN-Impact Value J (ft.-lbs)
As welded with 100% Ar	500 (72,500)	580 (84,200)	29	-30 (-22)	180 (132)

SMW

SAW

GMW

GTAW

FCW

Non-FERROUS

APPENDIX

SM-1N / ST-1N

Capable of producing weld deposits with 550 MPa (80 ksi) tensile strength

Conformances

AWS A5.28/ ASME SFA5.28 ER80S-Ni1

ABS AWS 5.28 ER80S-Ni1

LR AWS 5.28 ER80S-Ni1 (ST-1N)

BV SA4Y40 (ST-1N)

CWB ER80S-Ni1 (ST-1N)

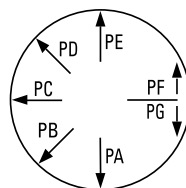
Applications

- Oil & gas industry, offshore industry, Power plant, chemical industry

Features

- Impact value in low temp. is good
- Bead appearance & weldability are excellent

Welding Position



Current

GMAW: DC + / GTAW: DC -

Shielding Gas

Ar

Diameter / Packaging

Diameter	Spool			Pac		
mm (in)	12.5kg (28lbs)	15kg (33 lbs)	20kg (44lbs)	150kg (330lbs)	200kg (440lbs)	250kg (551lbs)
0.8 (0.033)						
0.9 (0.035)						
1.0 (0.040)						
1.2 (0.045)		✓				
1.4 (0.052)						
1.6 (1/16)						

Diameter	5kg*1000						
mm (in)	1.0 (0.039)	1.2 (0.045)	1.6 (1/16)	2.0 (5/64)	2.4 (3/32)	2.6 (0.10)	3.2 (1/8)
			✓	✓	✓	✓	✓

Typical Chemical Composition of the Wire(%)

C	Si	Mn	P	S	Ni	Cu
0.088	0.62	1.15	0.011	0.010	0.93	0.08

Typical Mechanical Properties of All-Weld Metal

	YS MPa(lbs/in ²)	TS MPa(lbs/in ²)	EL (%)	Temp °C(°F)	CVN-Impact Value J (ft.-lbs)
As welded with 100% Ar	594 (86,000)	671 (97,300)	32.3	-45 (-49)	59 (43)
PWHT	568 (82,400)	645 (93,500)	34.0	-45 (-49)	108 (79)

ST-80CM

Heat resistance – low alloy steel

Conformances

AWS A5.28/ ASME SFA5.28 ER80S-G
JIS Z3317 YG1CM-A / JIS Z3316 YGT1CM
EN ISO 14341-B S2M3

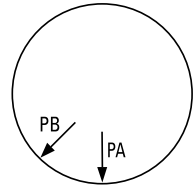
Applications

- Pressure vessels
- Offshore
- Machinery
- Chemical industry

Features

- MIG welding for boiler steam pipe of steam power generation and 1.0~1.25%Cr-0.5%Mo heat resisting steel using for refining oil & chemical industrial machine tool.
- Excellent TS and impact value in a high temperature after heat treatment.

Welding Position



Current

DC -

Shielding Gas

100% Ar
Ar + 2% O₂

Diameter / Packaging

Diameter mm (in)	Spool			Ball Pac		
	5kg (11lbs)	15kg (33lbs)	20kg (44lbs)	250kg (551lbs)	300kg (661lbs)	350kg (771lbs)
0.8 (0.033)	✓	✓	✓	✓	✓	✓
0.9 (0.035)	✓	✓	✓	✓	✓	✓
1.0 (0.040)	✓	✓	✓	✓	✓	✓
1.2 (0.045)	✓	✓	✓	✓	✓	✓
1.4 (0.052)	✓	✓	✓	✓	✓	✓
1.6 (1/16)	✓	✓	✓	✓	✓	✓

SWAW

SAW

GMW

GTAW

FCW

Non-FERROUS

APPENDIX

Typical Chemical Composition of the Wire(%)

C	Si	Mn	Cr	Mo
0.09	0.67	1.02	1.19	0.45

Typical Mechanical Properties of All-Weld Metal

	YS MPa(lbs/in ²)	EL (%)	Temp °C(°F)	CVN-Impact Value J (ft.lbs)	PWHT
As welded with 100% Ar	630 (91,500)	28	0 (32) -20 (-4)	290 (215) 280 (207)	690°C × 1Hr

Typical Welding Parameters

Diameter, Polarity Shielding Gas	CTWD mm(in)	Wire Feed Speed m/min (in/min)	Amp. (A)	Volt. (V)	Deposition Rate kg/hr (lb/hr)
0.9mm (0.035in), DC +					
100% CO ₂ Gas	12 (1/2)	2.5 (100)	80	18	0.7 (1.6)
		3.8 (150)	120	19	1.1 (2.4)
		6.4 (250)	175	21	1.8 (4.0)
Mixed Gas (Ar+CO ₂)	19 (3/4)	8.9 (350)	195	23	2.7 (6.0)
		12.7 (500)	230	29	3.6 (8.0)
		15.2 (600)	275	30	4.4 (9.6)
1.0mm (0.040in), DC +					
100% CO ₂ Gas	12 (1/2)	2.5 (100)	80	18	0.7 (1.6)
		3.8 (150)	120	19	1.1 (2.4)
		6.4 (250)	175	21	1.8 (4.0)
Mixed Gas (Ar+CO ₂)	19 (3/4)	8.9 (350)	195	23	2.7 (6.0)
		12.7 (500)	230	29	3.6 (8.0)
		15.2 (600)	275	30	4.4 (9.6)
1.2mm (0.045in), DC +					
100% CO ₂ Gas	12 (1/2)	2.5 (100)	80	18	0.7 (1.6)
		3.8 (150)	120	19	1.1 (2.4)
		6.4 (250)	175	21	1.8 (4.0)
Mixed Gas (Ar+CO ₂)	19 (3/4)	8.9 (350)	195	23	2.7 (6.0)
		12.7 (500)	230	29	3.6 (8.0)
		15.2 (600)	275	30	4.4 (9.6)

ST-308

Stainless steel



Conformances

AWS A5.9/ ASME SFA5.9 ER308
JIS Z3321 YS308
EN ISO 14343-A W 19 9
KR RY308G
ABS AWS A5.9 ER308
DNV-GL NV 308M
CE

Applications

- Steel Structures - Oil, Textile industries, Nuclear reactor

Features

- Resistance to crack
- High Efficiency
- Resistance to corrosion

Current

DC -

Shielding Gas

Ar

Diameter / Packaging

Diameter	
mm (in)	5kg*1000
1.0 (0.039)	
1.2 (0.045)	✓
1.6 (1/16)	✓
2.0 (5/64)	✓
2.4 (3/32)	✓
2.6 (0.10)	✓
3.2 (1/8)	✓

Typical Chemical Composition of the Wire(%)

C	Si	Mn	Cr	Ni
0.05	0.38	1.75	19.8	10.1

Typical Mechanical Properties of All-Weld Metal

TS MPa(lbs/in²)	EL (%)	Temp °C(°F)	CVN-Impact Value J (ft.-lbs)
610 (88,500)	40	0 (32)	130 (95)

SMW

SAW

GMW

GTAW

FCW

Non-FERROUS

APPENDIX

ST-308L

Low carbon 18%Cr-8%Ni steel



Conformances

AWS A5.9/ ASME SFA5.9 ER308L

JIS Z3321 YS308L

EN ISO 14343-A W 19 9L

KR RY308L (-196°C ≥29 J)

ABS AWS A5.9 ER308L

LR 304L (-196°C)

BV UP (KV -196°C)

DNV-GL VL 308L (-196°C)

NK KY308L

CCS 304L (-196°C)

CE

Applications

- Steel Structures - Oil, Textile industries, Nuclear reactor

Features

- Resistance to crack
- High Efficiency
- Resistance to corrosion

Current

DC -

Shielding Gas

Ar

Diameter / Packaging

Diameter	
mm (in)	5kg*1000
1.0 (0.039)	✓
1.2 (0.045)	✓
1.6 (1/16)	✓
2.0 (5/64)	✓
2.4 (3/32)	✓
2.6 (0.10)	✓
3.2 (1/8)	✓

Typical Chemical Composition of the Wire(%)

C	Si	Mn	Cr	Ni
0.02	0.36	1.70	20.0	10.3

Typical Mechanical Properties of All-Weld Metal

TS MPa(lbs/in²)	EL (%)	Temp °C(°F)	CVN-Impact Value J (ft-lbs)
600 (87,000)	41	0 (32)	110 (81)

ST-309

22%Cr-12%Ni steel, 18%Cr-8%Ni clad steel, STS-CrMo, STS-Carbon steel



Conformances

AWS A5.9/ ASME SFA5.9 ER309
JIS Z3321 YS309
EN ISO 14343-A W 23 12
ABS AWS A5.9 ER309
CE

Applications

- Steel Structures - Oil, Textile industries, Nuclear reactor

Features

- Resistance to crack
- High Efficiency
- Excellent resistance to heat

Current

DC -

Shielding Gas

Ar

Diameter / Packaging

Diameter	
mm (in)	5kg*1000
1.0 (0.039)	
1.2 (0.045)	
1.6 (1/16)	✓
2.0 (5/64)	✓
2.4 (3/32)	✓
2.6 (0.10)	✓
3.2 (1/8)	✓

Typical Chemical Composition of the Wire(%)

C	Si	Mn	Cr	Ni
0.07	0.38	1.88	24.4	12.8

Typical Mechanical Properties of All-Weld Metal

TS MPa(lbs/in ²)	EL (%)	Temp °C(°F)	CVN-Impact Value J (ft-lbs)
620 (90,000)	38	0 (32)	130 (96)

SMW

SAW

GMW

GTAW

FCAW

Non-FERROUS

APPENDIX

ST-309L

22%Cr-12%Ni steel, 18%Cr-8%Ni clad steel, STS-CrMo, STS-Carbon steel



Conformances

AWS A5.9/ ASME SFA5.9 ER309L

JIS Z3321 YS309L

EN ISO 14343-A W 23 12L

ABS AWS A5.9 ER309L

LR SS/CMn

BV 309L

DNV-GL VL 309L

NK KY309L

CCS 309L

CE

Applications

- Steel Structures - Oil, Textile industries, Nuclear reactor

Features

- Resistance to crack
- High efficiency
- Excellent resistance to heat

Current

DC -

Shielding Gas

Ar

Diameter / Packaging

Diameter	
mm (in)	5kg*1000
1.0 (0.039)	
1.2 (0.045)	✓
1.6 (1/16)	✓
2.0 (5/64)	✓
2.4 (3/32)	✓
2.6 (0.10)	✓
3.2 (1/8)	✓

Typical Chemical Composition of the Wire(%)

C	Si	Mn	Cr	Ni
0.03	0.40	1.74	24.2	12.6

Typical Mechanical Properties of All-Weld Metal

TS MPa(lbs/in²)	EL (%)	Temp °C(°F)	CVN-Impact Value J (ft-lbs)
600 (87,000)	38	0 (32)	150 (110)

ST-309MoL

Dissimilar metals such as stainless steels and carbon steels

Conformances

AWS A5.9/ ASME SFA5.9 ER309LMo

JIS Z3321 YS309LMo

EN ISO 14343-A W 23 12 2L

BV SA309Mo

Applications

- Clad steel side welding of 316, 316L STS clad steel

Features

- Excellent corrosion resistance
- Excellent resistance to heat
- Excellent Arc stability and bead wetting

Current

DC -

Shielding Gas

Ar

Diameter / Packaging

Diameter	
mm (in)	5kg*1000
1.0 (0.039)	
1.2 (0.045)	
1.6 (1/16)	✓
2.0 (5/64)	✓
2.4 (3/32)	✓
2.6 (0.10)	✓
3.2 (1/8)	✓

Typical Chemical Composition of the Wire(%)

C	Si	Mn	Cr	Ni	Mo
0.02	0.35	1.8	23.2	13.7	2.5

Typical Mechanical Properties of All-Weld Metal

TS MPa(lbs/in ²)	EL (%)
650 (94,200)	32

SMW

SAW

GMW

GTAW

FCAW

Non-FERROUS

APPENDIX

ST-310

25%Cr-20%Ni STS

Conformances

AWS A5.9/ ASME SFA5.9 ER310
JIS Z3321 YS310
EN ISO 14343-A W 25 20

Applications

- Welding on clad side of STS clad steel

Features

- Excellent corrosion resistance
- Excellent resistance to heat
- Excellent Arc stability and bead wetting

Current

DC -

Shielding Gas

Ar

Diameter / Packaging

Diameter	
mm (in)	5kg*1000
1.0 (0.039)	
1.2 (0.045)	
1.6 (1/16)	✓
2.0 (5/64)	✓
2.4 (3/32)	✓
2.6 (0.10)	✓
3.2 (1/8)	✓

Typical Chemical Composition of the Wire(%)

C	Si	Mn	Cr	Ni
0.09	0.35	1.90	26.8	20.9

Typical Mechanical Properties of All-Weld Metal

TS MPa(lbs/in ²)	EL (%)	Temp °C(°F)	CVN-Impact Value J (ft·lbs)
610 (88,500)	41	0 (32)	110 (81)

ST-312

29%Cr-9%Ni STS, joining of dissimilar-metal

Conformances

AWS A5.9/ ASME SFA5.9 ER312

JIS Z3321 YS312

EN ISO 14343-A W 29 9

Applications

- Welding of Dissimilar-metal STS to ferritic steel or special steel

Features

- Excellent corrosion resistance
- Excellent resistance to heat
- Excellent Arc stability and bead wetting

Current

DC -

Shielding Gas

Ar

Diameter / Packaging

Diameter	
mm (in)	5kg*1000
1.0 (0.039)	
1.2 (0.045)	
1.6 (1/16)	✓
2.0 (5/64)	✓
2.4 (3/32)	✓
2.6 (0.10)	✓
3.2 (1/8)	✓

Typical Chemical Composition of the Wire(%)

C	Si	Mn	Cr	Ni
0.10	0.38	1.68	30.0	8.8

Typical Mechanical Properties of All-Weld Metal

TS MPa(lbs/in²)	EL (%)
770 (111,600)	27

SMW

SAW

GMW

GTAW

FCAW

Non-FERROUS

APPENDIX

ST-316

18%Cr-12%Ni-2%Mo STS



Conformances

AWS A5.9/ ASME SFA5.9 ER316
JIS Z3321 YS316
EN ISO 14343-A W 19 12 3
ABS AWS A5.9 ER316
CE

Applications

- Steel Structures - Chemical industries and nuclear reactors

Features

- Excellent crack resistance
- Excellent resistance to heat
- Excellent Arc stability and bead wetting

Current

DC -

Shielding Gas

Ar

Diameter / Packaging

Diameter	
mm (in)	5kg*1000
1.0 (0.039)	
1.2 (0.045)	
1.6 (1/16)	✓
2.0 (5/64)	✓
2.4 (3/32)	✓
2.6 (0.10)	✓
3.2 (1/8)	✓

Typical Chemical Composition of the Wire(%)

C	Si	Mn	Cr	Ni	Mo
0.05	0.41	1.82	18.9	12.5	2.5

Typical Mechanical Properties of All-Weld Metal

TS MPa(lbs/in²)	EL (%)	Temp °C(°F)	CVN-Impact Value J (ft-lbs)
590 (85,600)	41	0 (32)	130 (95)

ST-316L

Low carbon 18%Cr-12%Ni-2%Mo STS

Conformances

AWS A5.9/ ASME SFA5.9 ER316L
JIS Z3321 YS316L
EN ISO 14343-A W 19 12 3L
KR RY316L (-196°C ≥29 J)
ABS AWS A5.9 ER316L
LR 316L (-196°C)
BV 316L (KV -196°C)
DNV·GL VL 316L (-196°C)
NK KY316L
CCS 316L
CWB AWS A5.9 ER316L
CE

Applications

- Steel Structures - Chemical industries and nuclear reactors

Features

- Excellent crack resistance
- Excellent resistance to heat
- Excellent Arc stability and bead wetting

Typical Chemical Composition of the Wire(%)

C	Si	Mn	Cr	Ni	Mo
0.02	0.38	1.85	18.8	12.4	2.5

Typical Mechanical Properties of All-Weld Metal

TS MPa(lbs/in²)	EL (%)	Temp °C(°F)	CVN-Impact Value J (ft-lbs)
570 (82,700)	44	0 (32)	140 (103)

Current

DC -

Shielding Gas

Ar

Diameter / Packaging

Diameter mm (in)	5kg*1000
1.0 (0.039)	✓
1.2 (0.045)	✓
1.6 (1/16)	✓
2.0 (5/64)	✓
2.4 (3/32)	✓
2.6 (0.10)	✓
3.2 (1/8)	✓



SMW

SAW

GMW

GTAW

FCW

Non-FERROUS

APPENDIX

ST-347

18%Cr-8%Ni-Nb(STS 347) & 18%Cr-8%Ni-Ti(STS 321)

Conformances

AWS A5.9/ ASME SFA5.9 ER347
JIS Z3321 YS347
EN ISO 14343-A W 19 9 Nb

Applications

- Welding of boiler and gas turbine

Features

- Resistanc to crack is good
- Nb contents improves corrosion resistance and heat resistance

Current

DC -

Shielding Gas

Ar

Diameter / Packaging

Diameter	
mm (in)	5kg*1000
1.0 (0.039)	
1.2 (0.045)	
1.6 (1/16)	✓
2.0 (5/64)	✓
2.4 (3/32)	✓
2.6 (0.10)	✓
3.2 (1/8)	✓

Typical Chemical Composition of the Wire(%)

C	Si	Mn	Cr	Ni	Nb
0.05	0.43	1.66	20.0	9.6	0.7

Typical Mechanical Properties of All-Weld Metal

TS MPa(lbs/in²)	EL (%)
680 (98,600)	32

SMT-2594

25%Cr-7%Ni-4.5%Mo-0.25%N Super Duplex STS

Conformances

AWS A5.9/ ASME SFA5.9 ER2594

EN ISO 14343-A G 25 9 4 NL

ABS AWS A5.9 ER2594

LR AWS A5.9 ER2594

DNV·GL Duplex Stainless Steels (-50°C)

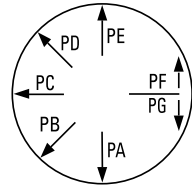
Applications

- Offshore structure & FPSO, chemical and petrochemical plants

Features

- Excellent corrosion resistance
- Superior pitting resistance

Welding Position



Current

GMAW: DC + / GTAW: DC -

Shielding Gas

Ar / Ar+ O₂

Diameter / Packaging

Diameter	Spool			Pac		
mm (in)	12.5kg (28lbs)	15kg (33 lbs)	20kg (44lbs)	150kg (330lbs)	200kg (440lbs)	250kg (551lbs)
0.8 (0.033)	✓					
0.9 (0.035)	✓					
1.0 (0.040)	✓					
1.2 (0.045)	✓					
1.4 (0.052)						
1.6 (1/16)	✓					

Diameter	5kg*1000						
mm (in)	1.0 (0.039)	1.2 (0.045)	1.6 (1/16)	2.0 (5/64)	2.4 (3/32)	2.6 (0.10)	3.2 (1/8)
			✓	✓	✓	✓	✓

Typical Chemical Composition of the Wire(%)

C	Si	Mn	P	S	Cr	Ni	Mo	Cu	N
0.011	0.41	0.53	0.019	0.001	25.27	9.13	3.86	0.21	0.257

Typical Mechanical Properties of All-Weld Metal

TS MPa(lbs/in ²)	EL (%)	Temp °C(°F)	CVN-Impact Value J (ft-lbs)	PREN
890 (129,000)	28.6	-50 (-58)	195 (144)	40

Typical Welding Parameters

Diameter, Polarity Shielding Gas	CTWD mm(in)	Wire Feed Speed m/min (in/min)	Amp. (A)	Volt. (V)	Deposition Rate kg/hr (lb/hr)
1.0mm (0.040 in), DC +					
100% Ar Gas	15-20 (0.59-0.78)	6.0 (236)	140	24	2.1 (4.6)
		7.1 (280)	160	24	2.5 (5.5)
		9.2 (362)	190	24	3.2 (7.1)
Mixed Gas (Ar + 2% O ₂)	15-20 (0.59-0.78)	5.2 (204)	160	26	1.8 (4.0)
		7.0 (276)	190	26	2.4 (5.3)
		8.3 (327)	220	26	2.9 (6.4)
1.2mm (0.045 in), DC +					
100% Ar Gas	15-20 (0.59-0.78)	9.2 (362)	190	27	4.6 (10.1)
		11.9 (469)	220	27	6.0 (13.2)
		15.5 (610)	260	27	7.8 (17.2)
Mixed Gas (Ar + 2% O ₂)	15-20 (0.59-0.78)	7.7 (303)	200	28	3.9 (8.6)
		8.6 (339)	230	28	4.3 (9.5)
		10.1 (398)	260	28	5.1 (11.2)

ST-2209

22%Cr-5%Ni-2%Mo-0.15%N STS

Conformances

AWS A5.9/ ASME SFA5.9 ER2209
JIS Z3321 YS2209
EN ISO 14343-A W 22 9 3N L
KR AWS A5.9 ER2209
ABS AWS A5.9 ER2209 (-50°C)
LR S31803m
DNV-GL Duplex Stainless Steels

Applications

- Welding of offshore oil/gas, chemical and petrochemical industries

Features

- Good general corrosion resistance
- High resistance to chloride induced stress corrosion cracking (CSCC)

Current

DC -

Shielding Gas

Ar

Diameter / Packaging

Diameter	
mm (in)	5kg*1000
1.0 (0.039)	
1.2 (0.045)	
1.6 (1/16)	✓
2.0 (5/64)	✓
2.4 (3/32)	✓
2.6 (0.10)	✓
3.2 (1/8)	✓

Typical Chemical Composition of the Wire(%)

C	Si	Mn	Cr	Ni	Mo
0.01	0.41	1.70	23.4	8.9	3.2

Typical Mechanical Properties of All-Weld Metal

TS MPa(lbs/in ²)	EL (%)	Temp °C(°F)	CVN-Impact Value J (ft-lbs)	PREN
810 (116,700)	27	-20 (-4)	195 (144)	35

SMW

SAW

GMW

GTAW

FCW

Non-FERROUS

APPENDIX

SMT-904L

20%Cr-25%Ni-4.5%Mo-1.5%Cu STS

Conformances

AWS A5.9/ ASME SFA5.9 ER385
JIS Z3321 YS385
EN ISO 14343-A G(W) 20 25 5 Cu L

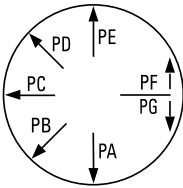
Applications

- Offshore structure & FPSO, chemical and petrochemical plants

Features

- Good general corrosion resistance
- Preferably keep Heat input below 1.5KJ/mm

Welding Position



Current

GMAW: DC + / GTAW: DC -

Shielding Gas

Ar / Ar+ O₂

Diameter / Packaging

Diameter	Spool			Pac		
mm (in)	12.5kg (28lbs)	15kg (33 lbs)	20kg (44lbs)	150kg (330lbs)	200kg (440lbs)	250kg (551lbs)
0.8 (0.033)	✓					
0.9 (0.035)	✓					
1.0 (0.040)	✓					
1.2 (0.045)	✓					
1.4 (0.052)						
1.6 (1/16)	✓					

Diameter	5kg*1000						
mm (in)	1.0 (0.039)	1.2 (0.045)	1.6 (1/16)	2.0 (5/64)	2.4 (3/32)	2.6 (0.10)	3.2 (1/8)
			✓	✓	✓	✓	✓

Typical Chemical Composition of the Wire(%)

C	Si	Mn	P	S	Cr	Ni	Mo	Cu
0.013	0.31	1.89	0.013	0.001	20.52	24.96	4.32	1.42

Typical Mechanical Properties of All-Weld Metal

YS MPa(lbs/in ²)	TS MPa(lbs/in ²)	EL (%)	Temp °C(°F)	CVN-Impact Value J (ft-lbs)
490 (71,000)	650 (94,300)	35.0	20 (68)	110 (81)
			-196 (-321)	70 (52)

Typical Welding Parameters

Diameter, Polarity Shielding Gas	CTWD mm(in)	Wire Feed Speed m/min (in/min)	Amp. (A)	Volt. (V)	Deposition Rate kg/hr (lb/hr)
1.0mm (0.040 in), DC +					
100% Ar Gas	15~20 (0.59~0.78)	6.0 (236)	140	24	2.1 (4.6)
		7.1 (280)	160	24	2.5 (5.5)
		9.2 (362)	190	24	3.2 (7.1)
Mixed Gas (Ar + 2% O ₂)	15~20 (0.59~0.78)	5.2 (204)	160	26	1.8 (4.0)
		7.0 (276)	190	26	2.4 (5.3)
		8.3 (327)	220	26	2.9 (6.4)
1.2mm (0.045 in), DC +					
100% Ar Gas	15~20 (0.59~0.78)	9.2 (362)	190	27	4.6 (10.1)
		11.9 (469)	220	27	6.0 (13.2)
		15.5 (610)	260	27	7.8 (17.2)
Mixed Gas (Ar + 2% O ₂)	15~20 (0.59~0.78)	7.7 (303)	200	28	3.9 (8.6)
		8.6 (339)	230	28	4.3 (9.5)
		10.1 (398)	260	28	5.1 (11.2)

ST-410

13%Cr STS(STS 403, STS 410)

Conformances

AWS A5.9/ ASME SFA5.9 ER410
JIS Z3321 YS410
EN ISO 14343-A W 13

Applications

- Hardfacing application

Features

- Excellent resistance to corrosion resistance and abrasion
- Good anti-abrasive property

Current

DC -

Shielding Gas

Ar

Diameter / Packaging

Diameter	
mm (in)	5kg*1000
1.0 (0.039)	
1.2 (0.045)	
1.6 (1/16)	✓
2.0 (5/64)	✓
2.4 (3/32)	✓
2.6 (0.10)	✓
3.2 (1/8)	✓

Typical Chemical Composition of the Wire(%)

C	Si	Mn	Cr	Ni
0.10	0.38	0.34	12.0	0.17

Typical Mechanical Properties of All-Weld Metal

TS MPa(lbs/in²)	EL (%)	Temp °C(°F)	CVN-Impact Value J (ft·lbs)
530 (76,800)	37	0 (32)	-

SM-90B3 / ST-90B3

2.25%Cr- 1%Mo steels, Joining carbon steel and Cr-Mo alloys

Conformances

AWS A5.28/ ASME SFA5.28 ER90S-B3

ABS AWS A5.28 ER90S-B3 (ST-90B3)

Applications

- High pressure piping and pressure vessels

Features

- Careful control of preheat, interpass temperatures postweld heat treatment is essential to prevent cracking

Welding Position

Current

GMAW: DC + / GTAW: DC -

Shielding Gas

Ar

Diameter / Packaging

Diameter mm (in)	Spool			Pac		
	10kg (22lbs)	15kg (33 lbs)	20kg (44lbs)	30kg (66lbs)	150kg (330lbs)	200kg (440lbs)
0.8 (0.033)						
0.9 (0.035)						
1.0 (0.040)						
1.2 (0.045)		✓	✓			
1.4 (0.052)						
1.6 (1/16)						

Diameter	5kg*1000						
mm (in)	1.0 (0.039)	1.2 (0.045)	1.6 (1/16)	2.0 (5/64)	2.4 (3/32)	2.6 (0.10)	3.2 (1/8)
				✓	✓		✓

Typical Chemical Composition of the Wire(%)

C	Si	Mn	Cr	Ni	Mo	Cu	Shielding Gas
0.118	0.48	0.54	2.48	0.15	0.98	0.32	Ar

Typical Mechanical Properties of All-Weld Metal

	YS MPa(lbs/in ²)	TS MPa(lbs/in ²)	EL (%)
As welded with 100% Ar	590 (85,600)	759 (109,518)	24

SMW

SAW

GMAW

GTAW

FCAW

Non-FERROUS

APPENDIX

ST-91B9

A213 T91(Seamless tube), A335 P91(Seamless pipe), A387 Gr91(Plate), A182/A336 F91(forging), A234 WP91

Conformances

AWS A5.28/ ASME SFA5.28 ER90S-B9
EN ISO 21952-A W CrMo91

Applications

- Headers, main steam piping and turbine casings

Features

- Good high temp. creep resistance
- In the PWHT condition the microstructure consists of tempered martensite with alloy carbides

Current

GTAW: DC -

Shielding Gas

Ar

Diameter / Packaging

Diameter	
mm (in)	5kg*1000
1.0 (0.039)	
1.2 (0.045)	
1.6 (1/16)	
2.0 (5/64)	
2.4 (3/32)	✓
2.6 (0.10)	
3.2 (1/8)	

Typical Chemical Composition of the Wire(%)

C	Si	Mn	Cr	Ni	Mo	Shielding Gas
0.10	0.30	0.47	8.91	0.67	0.96	Ar

Typical Mechanical Properties of All-Weld Metal

	YS MPa(lbs/in ²)	TS MPa(lbs/in ²)	EL (%)	Temp °C(°F)	CVN-Impact Value J (ft.lbs)
As welded with 100% Ar	746 (108,200)	830 (121,000)	21	0 (32) R.T	180 (133) 190 (137)

ST-92B9

A213 T92(Seamless tube), A335 P92(Seamless pipe), A387 Gr92(Plate), A182/A336 F92(forging), A234 WP92

Conformances

AWS A5.28/ ASME SFA5.28 ER90S-G

Applications

- Headers, main steam piping and turbine casings

Features

- Good high temp. creep resistance
- In the PWHT condition the microstructure consists of tempered martensite with alloy carbides

Current

GTAW: DC -

Shielding Gas

Ar

Diameter / Packaging

Diameter	
mm (in)	5kg*1000
1.0 (0.039)	
1.2 (0.045)	
1.6 (1/16)	
2.0 (5/64)	
2.4 (3/32)	✓
2.6 (0.10)	
3.2 (1/8)	

Typical Chemical Composition of the Wire(%)

C	Si	Mn	Cr	Ni	Mo	Shielding Gas
0.10	0.23	0.55	8.82	0.67	0.44	Ar

Typical Mechanical Properties of All-Weld Metal

	YS MPa(lbs/in²)	TS MPa(lbs/in²)	EL (%)	Temp °C(°F)	CVN-Impact Value J (ft.-lbs)
As welded with 100% Ar	758 (109,939)	845 (122,557)	21	0 (32) R.T	30 (22) 150 (111)

SMW

SAW

GMW

GTAW

FCW

Non-FERROUS

APPENDIX

FCAW

Flux Cored Wire



SF-71

Type : Rutile



Conformances

AWS A5.36/ ASME SFA5.36 E71T1-C1A0-CS1

(AWS A5.20/ ASME SFA5.20 E71T-1C)

JIS Z3313 T49J 0 T1-1 C A-U H10

EN ISO 17632-A-T 42 0 P C1 1

KR 2SMG, 2YSMG(C) H10

ABS 2SA, 2YSA H10, 2Y400SA

LR 2S, 2YS H10

BV SA2M, SA2YM HH, A2M, A2YM HH

DNV-GL I1Y40MS H10

NK KSW52G(C) H10

KSW52Y40G(C) H10

TÜV EN ISO 17632-A - T 42 0 P C 1

CWB CSA W48 E491T-1-H8

CE

RS 2, 2YS H10

CCS 2SM, 2YSM H10

CRS 2HS, 2YHS

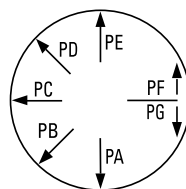
Applications

- Shipbuilding
- General fabrication
- Structural fabrication
- Pressure vessels

Features

- Designed for welding with 100% CO₂ shielding gas
- Good performance and low spatter
- Smooth and stable arc with a fast freezing slag

Welding Position



Current

DC +

Shielding Gas

100% CO₂

Diameter / Packaging

Diameter mm (in)	Spool				Pac		
	5kg (11lbs)	12.5kg (28lbs)	15kg (33lbs)	20kg (44lbs)	100kg (221lbs)	200kg (441lbs)	250kg (551lbs)
1.0 (0.040)	✓		✓	✓	✓	✓	✓
1.2 (0.045)	✓		✓	✓	✓	✓	✓
1.4 (0.052)	✓	✓	✓	✓	✓	✓	✓
1.6 (1/16)	✓		✓	✓	✓	✓	✓

Typical Chemical Composition of All-Weld Metal (%)

C	Si	Mn	P	S
0.04	0.49	1.29	0.010	0.009

Typical Mechanical Properties of All-Weld Metal

YS MPa(lbs/in ²)	TS MPa(lbs/in ²)	EL (%)	Temp °C(°F)	CVN-Impact Value J (ft.-lbs)
548 (79,600)	582 (84,500)	28.0	0 (32) -20 (-4)	86 (64) 45 (33)

Typical Welding Parameters

Diameter, Polarity Shielding Gas	CTWD mm (in)	Wire Feed Speed m/min (in/min)	Amp. (A)	Volt. (V)	Deposition Rate kg/hr (lb/hr)	Efficiency (%)
1.2mm (0.045 in) DC+						
100% CO ₂	25 (1)	4.5 (175)	120~160	18~23	1.5 (3.3)	86~88
		6.4 (250)	135~175	19~25	2.2 (4.8)	
		7.6 (300)	150~180	20~26	2.5 (5.5)	
		8.9 (350)	175~205	23~28	3.0 (6.6)	
		10.2 (400)	185~220	25~30	3.5 (7.6)	
		11.5 (450)	220~260	26~31	3.8 (8.4)	
		12.8 (500)	250~290	27~32	4.4 (9.6)	
	15.3 (600)	280~320	28~33	5.3 (11.6)		
1.4mm (0.052 in) DC+						
100% CO ₂	25 (1)	3.8 (150)	130~170	20~25	1.9 (4.1)	85~88
		5.1 (200)	160~200	21~26	2.5 (5.5)	
		6.4 (250)	180~230	22~28	3.0 (6.6)	
		7.6 (300)	220~260	23~29	4.2 (9.2)	
		10.2 (400)	270~320	27~32	5.5 (12.1)	
		12.8 (500)	300~350	28~34	6.0 (13.2)	
1.6mm (1/16 in) DC+						
100% CO ₂	25 (1)	3.2 (125)	170~210	22~25	2.0 (4.4)	84~87
		3.8 (150)	180~220	23~26	2.5 (5.5)	
		5.1 (200)	220~260	25~29	3.2 (7.0)	
		6.4 (250)	270~320	26~32	4.0 (8.8)	
		7.6 (300)	300~350	28~34	5.0 (11.0)	
		10.2 (400)	350~400	34~38	6.4 (14.0)	

SF-71LF

Type : Rutile

Conformances

AWS A5.36/ ASME SFA5.36 E71T1-C1A0-CS1
(AWS A5.20/ ASME SFA5.20 E71T-1C)
JIS Z3313 T49J 0 T1-1 C A-U H10
ABS 2YSA H10
LR 2S, 2YS H10

DNV-GL IYMS H10
NK KSW52G(C) H10
KAW52MG(C)

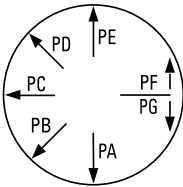
Applications

- Shipbuilding
- General fabrication
- Structural fabrication
- Pressure vessels

Features

- Designed for welding with 100% CO₂ shielding gas
- Low fume
- Smooth and stable arc with a fast freezing slag

Welding Position



Current

DC +

Shielding Gas

100% CO₂

Diameter / Packaging

Diameter mm (in)	Spool			Pac		
	5kg (11lbs)	15kg (33lbs)	20kg (44lbs)	100kg (221lbs)	200kg (441lbs)	250kg (551lbs)
1.2 (0.045)	✓	✓	✓		✓	✓
1.4 (0.052)	✓	✓	✓		✓	✓
1.6 (1/16)	✓	✓	✓		✓	✓

Typical Chemical Composition of All-Weld Metal (%)

C	Si	Mn	P	S
0.03	0.50	1.35	0.009	0.011

Typical Mechanical Properties of All-Weld Metal

YS MPa(lbs/in ²)	TS MPa(lbs/in ²)	EL (%)	Temp °C(°F)	CVN-Impact Value J (ft.-lbs)
550 (79,900)	590 (85,700)	27.0	0 (32) -20 (-4)	90 (66) 42 (31)

Typical Welding Parameters

Diameter, Polarity Shielding Gas	CTWD mm (in)	Wire Feed Speed m/min (in/min)	Amp. (A)	Volt. (V)	Deposition Rate kg/hr (lb/hr)	Efficiency (%)
1.2mm (0.045 in) DC+						
100% CO ₂	25 (1)	4.5 (175)	120~160	18~23	1.5 (3.3)	86~88
		6.4 (250)	135~175	19~25	2.2 (4.8)	
		7.6 (300)	150~180	20~26	2.5 (5.5)	
		8.9 (350)	175~205	23~28	3.0 (6.6)	
		10.2 (400)	185~220	25~30	3.5 (7.6)	
		11.5 (450)	220~260	26~31	3.9 (8.6)	
		12.8 (500)	250~290	27~32	4.3 (9.5)	
	15.3 (600)	280~320	28~33	5.2 (11.4)		
1.4mm (0.052 in) DC+						
100% CO ₂	25 (1)	3.8 (150)	130~170	20~25	1.9 (4.1)	85~88
		5.1 (200)	160~200	21~26	2.5 (5.5)	
		6.4 (250)	180~230	22~28	3.0 (6.6)	
		7.6 (300)	220~260	23~29	4.2 (9.2)	
		10.2 (400)	270~320	24~30	5.4 (11.9)	
		12.8 (500)	300~350	25~31	6.0 (13.2)	
1.6mm (1/16 in) DC+						
100% CO ₂	25 (1)	3.2 (125)	170~210	22~25	2.0 (4.4)	84~87
		3.8 (150)	180~220	23~26	2.5 (5.5)	
		5.1 (200)	220~260	25~29	3.1 (6.8)	
		6.4 (250)	270~320	26~32	4.0 (8.8)	
		7.6 (300)	300~350	28~34	5.0 (11.0)	
		10.2 (400)	350~400	34~38	6.4 (14.0)	

Supercored 71

Type : Rutile



Conformances

AWS A5.36/ ASME SFA5.36 E71T1-C1A0-CS1

(AWS A5.20/ ASME SFA5.20 E71T-1C)

JIS Z3313 T49 2 T1-1 C A H10

EN ISO 17632-A-T 42 2 P C1 1

KR 3SMG, 3YSMG(C) H10

ABS 3SAH10, 3YSA

LR 3YS H10

BV SA3M, SA3YM, A3M, A3YM HH

DNV-GL IIIYMS H10

NK KSW53Y40G(C) H10

TÜV EN ISO 17632-A - T 42 2 P C 1

DB DIN EN ISO 17632-A-T 42 2 P C 1 1

CE

RINA 3YS H10

CRS 3YS H10

RS 3YSM H10

CWB W48 E491T-1-H8

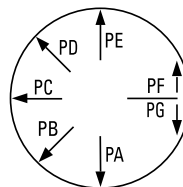
Applications

- Shipbuilding
- General fabrication
- Structural fabrication
- Steel industry

Features

- Designed for welding with 100% CO₂ shielding gas
- Good performance and low spatter
- Smooth and stable arc with a fast freezing slag

Welding Position



Current

DC +

Shielding Gas

100% CO₂

Diameter / Packaging

Diameter mm (in)	Spool			Pac		
	5kg (11lbs)	15kg (33lbs)	20kg (44lbs)	100kg (221lbs)	200kg (441lbs)	250kg (551lbs)
1.2 (0.045)	✓	✓	✓	✓	✓	
1.4 (0.052)	✓	✓	✓	✓	✓	
1.6 (1/16)	✓	✓	✓	✓	✓	

Typical Chemical Composition of All-Weld Metal (%)

C	Si	Mn	P	S
0.03	0.51	1.26	0.010	0.011

Typical Mechanical Properties of All-Weld Metal

YS MPa(lbs/in ²)	TS MPa(lbs/in ²)	EL (%)	Temp °C(°F)	CVN-Impact Value J (ft-lbs)
545 (79,100)	572 (83,100)	28.0	0 (32) -20 (-4)	110 (81) 70 (52)

Typical Welding Parameters

Diameter, Polarity Shielding Gas	CTWD mm (in)	Wire Feed Speed m/min (in/min)	Amp. (A)	Volt. (V)	Deposition Rate kg/hr (lb/hr)	Efficiency (%)
1.2mm (0.045 in) DC+						
100% CO ₂	25 (1)	4.5 (175)	120~160	18~23	1.5 (3.3)	86~88
		6.4 (250)	135~175	19~25	2.2 (4.8)	
		7.6 (300)	150~180	20~26	2.5 (5.5)	
		8.9 (350)	175~205	23~28	3.0 (6.6)	
		10.2 (400)	185~220	25~30	3.5 (7.6)	
		11.5 (450)	220~260	26~31	3.9 (8.6)	
		12.8 (500)	250~290	27~32	4.3 (9.5)	
	15.3 (600)	280~320	28~33	5.2 (11.4)		
1.4mm (0.052 in) DC+						
100% CO ₂	25 (1)	3.8 (150)	130~170	20~25	1.9 (4.1)	85~88
		5.1 (200)	160~200	21~26	2.5 (5.5)	
		6.4 (250)	180~230	22~28	3.0 (6.6)	
		7.6 (300)	220~260	23~29	4.2 (9.2)	
		10.2 (400)	270~320	27~32	5.4 (11.9)	
		12.8 (500)	300~350	28~34	6.0 (13.2)	
1.6mm (1/16 in) DC+						
100% CO ₂	25 (1)	3.2 (125)	170~210	22~25	2.0 (4.4)	84~87
		3.8 (150)	180~220	23~26	2.4 (5.3)	
		5.1 (200)	220~260	25~29	3.1 (6.8)	
		6.4 (250)	270~320	26~32	4.0 (8.8)	
		7.6 (300)	300~350	28~34	5.0 (11.0)	
		10.2 (400)	350~400	34~38	6.3 (13.9)	

SC-71LH

Type : Rutile



Conformances

AWS A5.36/ ASME SFA5.36 E71T1-C1A2-CS1

(AWS A5.20/ ASME SFA5.20 E71T-1C/-9C)

JIS Z3313 T49 3 T1-1 C A-U H5

EN ISO 17632-A-T 42 2 P C1 1 H5

KR 3YSG(C) H5

ABS 3YSA H5

LR 3YS H5

BV SA3Y HHH

DNV-GL IIYMS H5

NK KSW53Y40G(C) H5

TÜV EN ISO 17632-A-T 42 2 P C1 H5

CE

RINA 3YS H5

RS 3Y40MS H5RS

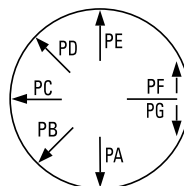
Applications

- Shipbuilding
- General fabrication
- Structural fabrication
- Steel industry

Features

- Designed for welding with 100% CO₂ shielding gas
- Good low Hydrogen level(H5) and crack resistance
- Smooth and stable arc with a fast freezing slag

Welding Position



Current

DC +

Shielding Gas

100% CO₂

Diameter / Packaging

Diameter mm (in)	Spool				Pac		
	5kg (11lbs)	12.5kg (28lbs)	15kg (33lbs)	20kg (44lbs)	100kg (221lbs)	200kg (441lbs)	250kg (551lbs)
1.2 (0.045)	✓		✓	✓	✓	✓	✓
1.4 (0.052)	✓	✓	✓	✓	✓	✓	✓
1.6 (1/16)	✓		✓	✓	✓	✓	✓

Typical Chemical Composition of All-Weld Metal (%)

C	Si	Mn	P	S
0.06	0.47	1.35	0.014	0.012

Typical Mechanical Properties of All-Weld Metal

YS MPa(lbs/in ²)	TS MPa(lbs/in ²)	EL (%)	Temp °C(°F)	CVN-Impact Value J (ft·lbs)
550 (79,900)	590 (85,600)	27.0	-30 (-22)	70 (52)

Typical Welding Parameters

Diameter, Polarity Shielding Gas	CTWD mm (in)	Wire Feed Speed m/min (in/min)	Amp. (A)	Volt. (V)	Deposition Rate kg/hr (lb/hr)	Efficiency (%)
1.2mm (0.045 in) DC+						
100% CO ₂	25 (1)	4.5 (175)	120~160	18~23	1.5 (3.3)	86~88
		6.4 (250)	135~175	19~25	2.2 (4.8)	
		7.6 (300)	150~180	20~26	2.5 (5.5)	
		8.9 (350)	175~205	23~28	3.0 (6.6)	
		10.2 (400)	185~220	25~30	3.5 (7.6)	
		11.5 (450)	220~260	26~31	3.9 (8.6)	
		12.8 (500)	250~290	27~32	4.3 (9.5)	
1.4mm (0.052 in) DC+						
100% CO ₂	25 (1)	3.8 (150)	130~170	20~25	1.9 (4.1)	86~88
		5.1 (200)	160~200	21~26	2.5 (5.5)	
		6.4 (250)	180~230	22~28	3.0 (6.6)	
		7.6 (300)	220~260	23~29	4.2 (9.2)	
		10.2 (400)	270~320	27~32	5.4 (11.9)	
		12.8 (500)	300~350	28~34	6.0 (13.2)	
1.6mm (1/16 in) DC+						
100% CO ₂	25 (1)	3.2 (125)	170~210	22~25	2.0 (4.4)	86~88
		3.8 (150)	180~220	23~26	2.4 (5.3)	
		5.1 (200)	220~260	25~29	3.1 (6.8)	
		6.4 (250)	270~320	26~32	4.0 (8.8)	
		7.6 (300)	300~350	28~34	5.0 (11.0)	
		10.2 (400)	350~400	34~38	6.3 (13.9)	

SMW

SAW

GMW

GTAW

FCW

Non-FERROUS

APPENDIX

Supercored 71H

Type : Rutile



Conformances

AWS A5.36/ ASME SFA5.36 E71T1-C1A4-CS1
(AWS A5.20/ ASME SFA5.20 E71T-1C/-9C/-9C-J)

JIS Z3313 T49 4 T1-1 C A H5

EN ISO 17632-A-T 42 4 P C1 1 H5

KR 4YSMG(C) H10, 3SMG(C) H10 / 3YSMG(C) H10

ABS 4YSA H10, 3YSA H10

LR 4YS H10

BV SA4YM HH, SA3YM HH

DNV-GL IVYSM H5, IIIYMS H5

NK KSW54G(C) H10

KSW53G(C) H10

TÜV EN ISO 17632-A-T 42 4 P C1 1

CWB CSA W48 E491T-9J-H8

CE

DB DIN EN ISO 17632-A-T 42 4 P C1 1

CCS 3YSM H10, 4YSM H10

RINA 3YS H10

RS 4Y40SM H5, 3Y40SM H5

NAKS

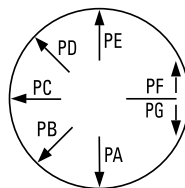
Applications

- Shipbuilding
- Offshore Structure
- Structural fabrication
- Pressure vessels

Features

- Low temperature service steel
- Designed for welding with 100% CO₂ shielding gas
- Smooth and stable arc with a fast freezing slag

Welding Position



Current

DC +

Shielding Gas

100% CO₂

Diameter / Packaging

Diameter mm (in)	Spool			Pac		
	5kg (11lbs)	15kg (33lbs)	20kg (44lbs)	100kg (221lbs)	200kg (441lbs)	250kg (551lbs)
1.2 (0.045)	✓	✓	✓	✓	✓	✓
1.4 (0.052)	✓	✓	✓	✓	✓	✓
1.6 (1/16)	✓	✓	✓	✓	✓	✓

Typical Chemical Composition of All-Weld Metal (%)

C	Si	Mn	P	S	Ni
0.03	0.46	1.36	0.008	0.011	0.40

Typical Mechanical Properties of All-Weld Metal

YS MPa(lbs/in ²)	TS MPa(lbs/in ²)	EL (%)	Temp °C(°F)	CVN-Impact Value J (ft-lbs)
550 (79,900)	570 (82,800)	27.0	-30 (-22) -40 (-40)	90 (66) 60 (44)

Typical Welding Parameters

Diameter, Polarity Shielding Gas	CTWD mm (in)	Wire Feed Speed m/min (in/min)	Amp. (A)	Volt. (V)	Deposition Rate kg/hr (lb/hr)	Efficiency (%)
1.2mm (0.045 in) DC+						
100% CO ₂	25 (1)	All Position				85~88
		4.3 (175)	100~130	20~25	1.6 (3.5)	
		5.6 (220)	120~150	21~26	2.0 (4.5)	
		7.0 (275)	130~160	22~27	2.5 (5.5)	
		8.3 (325)	160~190	23~28	2.9 (6.5)	
		8.9 (350)	170~200	24~29	3.2 (7.0)	
		10.2 (400)	200~230	25~30	3.6 (8.0)	
		Flat & Horizontal				
		11.4 (450)	210~240	26~31	4.1 (9.1)	
		12.1 (475)	230~260	27~32	4.3 (9.5)	
		13.3 (525)	250~280	28~33	4.7 (10.4)	
1.4mm (0.052 in) DC+						
100% CO ₂	25 (1)	All Position				86~88
		3.8 (150)	130~160	22~27	1.8 (3.9)	
		5.1 (200)	140~170	23~28	2.4 (5.2)	
		6.4 (250)	160~190	24~29	2.9 (6.5)	
		7.6 (300)	180~210	26~31	3.5 (7.8)	
		8.9 (350)	200~230	27~32	4.1 (9.1)	
		9.5 (375)	220~250	28~33	4.4 (9.8)	
		Flat & Horizontal				
		10.8 (425)	240~270	30~35	5.0 (11.1)	
		12.1 (475)	260~290	31~36	5.6 (12.4)	
		12.7 (500)	310~340	32~37	5.9 (13.0)	
1.6mm (1/16 in) DC+						
100% CO ₂	25 (1)	All Position				86~88
		3.8 (150)	180~210	21~27	2.5 (5.5)	
		4.4 (175)	220~250	23~28	2.9 (6.4)	
		5.1 (200)	260~290	24~29	3.3 (7.3)	
		5.7 (225)	280~300	25~31	3.7 (8.2)	
		6.4 (250)	300~330	27~34	4.2 (9.2)	
		7.6 (300)	330~360	29~36	5.0 (11.0)	
		Flat & Horizontal				
		8.3 (325)	360~390	31~38	5.4 (11.9)	
		8.9 (350)	390~420	32~39	5.8 (12.8)	
		11.4 (450)	420~450	34~39	7.5 (16.5)	

SC-71HJ

Type : Rutile

Conformances

AWS A5.36/ ASME SFA5.36 E71T1-C1A4-CS1
(AWS A5.20/ ASME SFA5.20 E71T-1C/-9C/-9C-J)
JIS Z3313 T49 4 T1-1 C A
EN ISO 17632-A-T 42 4 P C1 1 H10
KR 4Y40SG(C1) H10
ABS 4Y400SA H10

LR 4Y40S H10
BV SA4Y40 HH
DNV-GL IVY40MS H10
NK KSW54Y40G(C) H10

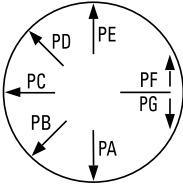
Applications

- Shipbuilding
- Offshore Structure
- Structural fabrication
- Pressure vessels

Features

- Designed for welding with 100% CO₂ shielding gas
- Good bead appearance
- Smooth and stable arc with a fast freezing slag
- Good performance in all position

Welding Position



Current

DC +

Shielding Gas

100% CO₂

Diameter / Packaging

Diameter mm (in)	Spool			Pac		
	5kg (11lbs)	15kg (33lbs)	20kg (44lbs)	100kg (221lbs)	200kg (441lbs)	250kg (551lbs)
1.2 (0.045)	✓	✓	✓	✓	✓	
1.4 (0.052)	✓	✓	✓	✓	✓	
1.6 (1/16)	✓	✓	✓	✓	✓	

Typical Chemical Composition of All-Weld Metal (%)

C	Si	Mn	P	S	Ni
0.04	0.45	1.30	0.008	0.011	0.40

Typical Mechanical Properties of All-Weld Metal

YS MPa(lbs/in ²)	TS MPa(lbs/in ²)	EL (%)	Temp °C(°F)	CVN-Impact Value J (ft-lbs)
560 (81,300)	580 (84,200)	27.5	-40 (-40)	70 (52)

Typical Welding Parameters

Diameter, Polarity Shielding Gas	CTWD mm (in)	Wire Feed Speed m/min (in/min)	Amp. (A)	Volt. (V)	Deposition Rate kg/hr (lb/hr)	Efficiency (%)
1.2mm (0.045 in) DC+						
100% CO ₂	25 (1)	All Position				85~88
		4.4 (175)	100~130	20~25	1.6 (3.5)	
		5.7 (225)	120~150	21~26	2.0 (4.5)	
		7.0 (275)	130~160	22~27	2.5 (5.5)	
		8.3 (325)	160~190	23~28	2.9 (6.5)	
		8.9 (350)	170~200	24~29	3.2 (7.0)	
		10.2 (400)	200~230	25~30	3.6 (8.0)	
		Flat & Horizontal				
		11.4 (450)	210~240	26~31	4.1 (9.1)	
12.1 (475)	230~260	27~32	4.3 (9.5)			
13.3 (525)	250~280	28~33	4.7 (10.4)			
1.4mm (0.052 in) DC+						
100% CO ₂	25 (1)	All Position				86~88
		3.8 (150)	130~160	22~27	1.8 (3.9)	
		5.1 (200)	140~170	23~28	2.4 (5.2)	
		6.4 (250)	160~190	24~29	2.9 (6.5)	
		7.6 (300)	180~210	26~31	3.5 (7.8)	
		8.9 (350)	200~230	27~32	4.1 (9.1)	
		9.5 (375)	220~250	28~33	4.4 (9.8)	
		Flat & Horizontal				
		10.8 (425)	240~270	30~35	5.0 (11.1)	
12.1 (475)	260~290	31~36	5.6 (12.4)			
12.7 (500)	310~340	32~37	5.9 (13.0)			
1.6mm (1/16 in) DC+						
100% CO ₂	25 (1)	All Position				86~88
		3.8 (150)	180~210	21~27	2.5 (5.5)	
		4.4 (175)	220~250	23~28	2.9 (6.4)	
		5.1 (200)	260~290	24~29	3.3 (7.3)	
		5.7 (225)	280~300	25~31	3.7 (8.2)	
		6.4 (250)	300~330	27~34	4.2 (9.2)	
		7.6 (300)	330~360	29~36	5.0 (11.0)	
		Flat & Horizontal				
		8.3 (325)	360~390	31~38	5.4 (11.9)	
8.9 (350)	390~420	32~39	5.8 (12.8)			
11.4 (450)	420~450	34~39	7.5 (16.5)			

Supercored 71MAG

Type : Rutile



Conformances

AWS A5.36/ ASME SFA5.36 E71T1-M21A2-CS1

(AWS A5.20/ ASME SFA5.20 E71T-1M/-9M)

JIS Z3313 T49 3 T1-1 M A-U H10

EN ISO 17632-A-T 42 3 P M21 1

ABS 3SAH10, 3YSA

LR 3S, 3YS H10

BV SA3M, SA3YM HH, A3M, A3YM

DNV-GL IIIYMS H10

TÜV EN ISO 17632-A - T 46 3 P M 1

CE

DB DIN EN ISO 17632-A-T 46 3 P M21 1

RINA 3YS H10

CWB CSA W48 E491T-9M-H8

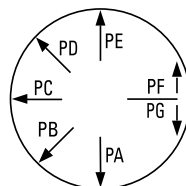
Applications

- Shipbuilding
- Civil construction
- General fabrication

Features

- Designed for welding with 75~80% Argon/ balance CO₂ shielding gas
- Good arc performance and bead appearance
- Low spatter

Welding Position



Current

DC +

Shielding Gas

Ar + 20~25% CO₂

Diameter / Packaging

Diameter mm (in)	Spool			Pac		
	5kg (11lbs)	15kg (33lbs)	20kg (44lbs)	100kg (221lbs)	200kg (441lbs)	250kg (551lbs)
1.0 (0.040)	✓	✓	✓		✓	✓
1.2 (0.045)	✓	✓	✓		✓	✓
1.4 (0.052)	✓	✓	✓		✓	✓
1.6 (1/16)	✓	✓	✓		✓	✓

Typical Chemical Composition of All-Weld Metal (%)

C	Si	Mn	P	S
0.04	0.54	1.25	0.011	0.012

Typical Mechanical Properties of All-Weld Metal

YS MPa(lbs/in ²)	TS MPa(lbs/in ²)	EL (%)	Temp °C(°F)	CVN-Impact Value J (ft-lbs)
580 (84,200)	600 (87,100)	28.0	-30 (-22)	60 (44)

Typical Welding Parameters

Diameter, Polarity Shielding Gas	CTWD mm (in)	Wire Feed Speed m/min (in/min)	Amp. (A)	Volt. (V)	Deposition Rate kg/hr (lb/hr)	Efficiency (%)
1.2mm (0.045 in) DC+						
80% Ar + 20% CO ₂	25 (1)	4.5 (175)	120~160	17~22	1.5 (3.3)	86~88
		6.4 (250)	135~175	18~24	2.2 (4.8)	
		7.6 (300)	150~180	19~25	2.5 (5.5)	
		8.9 (350)	175~205	22~27	3.0 (6.6)	
		10.2 (400)	185~220	24~29	3.5 (7.6)	
		11.5 (450)	220~260	25~30	3.8 (8.4)	
		12.8 (500)	250~290	26~31	4.4 (9.6)	
	15.3 (600)	280~320	27~32	5.3 (11.6)		
1.4mm (0.052 in) DC+						
80% Ar + 20% CO ₂	25 (1)	3.8 (150)	130~170	19~24	1.9 (4.1)	86~89
		5.1 (200)	160~200	20~25	2.5 (5.5)	
		6.4 (250)	180~230	21~27	3.0 (6.6)	
		7.6 (300)	220~260	22~28	4.2 (9.2)	
		10.2 (400)	270~320	26~31	5.5 (12.1)	
		12.8 (500)	300~350	27~33	6.0 (13.2)	
1.6mm (1/16 in) DC+						
80% Ar + 20% CO ₂	25 (1)	3.2 (125)	170~210	21~24	2.0 (4.4)	86~89
		3.8 (150)	180~220	22~25	2.5 (5.5)	
		5.1 (200)	220~260	24~28	3.2 (7.0)	
		6.4 (250)	270~320	25~31	4.0 (8.8)	
		7.6 (300)	300~350	27~33	5.0 (11.0)	
		10.2 (400)	350~400	33~37	6.4 (14.0)	

SC-71LHM Cored

Type : Rutile



Conformances

AWS A5.36/ ASME SFA5.36 E71T1-M21A2-CS1
(AWS A5.20/ ASME SFA5.20 E71T-1C/-9C/9C-J)
JIS Z3313 T49 3 T1-1 M A-U H5
EN ISO 17632-A-T 46 3 P M21 1 H5
ABS 3YSA H5
LR 3YS H5

BV SA3Y HHH
DNV-GL IIIYMS H5
TÜV EN ISO 17632-A-T 46 3 P M 1 H5
DB EN ISO 17632-A-T 46 3 P M21 1 H5
CWB CSA W48 E491T-9M-H4
CE

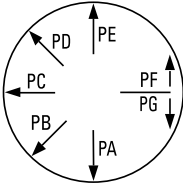
Applications

- Shipbuilding
- Steel industry
- General fabrication

Features

- Designed for welding with 75~80% Argon/ balance CO₂ shielding gas
- Good arc performance and fast freezing slag
- Low hydrogen level(H5) and good crack resistance

Welding Position



Current

DC +

Shielding Gas

Ar + 20~25% CO₂

Diameter / Packaging

Diameter mm (in)	Spool			Pac		
	5kg (11lbs)	15kg (33lbs)	20kg (44lbs)	100kg (221lbs)	200kg (441lbs)	250kg (551lbs)
1.2 (0.045)	✓	✓	✓			
1.4 (0.052)	✓	✓	✓			
1.6 (1/16)	✓	✓	✓			

Typical Chemical Composition of All-Weld Metal (%)

C	Si	Mn	P	S
0.05	0.50	1.20	0.012	0.015

Typical Mechanical Properties of All-Weld Metal

YS MPa(lbs/in ²)	TS MPa(lbs/in ²)	EL (%)	Temp °C(°F)	CVN-Impact Value J (ft-lbs)
580 (84,200)	600 (87,100)	28.0	-30 (-22)	80 (59)

Typical Welding Parameters

Diameter, Polarity Shielding Gas	CTWD mm (in)	Wire Feed Speed m/min (in/min)	Amp. (A)	Volt. (V)	Deposition Rate kg/hr (lb/hr)	Efficiency (%)
1.2mm (0.045 in) DC+						
80% Ar + 20% CO ₂	25 (1)	4.5 (175)	120~160	17~22	1.5 (3.3)	86~88
		6.4 (250)	135~175	18~24	2.2 (4.8)	
		7.6 (300)	150~180	19~25	2.5 (5.5)	
		8.9 (350)	175~205	22~27	3.0 (6.6)	
		10.2 (400)	185~220	24~29	3.5 (7.6)	
		11.5 (450)	220~260	25~30	3.8 (8.4)	
		12.8 (500)	250~290	26~31	4.4 (9.6)	
	15.3 (600)	280~320	27~32	5.3 (11.6)		
1.4mm (0.052 in) DC+						
80% Ar + 20% CO ₂	25 (1)	3.8 (150)	130~170	19~24	1.9 (4.1)	86~88
		5.1 (200)	160~200	20~25	2.5 (5.5)	
		6.4 (250)	180~230	21~27	3.0 (6.6)	
		7.6 (300)	220~260	22~28	4.2 (9.2)	
		10.2 (400)	270~320	26~31	5.5 (12.1)	
		12.8 (500)	300~350	27~33	6.0 (13.2)	
1.6mm (1/16 in) DC+						
80% Ar + 20% CO ₂	25 (1)	3.2 (125)	170~210	21~24	2.0 (4.4)	86~88
		3.8 (150)	180~220	22~25	2.5 (5.5)	
		5.1 (200)	220~260	24~28	3.2 (7.0)	
		6.4 (250)	270~320	25~31	4.0 (8.8)	
		7.6 (300)	300~350	27~33	5.0 (11.0)	
		10.2 (400)	350~400	33~37	6.4 (14.0)	

SF-71MC

Type : Rutile



Conformances

AWS A5.36/ ASME SFA5.36 E71T1-C1A2-CS2

E71T1-M21A2-CS2

(AWS A5.20/ ASME SFA5.20 E71T1-C/-1M/-9C/-9M/-12C/-12M)

EN ISO 17632-A-T 46 3 P M21 1

EN ISO 17632-A-T 46 2 P C1 1

ABS 3YSA H10

LR 3YS H10

BV SA3YM HH

DNV-GL IIYMS H10

TÜV EN ISO 17632-A-T 46 2 P C1 H10

T 46 3 P M1 H10

DB EN ISO 17632-A-T 46 2 P C1 H10

T 46 3 P M21 H10

CWB CSA W48 E491T-1(M)

/-9(M)/-12(M)-H8

CE

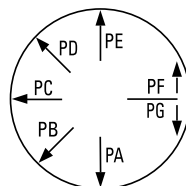
Applications

- Shipbuilding
- Structural fabrication
- General fabrication
- Pipe line
- Offshore structure

Features

- Low spatter and excellent performance
- Good arc performance and fast freezing slag
- Use 100% CO₂ gas or Ar-CO₂ mixture(Dual gas)
- Better performance in V-up position

Welding Position



Current

DC +

Shielding Gas

100% CO₂

Ar + 20~25% CO₂

Diameter / Packaging

Diameter mm (in)	Spool			Pac		
	5kg (11lbs)	15kg (33lbs)	20kg (44lbs)	100kg (221lbs)	200kg (441lbs)	250kg (551lbs)
1.2 (0.045)	✓	✓	✓	✓	✓	✓
1.4 (0.052)	✓	✓	✓	✓	✓	✓
1.6 (1/16)	✓	✓	✓	✓	✓	✓

Typical Chemical Composition of All-Weld Metal (%)

	C	Si	Mn	P	P
100% CO ₂	0.04	0.40	1.20	0.010	0.012

Typical Mechanical Properties of All-Weld Metal

	YS MPa(lbs/in ²)	TS MPa(lbs/in ²)	EL (%)	Temp °C(°F)	CVN-Impact Value J (ft-lbs)
100% CO ₂	510 (74,000)	550 (79,900)	28.0	-30 (-22)	75 (55)
80% Ar + 20% CO ₂	540 (78,400)	605 (87,700)	28.0	-30 (-22)	90 (66)

Typical Welding Parameters

Diameter, Polarity Shielding Gas	CTWD mm (in)	Wire Feed Speed m/min (in/min)	Amp. (A)	Volt. (V)	Deposition Rate kg/hr (lb/hr)	Efficiency (%)
1.2mm (0.045 in) DC+						
100% CO ₂	25 (1)	4.5 (175)	120~160	17~22	1.5 (3.3)	86~88
		6.4 (250)	135~175	18~24	2.2 (4.8)	
		7.6 (300)	150~180	19~25	2.5 (5.5)	
		8.9 (350)	175~205	22~27	3.0 (6.6)	
		10.2 (400)	185~220	24~29	3.5 (7.6)	
		11.5 (450)	220~260	25~30	3.8 (8.4)	
		12.8 (500)	250~290	26~31	4.4 (9.6)	
80% Ar + 20% CO ₂	25 (1)	15.3 (600)	280~320	27~32	5.3 (11.6)	86~88
		4.5 (175)	120~160	18~23	1.5 (3.3)	
		6.4 (250)	135~175	19~25	2.2 (4.8)	
		7.6 (300)	150~180	20~26	2.5 (5.5)	
		8.9 (350)	175~205	23~28	3.0 (6.6)	
		10.2 (400)	185~220	25~30	3.5 (7.6)	
		11.5 (450)	220~260	26~31	3.9 (8.6)	
		12.8 (500)	250~290	27~32	4.3 (9.5)	
		15.3 (600)	280~320	28~33	5.2 (11.4)	

SC-420MC

Type : Rutile



Conformances

AWS A5.36/ ASME SFA5.36 E71T1-C1A0-CS1 H4
E71T1-M21A0-CS1 H8
(AWS A5.20/ ASME SFA5.20 E71T-1C H4/-1M H8)
EN ISO 17632-A-T 42 2 P C1 1 H5
EN ISO 17632-A-T 42 2 P M21 1 H5
LR 3YS H5
BV SA3YM HHH

DNV-GL IIYMS H5
RINA 3YS H5
TÜV EN ISO 17632-A-T 42 2 P M21(C1) H5
DB EN ISO 17632-A-T 42 2 P M21(C1) H5
CE

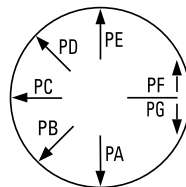
Applications

- Shipbuilding
- Structural fabrication
- General fabrication
- Offshore structure

Features

- Low spatter and excellent performance
- Good arc performance and fast freezing slag
- Use 100% CO₂ gas or Ar-CO₂ mixture(Dual gas)
- Better performance in V-up position
- Good low Hydrogen level(H5)

Welding Position



Current

DC +

Shielding Gas

100% CO₂
Ar + 20~25% CO₂

Diameter / Packaging

Diameter	Spool			Pac		
	mm (in)	5kg (11lbs)	15kg (33lbs)	20kg (44lbs)	100kg (221lbs)	200kg (441lbs) 250kg (551lbs)
1.2 (0.045)		✓	✓			

Typical Chemical Composition of All-Weld Metal (%)

	C	Si	Mn	P	P
100% CO ₂	0.05	0.40	1.25	0.010	0.005

Typical Mechanical Properties of All-Weld Metal

	YS MPa(lbs/in ²)	TS MPa(lbs/in ²)	EL (%)	Temp °C(°F)	CVN-Impact Value J (ft-lbs)
100% CO ₂	550 (79,750)	590 (85,550)	28.0	-20 (-4)	80 (59)
80% Ar + 20% CO ₂	585 (84,825)	640 (92,820)	26.0	-20 (-4)	105 (77)

Typical Welding Parameters

Diameter, Polarity Shielding Gas	CTWD mm (in)	Wire Feed Speed m/min (in/min)	Amp. (A)	Volt. (V)	Deposition Rate kg/hr (lb/hr)	Efficiency (%)
1.2mm (0.045 in) DC+						
100% CO ₂	25 (1)	4.5 (175)	120~160	17~22	1.5 (3.3)	86~88
		6.4 (250)	135~175	18~24	2.2 (4.8)	
		7.6 (300)	150~180	19~25	2.5 (5.5)	
		8.9 (350)	175~205	22~27	3.0 (6.6)	
		10.2 (400)	185~220	24~29	3.5 (7.6)	
		11.5 (450)	220~260	25~30	3.8 (8.4)	
		12.8 (500)	250~290	26~31	4.4 (9.6)	
80% Ar + 20% CO ₂	25 (1)	15.3 (600)	280~320	27~32	5.3 (11.6)	86~88
		4.5 (175)	120~160	18~23	1.5 (3.3)	
		6.4 (250)	135~175	19~25	2.2 (4.8)	
		7.6 (300)	150~180	20~26	2.5 (5.5)	
		8.9 (350)	175~205	23~28	3.0 (6.6)	
		10.2 (400)	185~220	25~30	3.5 (7.6)	
		11.5 (450)	220~260	26~31	3.9 (8.6)	
		12.8 (500)	250~290	27~32	4.3 (9.5)	
		15.3 (600)	280~320	28~33	5.2 (11.4)	

SC-71MJ

Type : Rutile

Conformances

AWS A5.36/ ASME SFA5.36 E71T1-M21A4-CS1
(AWS A5.20/ ASME SFA5.20 E71T-9M-J)
JIS Z3313 T49 4 T1-1 M A-U H5
EN ISO 17632-A-T 46 4 P M21 1 H5
ABS 4YSA, 4Y400SA H5

LR 4Y40S H5
BV SA4Y, SA4Y40 HHH
DNV-GL IVY40MS (H5)

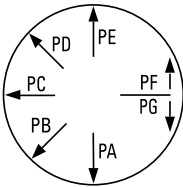
Applications

- Shipbuilding
- Pipe line
- Offshore structure

Features

- Good impact value at low temperature
- Smooth and stable arc with a fast freezing slag
- Low hydrogen level(H5)
- Designed for welding with Ar-CO₂ mixture

Welding Position



Current

DC +

Shielding Gas

Ar + 20~25% CO₂

Diameter / Packaging

Diameter	Spool			Pac		
	5kg (11lbs)	15kg (33lbs)	20kg (44lbs)	100kg (221lbs)	200kg (441lbs)	250kg (551lbs)
1.2 (0.045)	✓	✓				
1.4 (0.052)	✓	✓				
1.6 (1/16)	✓	✓				

Typical Chemical Composition of All-Weld Metal (%)

C	Si	Mn	P	S	Ni
0.06	0.30	1.10	0.012	0.011	0.42

Typical Mechanical Properties of All-Weld Metal

YS MPa(lbs/in ²)	TS MPa(lbs/in ²)	EL (%)	Temp °C(°F)	CVN-Impact Value J (ft-lbs)
545 (79,100)	583 (84,500)	25.0	-30 (-22) -40 (-40)	126 (93) 80 (59)

Typical Welding Parameters

Diameter, Polarity Shielding Gas	CTWD mm (in)	Wire Feed Speed m/min (in/min)	Amp. (A)	Volt. (V)	Deposition Rate kg/hr (lb/hr)	Efficiency (%)
1.2mm (0.045 in) DC+						
80% Ar + 20% CO ₂	25 (1)	All Position				86-88
		4.4 (175)	110~140	20~25	1.6 (3.5)	
		5.7 (225)	120~150	21~26	2.0 (4.5)	
		7.0 (275)	130~160	22~27	2.5 (5.5)	
		8.3 (325)	160~190	22~27	2.9 (6.5)	
		8.9 (350)	170~200	23~28	3.2 (7.0)	
		10.2 (400)	200~230	24~29	3.6 (8.0)	
		Flat & Horizontal				
		11.4 (450)	210~240	25~31	4.1 (9.1)	
		12.1 (475)	230~260	26~32	4.3 (9.5)	
13.3 (525)	250~280	27~33	4.7 (10.4)			
1.4mm (0.052 in) DC+						
80% Ar + 20% CO ₂	25 (1)	All Position				86-88
		3.8 (150)	120~150	22~27	1.8 (3.9)	
		4.4 (175)	130~160	21~26	2.1 (4.6)	
		5.1 (200)	160~190	22~27	2.4 (5.2)	
		5.7 (225)	180~210	23~28	2.7 (5.9)	
		6.4 (250)	200~230	24~29	2.9 (6.5)	
		7.6 (300)	220~250	25~30	3.5 (7.8)	
		Flat & Horizontal				
		8.9 (350)	260~290	28~32	4.1 (9.1)	
		11.4 (450)	310~330	29~34	5.3 (11.7)	
1.6mm (1/16 in) DC+						
80% Ar + 20% CO ₂	25 (1)	All Position				86-88
		3.8 (150)	170~200	21~26	2.5 (5.5)	
		4.4 (175)	180~210	22~27	2.9 (6.4)	
		5.1 (200)	200~230	22~28	3.3 (7.3)	
		5.7 (225)	230~260	24~29	3.7 (8.2)	
		6.4 (250)	250~280	25~30	4.2 (9.2)	
		7.6 (300)	280~310	26~31	5.0 (11.0)	
		Flat & Horizontal				
		8.3 (325)	300~330	27~32	5.4 (11.9)	
		8.9 (350)	330~360	28~33	5.8 (12.8)	
10.2 (450)	380~410	29~34	6.6 (14.6)			

SMAW

SAW

GMAW

GTAW

FCAW

Non-FERROUS

APPENDIX

SF-70MX

Type : Semi-Metal



Conformances

AWS A5.36/ ASME SFA5.36 E70T1-C1A0-CS1
(AWS A5.20/ ASME SFA5.20 E70T-1C)
JIS Z3313 T49 J 0 T1-0 C A-U H10
EN ISO 17632-A-T 42 0 R C1 3
KR 2SG, 2YSG (C1) H10, 2MG, 2YMG(C1) H10
ABS 2SA, 2YSAH10, 2Y400SA
LR 2S, 2YS H10
BV SA2YM HH
DNV-GL I1Y40MS H10

NK KSW2G, KSV52Y40G(C) H10
KAW2MG, KAW52MG(C) H10
CCS 2YSM H10
CRS 2HSM, 2YHSM
RINA 2YS H10
CWB CSA W48 E492T-1-H8
CE

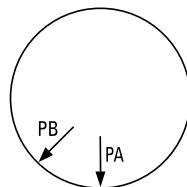
Applications

- Shipbuilding
- Structural fabrication
- General fabrication
- Transportation equipment

Features

- Designed for welding with 100% CO₂ shielding gas
- Good high deposition rate
- Good penetration and good arc stability
- Low spatter and soft arc
- Good anti-porosity

Welding Position



Current

DC +

Shielding Gas

100% CO₂

Diameter / Packaging

Diameter mm (in)	Spool			Pac		
	5kg (11lbs)	15kg (33lbs)	25kg (55lbs)	100kg (220lbs)	250kg (551lbs)	300kg (661lbs)
1.2 (0.045)	✓	✓		✓	✓	✓
1.4 (0.052)	✓	✓		✓	✓	✓
1.6 (1/16)	✓	✓		✓	✓	✓
2.4 (3/32)			✓	✓	✓	

Typical Chemical Composition of All-Weld Metal (%)

C	Si	Mn	P	S
0.05	0.5	1.5	0.011	0.013

Typical Mechanical Properties of All-Weld Metal

YS MPa(lbs/in ²)	TS MPa(lbs/in ²)	EL (%)	Temp °C(°F)	CVN-Impact Value J (ft-lbs)
560 (81,300)	590 (85,700)	28	-20 (-4)	50(37)

Typical Welding Parameters

Diameter, Polarity Shielding Gas	CTWD mm (in)	Wire Feed Speed m/min (in/min)	Amp. (A)	Volt. (V)	Deposition Rate kg/hr (lb/hr)	Efficiency (%)
1.2mm (0.045 in) DC+						
100% CO ₂	25 (1)	11.5 (450)	200~240	24~28	4.1 (9.0)	85~87
		12.6 (500)	220~260	27~29	4.5 (10.0)	87~89
		14.3 (560)	240~280	29~33	5.0 (10.9)	87~89
		15.4 (610)	260~300	29~33	5.4 (11.9)	89~90
1.4mm (0.052 in) DC+						
100% CO ₂	25 (1)	9.6 (380)	230~270	24~28	4.4 (9.8)	87~89
		10.7 (420)	250~290	25~29	5.0 (11.1)	87~89
		12.2 (480)	270~310	29~33	5.6 (12.4)	88~90
		12.8 (500)	300~340	30~34	5.9 (13.0)	88~90
		13.1 (515)	330~370	30~34	6.1 (13.4)	88~90
1.6mm (1/16 in) DC+						
100% CO ₂	25 (1)	6.4 (250)	250~290	26~30	3.8 (8.5)	86~88
		7.6 (300)	270~310	28~32	4.5 (10.0)	87~89
		8.9 (350)	300~340	30~34	5.5 (12.1)	87~89
		10.2 (400)	340~380	33~37	6.3 (13.9)	89~91
2.4mm (3/32 in) DC+						
100% CO ₂	25 (1)	3.2 (125)	335	23-28	4.9 (10.8)	86~88
		5.1 (200)	445	27-32	7.6 (16.7)	88~89
		6.4 (250)	500	29-34	9.6 (21.3)	89~92
		7.6 (300)	590	31-36	11.8 (26.0)	89~92

SC-70H Cored

Type : Semi-Metal

Conformances

AWS A5.36/ ASME SFA5.36 E70T1-C1A2-CS1

(AWS A5.20/ ASME SFA5.20 E70T-9C)

JIS Z3313 T49 3 T1-0 C A H10

EN ISO 17632-A-T 42 2 R C1 3

ABS 3YSA H10

LR 3YS H10

DNV-GL IIIYMS(H10)

CCS 3YSM H10

CWB CSA W48 E492T-9-H8

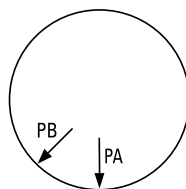
Applications

- Shipbuilding
- Structural fabrication
- Machinery
- Heavy equipment
- Transportation equipment

Features

- High deposition in the flat and horizontal positions
- Designed for welding with 100% CO₂ shielding gas
- Low spatter and soft arc
- Good anti-porosity

Welding Position



Current

DC +

Shielding Gas

100% CO₂

Diameter / Packaging

Diameter mm (in)	Spool			Pac		
	5kg (11lbs)	15kg (33lbs)	25kg (44lbs)	100kg (220lbs)	250kg (551lbs)	300kg (661lbs)
1.2 (0.045)		✓		✓	✓	✓
1.4 (0.052)		✓		✓	✓	✓
1.6 (1/16)		✓		✓	✓	✓
2.0 (5/64)			✓	✓		
2.4 (3/32)			✓	✓		
3.2 (1/8)			✓	✓		

Typical Chemical Composition of All-Weld Metal (%)

C	Si	Mn	P	S
0.05	0.56	1.48	0.014	0.010

Typical Mechanical Properties of All-Weld Metal

YS MPa(lbs/in ²)	TS MPa(lbs/in ²)	EL (%)	Temp °C(°F)	CVN-Impact Value J (ft.-lbs)
495 (71,900)	580 (84,100)	28	-30 (-22)	51 (38)

Typical Welding Parameters

Diameter, Polarity Shielding Gas	CTWD mm (in)	Wire Feed Speed m/min (in/min)	Amp. (A)	Volt. (V)	Deposition Rate kg/hr (lb/hr)	Efficiency (%)
1.2mm (0.045 in) DC+						
100% CO ₂	25 (1)	10.2 (400)	220~240	24~28	4.7 (10.4)	89~91
		12.8 (500)	230~270	28~32	5.6 (12.3)	89~91
		15.3 (600)	280~320	30~34	6.3 (13.9)	90~92
1.4mm (0.052 in) DC+						
100% CO ₂	25 (1)	12.2 (480)	280~320	30~34	5.7 (12.6)	89~91
		12.7 (500)	310~330	30~34	5.9 (13.0)	89~91
		13.0 (512)	330~370	34~38	6.3 (13.9)	90~92
1.6mm (1/16 in) DC+						
100% CO ₂	25 (1)	7.7 (300)	280~320	30~34	5.1 (11.2)	89~91
		8.8 (350)	330~370	32~38	5.9 (13.0)	89~91
		10.3 (400)	380~420	34~40	6.6 (14.6)	90~92
2.0mm (5/64 in) DC+						
100% CO ₂	25 (1)	6.4 (250)	330~370	31~35	6.0 (13.2)	89~91
		7.7 (300)	380~420	32~36	7.1 (15.6)	92~93
		10.0 (390)	430~470	34~38	9.8 (21.6)	92~93
2.4mm (3/32 in) DC+						
100% CO ₂	25 (1)	4.5 (180)	380~420	31~35	6.4 (14.1)	89~91
		5.2 (200)	430~470	32~36	7.6 (16.8)	92~93
		6.4 (250)	480~520	34~38	9.6 (21.2)	92~93
3.2mm (1/8 in) DC+						
100% CO ₂	25 (1)	2.5 (98)	360~400	30~34	6.6 (14.6)	89~91
		2.8 (110)	380~420	30~34	7.2 (15.9)	92~93
		3.3 (130)	460~500	32~36	10.3 (22.7)	92~93

Supercored 70MXH

Type : Semi-Metal

Conformances

AWS A5.36/ ASME SFA5.36 E70T1-C1A2-CS1

(AWS A5.20/ ASME SFA5.20 E70T-9C)

JIS Z3313 T49 J 2 T1-0 C A -U H5

EN ISO 17632-A-T 42 2 R C1 H5

KR 3YSG(C) H5, 3YMG(C) H5

ABS 3SA H5, 3YSA

LR 3YS H5

BV SA3YM, A3YM HHH

DNV-GL IIYMS H5

NK KSW53G(C) H5

KAW53MG(C) H5

CCS 3YSM H5

RINA 3YS H5

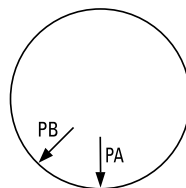
Applications

- Shipbuilding
- Structural fabrication
- General fabrication
- Heavy equipment
- Offshore structure

Features

- Designed for welding with 100% CO₂ shielding gas
- High speed single or twin tandem welding
- Low hydrogen level (H5)
- Good anti-porosity to zinc primer

Welding Position



Current

DC +

Shielding Gas

100% CO₂

Diameter / Packaging

Diameter	Spool			Pac		
mm (in)	5kg (11lbs)	15kg (33lbs)	20kg (44lbs)	250kg (551lbs)	300kg (661lbs)	500kg (771lbs)
1.4 (0.052)		✓	✓	✓	✓	✓
1.6 (1/16)		✓	✓	✓	✓	✓

Typical Chemical Composition of All-Weld Metal (%)

C	Si	Mn	P	S
0.05	0.55	1.65	0.013	0.010

Typical Mechanical Properties of All-Weld Metal

YS MPa(lbs/in ²)	TS MPa(lbs/in ²)	EL (%)	Temp °C(°F)	CVN-Impact Value J (ft-lbs)
540 (78,400)	620 (90,000)	28	-30 (-22)	54(40)

Typical Welding Parameters

Diameter, Polarity Shielding Gas	CTWD mm (in)	Wire Feed Speed m/min (in/min)	Amp. (A)	Volt. (V)	Deposition Rate kg/hr (lb/hr)	Efficiency (%)
1.4mm (0.052 in) DC+						
100% CO ₂	25 (1)	12.2 (480)	280~320	29~33	5.6 (12.4)	90~92
		13.1 (515)	330~370	34~38	6.1 (13.4)	91~93
		15.0 (590)	380~420	36~40	6.4 (14.1)	91~93
1.6mm (1/16 in) DC+						
100% CO ₂	25 (1)	7.6 (300)	280~320	31~35	4.9 (10.8)	87~89
		8.9 (350)	330~370	34~38	5.5 (12.1)	90~91
		10.2 (400)	380~420	36~40	6.3 (13.9)	90~91
		11.8 (500)	430~470	40~44	7.7 (17.0)	91~92

SC-70T Cored

Type : Metal-Cored



Conformances

AWS A5.36/ ASME SFA5.36 E70T15-C1A0-CS1
E70T15-M21A2-CS1

(AWS A5.18/ ASME SFA5.18 E70C-3C/6M)

JIS Z3313 T 49 2 T15-1 CA

Z3313 T 49 3 T15-1 MA

EN ISO 17632-A-T 42 2 M C1 1

EN ISO 17632-A-T 46 2 M M21 1 H5

ABS 3YSA H10, 3YSA (C)

LR 3YS H10 (C1), 3YS H5 (M21)

BV SA3YM HH (C1), SA3Y HHH (M21)

DNV-GL IIYMS H10 (C1), IIYMS H5 (M21)

TÜV EN ISO 17632-A T46 2 M M / T42 2 M C

DB EN ISO 17632-A T46 2 M21 M1 / T42 2 M C1 1

CWB CSA W48 E491C-3-H4

E491C-6MJ-H8

CE

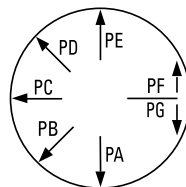
Applications

- Shipbuilding
- Machinery
- Structural fabrication

Features

- Good weldability in thin plate and root pass welding
- High productivity and automatic applications
- Minimum amount of slag & spatter
- Use 100% CO₂ gas or Ar-CO₂ mixture (Dual gas)
- All position welding
- Good anti-porosity

Welding Position



Current

DC +

Shielding Gas

100% CO₂

Ar + 20~25% CO₂

Diameter / Packaging

Diameter	Spool			Pac		
	5kg (11lbs)	15kg (33 lbs)	20kg (44lbs)	250kg (551lbs)	300kg (661lbs)	350kg (771lbs)
1.0 (0.040)	✓	✓	✓	✓	✓	✓
1.2 (0.045)	✓	✓	✓	✓	✓	✓

Typical Chemical Composition of All-Weld Metal (%)

	C	Si	Mn	P	S
100% CO ₂	0.06	0.60	1.20	0.011	0.014
80% Ar + 20% CO ₂	0.07	0.65	1.45	0.010	0.011

Typical Mechanical Properties of All-Weld Metal

	YS MPa(lbs/in ²)	TS MPa(lbs/in ²)	EL (%)	Temp °C(°F)	CVN-Impact Value J (ft-lbs)
100% CO ₂	473 (68,600)	551 (79,900)	29	-20 (-4)	69 (51)
80% Ar + 20% CO ₂	552 (80,100)	598 (86,800)	27	-30 (-22)	65 (48)

Typical Welding Parameters

Diameter, Polarity Shielding Gas	CTWD mm (in)	Wire Feed Speed m/min (in/min)	Amp. (A)	Volt. (V)	Deposition Rate kg/hr (lb/hr)	Efficiency (%)
1.2mm (0.045 in) DC+						
100% CO ₂	19-25 (3/4-1)	2.4 (90)	80	17	0.8 (1.8)	90-92
		4.8 (190)	160	23	2.8 (6.2)	91-93
		9.8 (390)	250	28	4.0 (8.8)	92-94
		12.7 (500)	300	32	5.4 (11.9)	93-95
80% Ar + 20% CO ₂	19-25 (3/4-1)	7.4 (290)	200	24	2.7 (5.9)	92-94
		9.8 (390)	250	28	4.2 (9.2)	93-95
		12.7 (500)	300	30	5.7 (12.5)	95-97

SC-70Z Cored

Type : Metal-Cored

Conformances

AWS A5.36M/ ASME SFA5.36M E490T15-C1A0-G
E490T15-M21A0-G

(AWS A5.18/ ASME SFA5.18 E70C-G)

EN ISO 17632-A-T 46 Z M C1 3

EN ISO 17632-A-T 46 Z M M21 3

CWB CSA W48 E491T-G

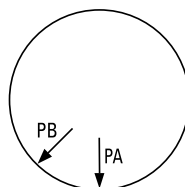
Applications

- Automotive
- Galvanized steel structure
- Shipbuilding

Features

- Designed for low carbon and low alloy galvanized steel sheet
- Applicable to the zinc plate steel
- Low spatter
- Good anti-porosity

Welding Position



Current

DC +

Shielding Gas

100% CO₂

Ar + 20~25% CO₂

Diameter / Packaging

Diameter	Spool			Pac		
	5kg (11lbs)	15kg (33 lbs)	20kg (44lbs)	250kg (551lbs)	300kg (661lbs)	350kg (771lbs)
1.0 (0.040)	✓	✓	✓	✓	✓	✓
1.2 (0.045)	✓	✓	✓	✓	✓	✓

Typical Chemical Composition of All-Weld Metal (%)

	C	Si	Mn	P	S
100% CO ₂	0.09	0.42	1.35	0.022	0.013
80% Ar + 20% CO ₂	0.10	0.61	1.57	0.025	0.014

Typical Mechanical Properties of All-Weld Metal

	YS MPa(lbs/in ²)	TS MPa(lbs/in ²)	EL (%)	Temp °C(°F)	CVN-Impact Value J (ft-lbs)
100% CO ₂	550 (68,600)	600 (79,900)	30	0 (32)	120 (89)
80% Ar + 20% CO ₂	580 (80,100)	640 (86,800)	25	0 (32)	105 (77)

Typical Welding Parameters

Diameter, Polarity Shielding Gas	CTWD mm (in)	Wire Feed Speed m/min (in/min)	Amp. (A)	Volt. (V)	Deposition Rate kg/hr (lb/hr)	Efficiency (%)
1.2mm (0.045 in) DC+						
100% CO ₂	19-25 (3/4-1)	Flat & Horizontal				
		4.8 (190)	160	21	2.7 (5.9)	91-93
		9.8 (390)	250	30	4.3 (9.5)	92-94
		12.7 (500)	300	32	5.2 (11.4)	93-95
80% Ar + 20% CO ₂	19-25 (3/4-1)	Flat & Horizontal				
		6.1 (240)	180	21	2.8 (6.2)	91-93
		9.8 (390)	250	28	4.4 (9.7)	93-95
		12.7 (500)	300	31	5.4 (11.9)	96-98

Supercored 70NS

Type : Metal-Cored



Conformances

AWS A5.36/ ASME SFA5.36 E70T15-M21A2-CS1

(AWS A5.18/ ASME SFA5.18 E70C-6M)

JIS Z3313 T49 3 T15 0 M A H5

EN ISO 17632-A-T 42 3 M M 21 3 H5

ABS 3SAH5, 3YSA

LR 3YSH5

BV SA3M, SA3YM HHH

DNV-GL IIIYMS H5

TÜV EN ISO 17632-A-T423MM3

CWB CSA W48 E492C-6M-H4

CE

DB DIN EN ISO 17632-A-T422MM3

RINA 3YS H5

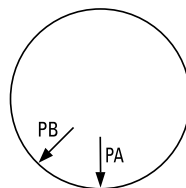
Applications

- Machinery
- Structural fabrication
- Automotive or robotic welding.
- Shipbuilding

Features

- Designed for welding with Ar + CO₂ shielding gas
- High deposition rates, stable arc, travel speed
- Low spatter
- Good anti-porosity

Welding Position



Current

DC +

Shielding Gas

Ar + 20~25% CO₂

Diameter / Packaging

Diameter mm (in)	Spool			Pac		
	5kg (11lbs)	15kg (33lbs)	20kg (44lbs)	250kg (551lbs)	300kg (661lbs)	350kg (771lbs)
1.2 (0.045)	✓	✓	✓	✓	✓	✓
1.4 (0.052)	✓	✓	✓	✓	✓	✓
1.6 (1/16)	✓	✓	✓	✓	✓	✓

Typical Chemical Composition of All-Weld Metal (%)

	C	Si	Mn	P	S
80% Ar + 20% CO ₂	0.05	0.55	1.45	0.011	0.010
90% Ar + 10% CO ₂	0.04	0.69	1.67	0.012	0.005

Typical Mechanical Properties of All-Weld Metal

	YS MPa(lbs/in ²)	TS MPa(lbs/in ²)	EL (%)	Temp °C(°F)	CVN-Impact Value J (ft-lbs)
80% Ar + 20% CO ₂	480 (69,700)	550 (79,800)	25	-30 (-22)	50 (37)
90% Ar + 10% CO ₂	492 (71,340)	564 (81,700)	24	-30 (-22)	49 (36)

Typical Welding Parameters

Diameter, Polarity Shielding Gas	CTWD mm (in)	Wire Feed Speed m/min (in/min)	Amp. (A)	Volt. (V)	Deposition Rate kg/hr (lb/hr)	Efficiency (%)
1.2mm (0.045 in) DC+						
80% Ar + 20% CO ₂	19-25 (3/4-1)	Flat & Horizontal				
		7.3 (288)	190~210	22~26	3.4 (7.6)	90~96
		9.7 (382)	240~260	23~27	4.5 (9.7)	
		12.2 (489)	280~310	24~30	5.9 (12.8)	
1.4mm (0.052 in) DC+						
80% Ar + 20% CO ₂	19~25 (3/4~1)	Flat & Horizontal				
		6.7 (261)	250~270	22~26	3.8 (8.3)	92~96
		7.8 (307)	290~310	25~31	4.9 (10.4)	
		9.4 (370)	330~350	28~32	5.5 (12.0)	
1.6mm (1/16 in) DC+						
80% Ar + 20% CO ₂	25~32 (1~1 1/4)	Flat & Horizontal				
		5.6 (220)	290~310	26~32	4.5 (9.3)	93~96
		6.8 (270)	340~350	29~33	5.6 (12.1)	
		7.8 (310)	350~370	31~34	6.7 (14.3)	

SC-70A

Type : Metal-Cored



Conformances

AWS A5.36/ ASME SFA5.36 E70T15-C1A0-CS1
E70T15-M21A2-CS1

(AWS A5.18 / ASME SFA5.18 E70C-3C
E70C-6M)

EN ISO 17632-A-T 42 2 M C1 1 H5

EN ISO 17632-A-T 46 2 M M21 1 H5

ABS 3YSA H5

LR 3YS H5

BV SA3Y H5

DNV IIIYS H5

RINA 3YS H5

TÜV EN ISO 17632-A - T 42 2 M C 1 H5
/ T 46 2 M M 1 H5

DB EN ISO 17632-A - T 42 2 M C 1 H5
/ T 46 2 M M 1 H5

CWB CSA W48-06 E491C-6M-H8
CE

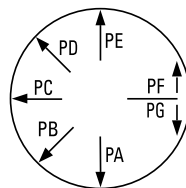
Applications

- Shipbuilding, bridge construction machinery, and vehicles.

Features

- Designed for welding with 100% CO₂ shielding gas
- Excellent weld-ability and low spatter
- Exceptionally smooth and stable arc with a fast freezing slag system

Welding Position



Current

DC +

Shielding Gas

Ar + 20~25% CO₂
100% CO₂

Diameter / Packaging

Diameter mm (in)	Spool			Pac		
	5kg (11lbs)	15kg (33lbs)	20kg (44lbs)	200kg (441bs)	250kg (551bs)	300kg (661bs)
1.2 (0.045)	✓	✓	✓	✓	✓	✓
1.4 (0.052)		✓	✓	✓	✓	✓
1.6 (1/16)		✓	✓	✓	✓	✓

Typical Chemical Composition of All-Weld Metal (%)

	C	Si	Mn	P	S
100% CO ₂	0.06	0.50	1.20	0.011	0.006
80% Ar + 20% CO ₂	0.07	0.58	1.43	0.011	0.007

Typical Mechanical Properties of All-Weld Metal

	YS MPa(lbs/in ²)	TS MPa(lbs/in ²)	EL (%)	Temp °C(°F)	CVN-Impact Value J (ft-lbs)
100% CO ₂	446 (64,742)	530 (76,935)	30	-20 (-4)	50 (37)
80% Ar + 20% CO ₂	492 (71,419)	580 (84,193)	26	-30 (-22)	57 (42)

Typical Welding Parameters

Diameter, Polarity Shielding Gas	CTWD mm (in)	Wire Feed Speed m/min (in/min)	Amp. (A)	Volt. (V)	Deposition Rate kg/hr (lb/hr)	Efficiency (%)
1.2mm (0.045 in) DC+						
100% CO ₂	19-25 (3/4-1)	2.4 (90)	80	17	0.8 (1.8)	90-92
		4.8 (190)	160	23	2.8 (6.2)	91-93
		9.8 (390)	250	28	4.0 (8.8)	92-94
		12.7 (500)	300	32	5.4 (11.9)	93-95
80% Ar + 20% CO ₂	19-25 (3/4-1)	7.4 (290)	200	24	2.7 (5.9)	92-94
		9.8 (390)	250	28	4.2 (9.2)	93-95
		12.7 (500)	300	30	5.7 (12.5)	95-97

Supercored 70B

Type : Basic



Conformances

AWS A5.36/ ASME SFA5.36 E71T5-M21A4-CS1 H4

(AWS A5.20/ ASME SFA5.20 E70T-5M-J)

JIS Z3313 T49 4 T5-1 M A-U H5

EN ISO 17632-A-T 42 4 B M21 3 H5

ABS 3YSA H5

LR 3S, 3YS H5

BV SA3YM HHH

DNV-GL IIYMS H5

TÜV EN ISO 17632-A-T42 4 B M3 H5

DB EN ISO 17632-A-T42 4 B M21 3 H5

CE

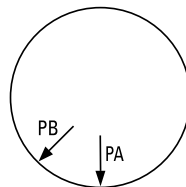
Applications

- Shipbuilding
- Structural fabrication

Features

- Good crack resistance
- Good impact value at low temperature
- Good anti-porosity

Welding Position



Current

DC +

Shielding Gas

Ar + 20~25% CO₂

Diameter / Packaging

Diameter mm (in)	Spool			Pac		
	5kg (11lbs)	15kg (33lbs)	20kg (44lbs)	100kg (221lbs)	200kg (441lbs)	250kg (551lbs)
1.0 (0.040)	✓	✓	✓			
1.2 (0.045)	✓	✓	✓			
1.4 (0.052)	✓	✓	✓			
1.6 (1/16)	✓	✓	✓			

Typical Chemical Composition of All-Weld Metal (%)

C	Si	Mn	P	S
0.06	0.43	1.33	0.011	0.013

Typical Mechanical Properties of All-Weld Metal

YS MPa(lbs/in ²)	TS MPa(lbs/in ²)	EL (%)	Temp °C(°F)	CVN-Impact Value J (ft-lbs)
450 (65,300)	520 (75,400)	32.0	-40 (-40)	78 (58)

Typical Welding Parameters

Diameter, Polarity Shielding Gas	CTWD mm (in)	Wire Feed Speed m/min (in/min)	Amp. (A)	Volt. (V)	Deposition Rate kg/hr (lb/hr)	Efficiency (%)
1.2mm (0.045 in) DC+						
80% Ar + 20% CO ₂	25 (1)	4.5 (175)	120~160	17~22	1.5 (3.3)	86~88
		6.4 (250)	135~175	18~24	2.2 (4.8)	
		7.6 (300)	150~180	19~25	2.5 (5.5)	
		8.9 (350)	175~205	22~27	3.0 (6.6)	
		10.2 (400)	185~220	24~29	3.5 (7.6)	
		11.5 (450)	220~260	25~30	3.8 (8.4)	
		12.8 (500)	250~290	26~31	4.4 (9.6)	
		15.3 (600)	280~320	27~32	5.3 (11.6)	
1.4mm (0.052 in) DC+						
80% Ar + 20% CO ₂	25 (1)	3.8 (150)	130~170	19~24	1.9 (4.1)	86~89
		5.1 (200)	160~200	20~25	2.5 (5.5)	
		6.4 (250)	180~230	21~27	3.0 (6.6)	
		7.6 (300)	220~260	22~28	4.2 (9.2)	
		10.2 (400)	270~320	26~31	5.5 (12.1)	
		12.8 (500)	300~350	27~33	6.0 (13.2)	
1.6mm (1/16 in) DC+						
80% Ar + 20% CO ₂	25 (1)	3.2 (125)	170~210	21~24	2.0 (4.4)	86~89
		3.8 (150)	180~220	22~25	2.5 (5.5)	
		5.1 (200)	220~260	24~28	3.2 (7.0)	
		6.4 (250)	270~320	25~31	4.0 (8.8)	
		7.6 (300)	300~350	27~33	5.0 (11.0)	
		10.2 (400)	350~400	33~37	6.4 (14.0)	

Supercored 70SB

Type : Basic

Conformances

AWS A5.36/ ASME SFA5.36 E71T5-C1A2-CS1 H4
(AWS A5.20/ ASME SFA5.20 E71T-5C)
JIS Z3313 T49 4 T5-1 M A-U H5
EN ISO 17632-A-T 42 3 B C1 2 H5
KR 3YSG(C1) H5
ABS 3SA, 3YSA H5

LR 3YS H5
BV SA3YM HHH
DNV-GL IIIYMS H5
NK KSW53G(C) H5

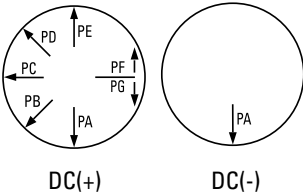
Applications

- Shipbuilding
- Structural fabrication
- Heavy equipment

Features

- Good crack resistance
- Good impact value at low temperature

Welding Position



Current

DC +

Shielding Gas

100% CO₂

Diameter / Packaging

Diameter	Spool			Pac		
mm (in)	12.5kg (28lbs)	15kg (33lbs)	20kg (44lbs)	250kg (551lbs)	300kg (661lbs)	350kg (771lbs)
0.8 (0.033)						
0.9 (0.035)						
1.0 (0.040)						
1.2 (0.045)	✓	✓	✓			
1.4 (0.052)	✓	✓	✓			
1.6 (1/16)	✓	✓	✓			

Typical Chemical Composition of All-Weld Metal (%)

C	Si	Mn	P	S
0.07	0.5	0.4	0.008	0.010

Typical Mechanical Properties of All-Weld Metal

YS MPa(lbs/in ²)	TS MPa(lbs/in ²)	EL (%)	Temp °C(°F)	CVN-Impact Value J (ft-lbs)	Polarity
570 (82,800)	620 (90,000)	26	-30 (-22)	70 (52)	DC (-)
500 (72,600)	550 (79,900)	31	-30 (-22)	80 (59)	DC (+)

Typical Welding Parameters

Diameter, Polarity Shielding Gas	CTWD mm (in)	Wire Feed Speed m/min (in/min)	Amp. (A)	Volt. (V)	Deposition Rate kg/hr (lb/hr)	Efficiency (%)
1.2mm (0.045 in) DC+						
100% CO ₂	25 (1)	4.5 (175)	120~160	18~23	1.5 (3.3)	86~88
		6.4 (250)	135~175	19~25	2.2 (4.8)	
		7.6 (300)	150~180	20~26	2.5 (5.5)	
		8.9 (350)	175~205	23~28	3.0 (6.6)	
		10.2 (400)	185~220	25~30	3.5 (7.6)	
		11.5 (450)	220~260	26~31	3.8 (8.4)	
		12.8 (500)	250~290	27~32	4.4 (9.6)	
	15.3 (600)	280~320	28~33	5.3 (11.6)		
1.4mm (0.052 in) DC+						
100% CO ₂	25 (1)	3.8 (150)	130~170	20~25	1.9 (4.1)	85~89
		5.1 (200)	160~200	21~26	2.5 (5.5)	
		6.4 (250)	180~230	22~28	3.0 (6.6)	
		7.6 (300)	220~260	23~29	4.2 (9.2)	
		10.2 (400)	270~320	27~32	5.5 (12.1)	
		12.8 (500)	300~350	28~34	6.0 (13.2)	
1.6mm (1/16 in) DC+						
100% CO ₂	25 (1)	3.2 (125)	170~210	22~25	2.0 (4.4)	84~87
		3.8 (150)	180~220	23~26	2.5 (5.5)	
		5.1 (200)	220~260	25~29	3.2 (7.0)	
		6.4 (250)	270~320	26~32	4.0 (8.8)	
		7.6 (300)	300~350	28~34	5.0 (11.0)	
		10.2 (400)	350~400	34~38	6.4 (14.0)	

SC-EG2 Cored

Type : Metal-Cored

Conformances

AWS A5.26/ ASME SFA5.26 EG70T-2C
 JIS Z3319 YFEG-22C
 KR 3V, 3YV
 ABS 3, 3YH10
 LR 3, 3Y
 BV AV3, AV3Y
 DNV-GL I1Y (-20°C)
 NK KEW53
 CCS 3, 3Y
 RINA 3Y

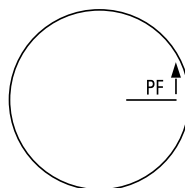
Applications

- Shipbuilding
- Storage tank

Features

- Electro gas arc welding process
- Hig deposition (Vertical up butt welding)

Welding Position



Current

DC +

Shielding Gas

100% CO₂

Diameter / Packaging

Diameter	Spool	
mm (in)	15kg (33lbs)	20kg (44lbs)
1.6 (1/16)	✓	✓

Typical Chemical Composition of All-Weld Metal (%)

C	Si	Mn	P	S	Mo
0.08	0.3	1.52	0.012	0.010	0.12

Typical Mechanical Properties of All-Weld Metal

YS MPa(lbs/in ²)	TS MPa(lbs/in ²)	EL (%)	Temp °C(°F)	CVN-Impact Value J (ft.lbs)
510 (74,000)	560 (81,300)	27	-20 (0)	60 (44)

Typical Welding Parameters

Diameter, Polarity Shielding Gas	CTWD mm (in)	Wire Feed Speed m/min (in/min)	Amp. (A)	Volt. (V)	Deposition Rate kg/hr (lb/hr)	Efficiency (%)
1.6mm (1/16 in) DC+						
100% CO ₂	25 (1)	8.3 (327)	330	32	5.8 (12.8)	92~94
		8.8 (346)	350	34	6.6 (14.6)	92~94
		9.8 (386)	380	38	7.1 (15.7)	93~95

SC-EG3

Type : Metal-Cored

Conformances

AWS A5.26/ ASME SFA5.26 EG82T-NM2

KR 4Y40V H5

ABS 5Y400 H5

LR 5Y40², 4Y²

BV AV5Y40 HHH

DNV-GL VY40(H5)

NK KEW54Y40G(C) H5 (-60°C ≥39J)

CCS 4Y40 H5

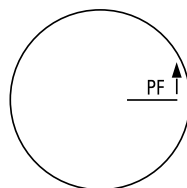
Applications

- Shipbuilding
- LPG and LNG storage tank

Features

- Electro gas arc welding process
- High deposition(vertical up butt welding)
- Low temperature service

Welding Position



Current

DC +

Shielding Gas

100% CO₂

Diameter / Packaging

Diameter	Spool
mm (in)	20kg (44lbs)
1.6 (1/16)	✓

Typical Chemical Composition of All-Weld Metal (%)

C	Si	Mn	P	S	Ni
0.07	0.22	1.52	0.012	0.010	1.8

Typical Mechanical Properties of All-Weld Metal

YS MPa(lbs/in ²)	TS MPa(lbs/in ²)	EL (%)	Temp °C(°F)	CVN-Impact Value J (ft.-lbs)
575 (83,400)	672 (94,500)	23.5	-60 (76)	50 (37)

Typical Welding Parameters

Diameter, Polarity Shielding Gas	CTWD mm (in)	Wire Feed Speed m/min (in/min)	Amp. (A)	Volt. (V)	Deposition Rate kg/hr (lb/hr)	Efficiency (%)
1.6mm (1/16 in) DC+						
100% CO ₂	25 (1)	8.2 (323)	330	32	5.5 (12.1)	91~93
		8.6 (346)	350	34	6.2 (14.6)	91~93
		9.6 (378)	380	38	6.8 (15.0)	92~94

SMW

SAW

GMW

GTAW

FCW

Non-FERROUS

APPENDIX

SC-55 Cored

Type : Rutile

Conformances

AWS A5.36/ ASME SFA5.36 E81T1-C1A0-G
(AWS A5.29/ ASME SFA5.29 E81T1-GC)
JIS Z3313 T55 2 T1-1 C A-U H10
ABS AWS A5.36 E81T1-C1A0-G H10

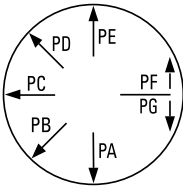
Applications

- Structural fabrication
- Storage tank
- Bridge construction
- Steel industry

Features

- Designed for welding with 100% CO₂ shielding gas
- Good crack resistance
- Smooth and stable arc with a fast freezing slag
- All position welding

Welding Position



Current

DC +

Shielding Gas

100% CO₂

Diameter / Packaging

Diameter mm (in)	Spool			Pac		
	5kg (11lbs)	15kg (33lbs)	20kg (44lbs)	100kg (221lbs)	200kg (441lbs)	250kg (551lbs)
1.2 (0.045)	✓	✓	✓	✓	✓	✓
1.4 (0.052)	✓	✓	✓	✓	✓	✓
1.6 (1/16)	✓	✓	✓	✓	✓	✓

Typical Chemical Composition of All-Weld Metal (%)

C	Si	Mn	P	S
0.06	0.45	1.40	0.012	0.006

Typical Mechanical Properties of All-Weld Metal

YS MPa(lbs/in ²)	TS MPa(lbs/in ²)	EL (%)	Temp °C(°F)	CVN-Impact Value J (ft.-lbs)
560 (81,200)	610 (88,500)	28.5	-20 (-4)	80 (59)

Typical Welding Parameters

Diameter, Polarity Shielding Gas	CTWD mm (in)	Wire Feed Speed m/min (in/min)	Amp. (A)	Volt. (V)	Deposition Rate kg/hr (lb/hr)	Efficiency (%)
1.2mm (0.045 in) DC+						
100% CO ₂	25 (1)	4.5 (175)	120~160	18~23	1.5 (3.3)	86~88
		6.4 (250)	135~175	19~25	2.2 (4.8)	
		7.6 (300)	150~180	20~26	2.5 (5.5)	
		8.9 (350)	175~205	23~28	3.0 (6.6)	
		10.2 (400)	185~220	25~30	3.5 (7.6)	
		11.5 (450)	220~260	26~31	3.9 (8.6)	
		12.8 (500)	250~290	27~32	4.3 (9.5)	
		15.3 (600)	280~320	28~33	5.2 (11.4)	
1.4mm (0.052 in) DC+						
100% CO ₂	25 (1)	3.8 (150)	130~170	20~25	1.9 (4.1)	85~88
		5.1 (200)	160~200	21~26	2.5 (5.5)	
		6.4 (250)	180~230	22~28	3.0 (6.6)	
		7.6 (300)	220~260	23~29	4.2 (9.2)	
		10.2 (400)	270~320	24~30	5.4 (11.9)	
		12.8 (500)	300~350	25~31	6.0 (13.2)	
1.6mm (1/16 in) DC+						
100% CO ₂	25 (1)	3.2 (125)	170~210	22~25	2.0 (4.4)	84~87
		3.8 (150)	180~220	23~26	2.5 (5.5)	
		5.1 (200)	220~260	25~29	3.1 (6.8)	
		6.4 (250)	270~320	26~32	4.0 (8.8)	
		7.6 (300)	300~350	28~34	5.0 (11.0)	
		10.2 (400)	350~400	34~38	6.4 (14.0)	

SC-55F Cored

Type : Semi-Metal

Conformances

AWS A5.36/ ASME SFA5.36 E80T1-C1A0-G
(AWS A5.29/ ASME SFA5.29 E80T1-G)
JIS Z3313 T55 2 T1-0 C A-N1-U H10

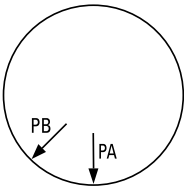
Applications

- Structural fabrication
- Storage tank
- Bridge construction
- Steel industry

Features

- Minimum spatter level
- Easy to remove slag
- Good anti-porosity

Welding Position



Current

DC +

Shielding Gas

100% CO₂

Diameter / Packaging

Diameter mm (in)	Spool			Pac		
	5kg (11lbs)	15kg (33lbs)	20kg (44lbs)	100kg (221lbs)	250kg (551lbs)	300kg (661lbs)
1.2 (0.045)	✓	✓		✓	✓	✓
1.4 (0.052)	✓	✓		✓	✓	✓
1.6 (1/16)	✓	✓		✓	✓	✓

Typical Chemical Composition of All-Weld Metal (%)

C	Si	Mn	P	S
0.05	0.48	1.56	0.012	0.010

Typical Mechanical Properties of All-Weld Metal

YS MPa(lbs/in ²)	TS MPa(lbs/in ²)	EL (%)	Temp °C(°F)	CVN-Impact Value J (ft-lbs)
580 (84,200)	625 (90,600)	24.5	-20 (-4)	75 (58)

Typical Welding Parameters

Diameter, Polarity Shielding Gas	CTWD mm (in)	Wire Feed Speed m/min (in/min)	Amp. (A)	Volt. (V)	Deposition Rate kg/hr (lb/hr)	Efficiency (%)
1.2mm (0.045 in) DC+						
100% CO ₂	20~25 (51/64~1)	11.5 (450)	225	26	4.1 (9.0)	85~86
		12.5 (480)	245	29	4.4 (9.7)	87~88
		14.2 (560)	265	30	4.9 (10.8)	87~89
		15.2 (610)	285	31	5.4 (11.9)	89~90
1.4mm (0.052 in) DC+						
100% CO ₂	20~25 (51/64~1)	9.6 (380)	255	26	4.4 (9.8)	87~88
		10.6 (420)	275	27	5.0 (11.0)	87~88
		12.1 (480)	295	31	5.5 (12.1)	88~89
		12.7 (500)	325	32	5.8 (12.8)	88~90
		13.1 (515)	350	32	6.1 (13.4)	88~90
1.6mm (1/16 in) DC+						
100% CO ₂	20~25 (51/64~1)	6.4 (250)	270	28	3.8 (8.5)	86~88
		7.3 (290)	295	32	4.6 (10.1)	87~89
		8.6 (340)	335	32	5.6 (12.3)	87~89
		10.0 (390)	360	35	6.4 (14.1)	89~91

Supercored 81

Type : Rutile

Conformances

AWS A5.36/ ASME SFA5.36 E81T1-C1A2-Ni1
(AWS A5.29/ ASME SFA5.29 E81T1-Ni1C)
JIS Z3313 T55 3 T1-1 C A-N2-U H10
EN ISO 17632-A-T 46 2 1Ni P C 1

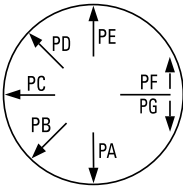
Applications

- Machinery
- Structural fabrication
- Storage tank
- Bridge construction

Features

- Good arc performance and low spatter
- Easy to remove slag
- Good impact value

Welding Position



Current

DC +

Shielding Gas

100% CO₂

Diameter / Packaging

Diameter mm (in)	Spool			Pac		
	5kg (11lbs)	15kg (33lbs)	20kg (44lbs)	100kg (221lbs)	200kg (441lbs)	250kg (551lbs)
1.0 (0.040)						
1.2 (0.045)		✓	✓		✓	✓
1.4 (0.052)		✓	✓		✓	✓
1.6 (1/16)		✓	✓		✓	✓

Typical Chemical Composition of All-Weld Metal (%)

C	Si	Mn	P	S	Ni
0.03	0.35	1.25	0.011	0.012	0.95

Typical Mechanical Properties of All-Weld Metal

YS MPa(lbs/in ²)	TS MPa(lbs/in ²)	EL (%)	Temp °C(°F)	CVN-Impact Value J (ft·lbs)
570 (82,700)	640 (92,900)	25	-30 (-22)	90 (66)

Typical Welding Parameters

Diameter, Polarity Shielding Gas	CTWD mm (in)	Wire Feed Speed m/min (in/min)	Amp. (A)	Volt. (V)	Deposition Rate kg/hr (lb/hr)	Efficiency (%)
1.2mm (0.045 in) DC+						
100% CO ₂	25 (1)	4.5 (175)	120~160	18~23	1.5 (3.3)	86~88
		6.4 (250)	135~175	19~25	2.2 (4.8)	
		7.6 (300)	150~180	20~26	2.5 (5.5)	
		8.9 (350)	175~205	23~28	3.0 (6.6)	
		10.2 (400)	185~220	25~30	3.5 (7.6)	
		11.5 (450)	220~260	26~31	3.8 (8.4)	
		12.8 (500)	250~290	27~32	4.4 (9.6)	
1.4mm (0.052 in) DC+						
100% CO ₂	25 (1)	3.8 (150)	130~170	20~25	1.9 (4.1)	85~88
		5.1 (200)	160~200	21~26	2.5 (5.5)	
		6.4 (250)	180~230	22~28	3.0 (6.6)	
		7.6 (300)	220~260	23~29	4.2 (9.2)	
		10.2 (400)	270~320	27~32	5.5 (12.1)	
		12.8 (500)	300~350	28~34	6.0 (13.2)	
1.6mm (1/16 in) DC+						
100% CO ₂	25 (1)	3.2 (125)	170~210	22~25	2.0 (4.4)	84~87
		3.8 (150)	180~220	23~26	2.5 (5.5)	
		5.1 (200)	220~260	25~29	3.2 (7.0)	
		6.4 (250)	270~320	26~32	4.0 (8.8)	
		7.6 (300)	300~350	28~34	5.0 (11.0)	
		10.2 (400)	350~400	34~38	6.4 (14.0)	

SF-80MX

Type : Semi-Metal

Conformances

AWS A5.36/ ASME SFA5.36 E80T1-C1A2-G
(AWS A5.29/ ASME SFA5.29 E80T1-GC)
JIS Z3313 T55 2 T1-0 C A-N2 H10
EN ISO 17632-A-T 46 2 1Ni R C1 3

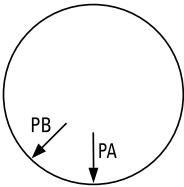
Applications

- Structural fabrication
- High tensile steel(590MPa steel class)
- Steel industry

Features

- Good deposition rate
- Good penetration and good arc stability

Welding Position



Current

DC +

Shielding Gas

100% CO₂

Diameter / Packaging

Diameter mm (in)	Spool			Pac		
	5kg (11lbs)	15kg (33lbs)	20kg (44lbs)	100kg (221lbs)	250kg (551lbs)	300kg (661lbs)
1.2 (0.045)	✓	✓		✓	✓	✓
1.4 (0.052)	✓	✓		✓	✓	✓
1.6 (1/16)	✓	✓		✓	✓	✓

Typical Chemical Composition of All-Weld Metal (%)

C	Si	Mn	P	S	Ni
0.06	0.55	1.42	0.015	0.010	1.00

Typical Mechanical Properties of All-Weld Metal

YS MPa(lbs/in ²)	TS MPa(lbs/in ²)	EL (%)	Temp °C(°F)	CVN-Impact Value J (ft-lbs)
590 (85,600)	630 (91,400)	24	-20 (-4)	53 (39)

Typical Welding Parameters

Diameter, Polarity Shielding Gas	CTWD mm (in)	Wire Feed Speed m/min (in/min)	Amp. (A)	Volt. (V)	Deposition Rate kg/hr (lb/hr)	Efficiency (%)
1.2mm (0.045 in) DC+						
100% CO ₂	20~25 (51/64~1)	11.5 (450)	225	26	4.1 (9.0)	85~86
		12.5 (480)	245	29	4.4 (9.7)	87~88
		14.2 (560)	265	30	4.9 (10.8)	87~89
		15.2 (610)	285	31	5.4 (11.9)	89~90
1.4mm (0.052 in) DC+						
100% CO ₂	20~25 (51/64~1)	9.6 (380)	255	26	4.4 (9.8)	87~88
		10.6 (420)	275	27	5.0 (11.0)	87~88
		12.1 (480)	295	31	5.5 (12.1)	88~89
		12.7 (500)	325	32	5.8 (12.8)	88~90
		13.1 (515)	350	32	6.1 (13.4)	88~90
1.6mm (1/16 in) DC+						
100% CO ₂	20~25 (51/64~1)	6.4 (250)	270	28	3.8 (8.5)	86~88
		7.3 (290)	295	32	4.6 (10.1)	87~89
		8.6 (340)	335	32	5.6 (12.3)	87~89
		10.0 (390)	360	35	6.4 (14.1)	89~91

SC-80M

Type : Metal-Cored

Conformances

AWS A5.36/ ASME SFA5.36 E80T15-M21A4-G
(AWS A5.28/ ASME SFA5.28 E80C-G)
EN ISO 17632-A-T 46 4 M M21 3 H5

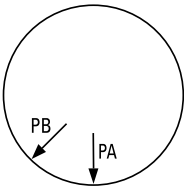
Applications

- Bridge construction
- Structural fabrication
- Robotic welding
- Transportation equipment

Features

- High strength weathering grade steels(Corten steel)
- Good anti-porosity

Welding Position



Current

DC +

Shielding Gas

Ar + 20~25% CO₂

Diameter / Packaging

Diameter mm (in)	Spool			Pac		
	5kg (11lbs)	15kg (33lbs)	20kg (44lbs)	250kg (551lbs)	300kg (661lbs)	350kg (771lbs)
1.2 (0.045)	✓	✓	✓	✓	✓	✓
1.4 (0.052)	✓	✓	✓	✓	✓	✓
1.6 (1/16)	✓	✓	✓	✓	✓	✓

Typical Chemical Composition of All-Weld Metal (%)

C	Si	Mn	P	S	Cr	Ni	Cu
0.07	0.63	1.65	0.014	0.007	0.25	0.72	0.34

Typical Mechanical Properties of All-Weld Metal

YS MPa(lbs/in ²)	TS MPa(lbs/in ²)	EL (%)	Temp °C(°F)	CVN-Impact Value J (ft-lbs)
610 (88,400)	664 (96,300)	24	-40 (-40)	50 (37)

Typical Welding Parameters

Diameter, Polarity Shielding Gas	CTWD mm (in)	Wire Feed Speed m/min (in/min)	Amp. (A)	Volt. (V)	Deposition Rate kg/hr (lb/hr)	Efficiency (%)
1.2mm (0.045 in) DC+						
80% Ar + 20% CO ₂	19-25 (3/4-1)	Flat & Horizontal				
		7.8 (307)	240~260	22~26	3.5 (7.5)	90~96
		9.4 (374)	270~290	22~27	4.0 (9.2)	
		10.3 (405)	300~320	23~27	4.5 (10.8)	
1.4mm (0.052 in) DC+						
80% Ar + 20% CO ₂	19-25 (3/4-1)	Flat & Horizontal				
		7.2 (283)	280~300	24~28	4.1 (8.9)	94~98
		7.7 (303)	310~330	26~29	4.9 (10.8)	
		10.9 (410)	350~370	27~30	6.6 (14.2)	
1.6mm (1/16 in) DC+						
80% Ar + 20% CO ₂	19-25 (3/4-1)	Flat & Horizontal				
		7.3 (287)	340~360	24~28	5.5 (11.9)	93~96
		8.4 (330)	390~410	26~29	6.8 (14.8)	
		12.5 (492)	450~470	27~30	9.2 (20.5)	

SC-90M

Type : Metal-Cored

Conformances

AWS A5.36/ ASME SFA5.36 E90T15-M21A6-G
(AWS A5.28/ ASME SFA5.28 E90C-G)
EN ISO 18276-A-T 55 Z Z M M21 1 H5

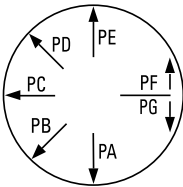
Applications

- Structural fabrication
- Robotic welding

Features

- Low temperature
- Low spatter
- Good anti-porosity

Welding Position



Current

DC +

Shielding Gas

Ar + 20~25% CO₂

Diameter / Packaging

Diameter	Spool			Pac		
	5kg (11lbs)	15kg (33lbs)	20kg (44lbs)	250kg (551lbs)	300kg (661lbs)	350kg (771lbs)
1.2 (0.045)	✓	✓	✓	✓	✓	✓
1.4 (0.052)	✓	✓	✓	✓	✓	✓

Typical Chemical Composition of All-Weld Metal (%)

C	Si	Mn	P	S	Ni	Mo
0.07	0.54	1.35	0.012	0.007	1.17	0.18

Typical Mechanical Properties of All-Weld Metal

YS MPa(lbs/in ²)	TS MPa(lbs/in ²)	EL (%)	Temp °C(°F)	CVN-Impact Value J (ft-lbs)
633 (91,800)	672 (97,500)	25	-50 (-58)	88 (65)

Typical Welding Parameters

Diameter, Polarity Shielding Gas	CTWD mm (in)	Wire Feed Speed m/min (in/min)	Amp. (A)	Volt. (V)	Deposition Rate kg/hr (lb/hr)	Efficiency (%)
1.2mm (0.045 in) DC+						
80% Ar + 20% CO ₂	19-25 (3/4-1)	Flat & Horizontal				
		9.8 (385)	240~260	25~27	3.9 (8.6)	90~96
		13.1 (515)	270~290	27~29	5.4 (11.6)	
		14.6 (574)	320~340	29~31	6.2 (14.2)	
1.4mm (0.052 in) DC+						
80% Ar + 20% CO ₂	19-25 (3/4-1)	Flat & Horizontal				
		9.7 (381)	280~300	26~28	5.2 (11.6)	92~97
		12.8 (503)	310~330	28~30	7.4 (15.9)	
		15.6 (614)	350~370	30~32	8.8 (19.2)	

SC-91

Type : Rutile

Conformances

AWS A5.36M/ ASME SFA5.36M E621T1-C1A0-G
(AWS A5.29/ ASME SFA5.29 E91T1-GC)
JIS Z3313 T57 2 T1-1 C A-N1 H10
EN ISO 17632-A-T 50 2 1Ni P C 1

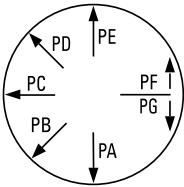
Applications

- Structural fabrication
- Steel industry

Features

- Smooth and stable arc with a fast freezing slag
- Pre-heat recommended to avoid cold crack
- High-tensile steel (HSB 600)

Welding Position



Current

DC +

Shielding Gas

100% CO₂

Diameter / Packaging

Diameter	Spool			Pac		
	5kg (11lbs)	15kg (33lbs)	20kg (44lbs)	100kg (221lbs)	200kg (441lbs)	250kg (551lbs)
1.2 (0.045)	✓	✓	✓			
1.4 (0.052)	✓	✓	✓			
1.6 (1/16)	✓	✓	✓			

Typical Chemical Composition of All-Weld Metal (%)

C	Si	Mn	P	S	Ni
0.06	0.55	1.20	0.013	0.013	0.85

Typical Mechanical Properties of All-Weld Metal

YS MPa(lbs/in ²)	TS MPa(lbs/in ²)	EL (%)	Temp °C(°F)	CVN-Impact Value J (ft-lbs)
645 (93,600)	660 (95,800)	24.0	0 (32) -20 (-4)	100 (74) 70 (52)

Typical Welding Parameters

Diameter, Polarity Shielding Gas	CTWD mm (in)	Wire Feed Speed m/min (in/min)	Amp. (A)	Volt. (V)	Deposition Rate kg/hr (lb/hr)	Efficiency (%)
1.2mm (0.045 in) DC+						
100% CO ₂	25 (1)	All Position				86-88
		4.4 (175)	110~140	23~28	1.6 (3.5)	
		5.1 (200)	120~150	24~29	1.8 (4.0)	
		6.4 (250)	130~160	25~30	2.3 (5.0)	
		7.6 (300)	160~190	25~30	2.7 (6.0)	
		8.9 (350)	170~200	26~31	3.2 (7.0)	
		9.5 (375)	190~220	26~31	3.4 (7.5)	
		10.8 (425)	210~240	27~32	3.8 (8.5)	
		Flat & Horizontal				
12.1 (475)	230~260	28~33	4.9 (10.8)			
12.7 (500)	240~270	29~34	5.2 (11.4)			
1.4mm (0.052 in) DC+						
100% CO ₂	25 (1)	All Position				86-88
		3.8 (150)	120~150	23~28	1.8 (3.9)	
		4.7 (180)	130~160	24~29	2.2 (4.8)	
		5.7 (225)	160~190	24~29	2.7 (5.9)	
		6.4 (250)	180~210	25~30	2.9 (6.5)	
		6.9 (275)	200~230	25~30	3.2 (7.2)	
		7.6 (300)	220~250	26~31	3.5 (7.8)	
		Flat & Horizontal				
		8.5 (335)	240~270	26~31	4.0 (8.7)	
9.5 (375)	260~290	27~32	4.4 (9.8)			
10.2 (400)	280~310	27~34	4.7 (10.4)			
1.6mm (1/16 in) DC+						
100% CO ₂	25 (1)	All Position				86-88
		3.8 (150)	170~200	24~29	2.5 (5.5)	
		4.4 (175)	180~210	24~30	2.9 (6.4)	
		5.1 (200)	200~230	25~30	3.3 (7.3)	
		5.7 (225)	230~260	25~31	3.7 (8.2)	
		6.4 (250)	250~280	26~31	4.2 (9.2)	
		6.9 (275)	270~300	26~32	4.6 (10.1)	
		Flat & Horizontal				
		8.3 (325)	300~330	27~32	5.4 (11.9)	
8.9 (350)	330~360	28~34	5.8 (12.8)			

SC-90

Type : Semi-Metal

Conformances

AWS A5.36M/ ASME SFA5.36M E620T1-C1A0-G
(AWS A5.29/ ASME SFA5.29 E90T1-GC)
JIS Z3313 T62 2 T1-0 C A- H10
EN ISO 17632-A-T 50 2 R C1 3

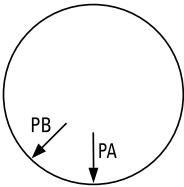
Applications

- Structural fabrication and automotive
- General fabrication
- High tensile steel (HSB 600)

Features

- High speed single welding in flat and horizontal positions

Welding Position



Current

DC +

Shielding Gas

100% CO₂

Diameter / Packaging

Diameter mm (in)	Spool			Pac		
	5kg (11lbs)	15kg (33lbs)	20kg (44lbs)	100kg (221lbs)	250kg (551lbs)	300kg (661lbs)
1.2 (0.045)	✓	✓		✓	✓	✓
1.4 (0.052)	✓	✓		✓	✓	✓
1.6 (1/16)	✓	✓		✓	✓	✓

Typical Chemical Composition of All-Weld Metal (%)

C	Si	Mn	P	S	Ni	Mo
0.08	0.55	1.75	0.014	0.014	0.35	0.12

Typical Mechanical Properties of All-Weld Metal

YS MPa(lbs/in ²)	TS MPa(lbs/in ²)	EL (%)	Temp °C(°F)	CVN-Impact Value J (ft-lbs)
600 (87,100)	660 (95,800)	22.5	-20 (-4)	60 (44)

Typical Welding Parameters

Diameter, Polarity Shielding Gas	CTWD mm (in)	Wire Feed Speed m/min (in/min)	Amp. (A)	Volt. (V)	Deposition Rate kg/hr (lb/hr)	Efficiency (%)
1.2mm (0.045 in) DC+						
100% CO ₂	20~25 (51/64~1)	10.4 (410)	200	26	3.5 (7.7)	85~87
		12.7 (500)	250	30	4.7 (10.4)	87~89
		15.3 (600)	300	33	6.3 (13.9)	91~93
1.4mm (0.052 in) DC+						
100% CO ₂	20~25 (51/64~1)	12.0 (470)	300	31	5.6 (12.3)	90~92
		12.5 (490)	320	32	6.1 (13.4)	91~93
		13.3 (520)	350	36	6.7 (14.8)	91~93
1.6mm (1/16 in) DC+						
100% CO ₂	20~25 (51/64~1)	7.6 (300)	300	33	4.9 (10.8)	87~89
		8.9 (350)	350	36	5.5 (12.1)	90~91
		10.2 (400)	400	38	6.3 (13.9)	90~91

SC-91LP

Type : Rutile

Conformances

AWS A5.36/ ASME SFA5.36 E91T1-M21A4-G

(AWS A5.29/ ASME SFA5.29 E91T1-GM)

EN ISO 17632-A-T 50 4 1Ni P M21 1 H5

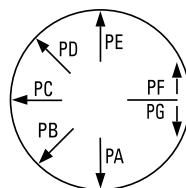
Applications

- Pipe Line
- Structural fabrication

Features

- Designed for welding with Ar + 20~25% CO₂ shielding gas
- Good bead appearance
- Good performance in all positions (Orbital welding)
- Good impact value at low temperature

Welding Position



Current

DC +

Shielding Gas

Ar + 20~25% CO₂

Diameter / Packaging

Diameter	Spool		
	5kg (11lbs)	15kg (33lbs)	20kg (44lbs)
1.2 (0.045)	✓	✓	✓

Typical Chemical Composition of All-Weld Metal (%)

C	Si	Mn	P	S	Ni
0.05	0.40	1.40	0.013	0.006	0.90

Typical Mechanical Properties of All-Weld Metal

YS MPa(lbs/in ²)	TS MPa(lbs/in ²)	EL (%)	Temp °C(°F)	CVN-Impact Value J (ft-lbs)
650 (94,300)	690 (100,000)	24.5	-20 (-4) -40 (-40)	80 (59) 60 (44)

Typical Welding Parameters

Diameter, Polarity Shielding Gas	CTWD mm (in)	Wire Feed Speed m/min (in/min)	Amp. (A)	Volt. (V)	Melt-off Rate kg/hr (lb/hr)
1.2mm (0.045 in) DC+					
80% Ar + 20% CO ₂	25 (1)	4.4~10.2 (175~400)	130~275	23~30	1.8~4.1 (4.0~9.0)

SC-91P

Type : Rutile

Conformances

AWS A5.36M/ ASME SFA5.36M E621T1-M21A0-G

(AWS A5.29/ ASME SFA5.29 E91T1-GM)

EN ISO 18276-A-T 55 0 Z P M21 1

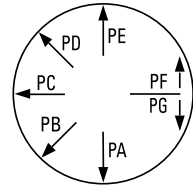
Applications

- Pipe Line
- Structural fabrication

Features

- Designed for welding with Ar + 20~25% CO₂ shielding gas
- Good bead appearance
- Good performance in all positions (Orbital welding)

Welding Position



Current

DC +

Shielding Gas

Ar + 20~25% CO₂

Diameter / Packaging

Diameter mm (in)	Spool		
	5kg (11lbs)	15kg (33lbs)	20kg (44lbs)
1.2 (0.045)	✓	✓	✓

Typical Chemical Composition of All-Weld Metal (%)

C	Si	Mn	P	S	Ni	Mo
0.05	0.45	1.30	0.013	0.010	0.85	0.22

Typical Mechanical Properties of All-Weld Metal

YS MPa(lbs/in ²)	TS MPa(lbs/in ²)	EL (%)	Temp °C(°F)	CVN-Impact Value J (ft·lbs)
640 (92,900)	680 (98,700)	26.0	0 (32)	80 (59)

Typical Welding Parameters

Diameter, Polarity Shielding Gas	CTWD mm (in)	Wire Feed Speed m/min (in/min)	Amp. (A)	Volt. (V)	Melt-off Rate kg/hr (lb/hr)
1.2mm (0.045 in) DC+					
80% Ar + 20% CO ₂	25 (1)	4.4~10.2 (175~400)	130~275	23~30	1.8~4.1 (4.0~9.0)

SC-91K2 Cored

Type : Rutile

Conformances

AWS A5.36/ ASME SFA5.36 E91T1-C1A4-K2
(AWS A5.29/ ASME SFA5.29 E91T1-K2C)
JIS Z3313 T57 4 T1-1 C A-N3 H10
EN ISO 17632-A-T 50 4 1.5Ni P C 1

ABS AWS A5.29 E91T1-K2C
(-40°C ≥50 J)
DNV-GL IVY50MS H5
CWB CSA W48 E621 T1-K2C-H8
CCS 4Y50 H5

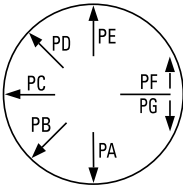
Applications

- General fabrication
- Offshore structure
- High tensile welded structure

Features

- Good impact value at low temperature

Welding Position



Current

DC +

Shielding Gas

100% CO₂

Diameter / Packaging

Diameter	Spool			Pac		
	12.5kg (28lbs)	15kg (33lbs)	20kg (44lbs)	100kg (221lbs)	200kg (441lbs)	250kg (551lbs)
1.2 (0.045)	✓	✓	✓			
1.4 (0.052)	✓	✓	✓			
1.6 (1/16)	✓	✓	✓			

Typical Chemical Composition of All-Weld Metal (%)

C	Si	Mn	P	S	Ni	Mo
0.04	0.35	1.25	0.013	0.012	1.55	0.09

Typical Mechanical Properties of All-Weld Metal

YS MPa(lbs/in ²)	TS MPa(lbs/in ²)	EL (%)	Temp °C(°F)	CVN-Impact Value J (ft-lbs)
620 (90,000)	650 (94,500)	27.0	-20 (-4) -40 (-40)	110 (81) 60 (44)

Typical Welding Parameters

Diameter, Polarity Shielding Gas	CTWD mm (in)	Wire Feed Speed m/min (in/min)	Amp. (A)	Volt. (V)	Deposition Rate kg/hr (lb/hr)	Efficiency (%)
1.2mm (0.045 in) DC+						
100% CO ₂	25 (1)	All Position				86-88
		4.4 (175)	110-140	23-28	1.6 (3.5)	
		5.1 (200)	120-150	24-29	1.8 (4.0)	
		6.4 (250)	130-160	25-30	2.3 (5.0)	
		7.6 (300)	160-190	25-30	2.7 (6.0)	
		8.9 (350)	170-200	26-31	3.2 (7.0)	
		9.5 (375)	190-220	26-31	3.4 (7.5)	
		10.8 (425)	210-240	27-32	3.8 (8.5)	
		Flat & Horizontal				
		12.1 (475)	230-260	28-33	4.9 (10.8)	
12.7 (500)	240-270	29-34	5.2 (11.4)			
1.4mm (0.052 in) DC+						
100% CO ₂	25 (1)	All Position				86-88
		3.8 (150)	120-150	23-28	1.8 (3.9)	
		4.7 (180)	130-160	24-29	2.2 (4.8)	
		5.7 (225)	160-190	24-29	2.7 (5.9)	
		6.4 (250)	180-210	25-30	2.9 (6.5)	
		6.9 (275)	200-230	25-30	3.2 (7.2)	
		7.6 (300)	220-250	26-31	3.5 (7.8)	
		Flat & Horizontal				
		8.5 (335)	240-270	26-31	4.0 (8.7)	
		9.5 (375)	260-290	27-32	4.4 (9.8)	
10.2 (400)	280-310	27-34	4.7 (10.4)			
1.6mm (1/16 in) DC+						
100% CO ₂	25 (1)	All Position				86-88
		3.8 (150)	170-200	24-29	2.5 (5.5)	
		4.4 (175)	180-210	24-30	2.9 (6.4)	
		5.1 (200)	200-230	25-30	3.3 (7.3)	
		5.7 (225)	230-260	25-31	3.7 (8.2)	
		6.4 (250)	250-280	26-31	4.2 (9.2)	
		6.9 (275)	270-300	26-32	4.6 (10.1)	
		Flat & Horizontal				
		8.3 (325)	300-330	27-32	5.4 (11.9)	
		8.9 (350)	330-360	28-34	5.8 (12.8)	

SMAW

SAW

GMAW

GTAW

FCAW

Non-FERROUS

APPENDIX

SC-91LT

Type : Rutile

Conformances

AWS A5.36/ ASME SFA5.36 E91T1-C1A8-Ni2
(AWS A5.29/ ASME SFA5.29 E91T1-Ni2C-J)
JIS Z3313 T59 6 T1-1 C A-N5 H5
EN ISO 17632-A-T 50 6 Z P C 1 2 H5
ABS 5YQ500SA H5

LR 5Y50S H5
DNV-GL VY50MS (H5)
CWB E621T1-Ni2C-J H4
(E91T1-Ni2C-J H4)
RS 5Y50SM H5

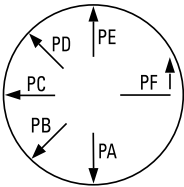
Applications

- Shipbuilding
- Offshore structure
- Structural fabrication

Features

- Good impact value at low temperature

Welding Position



Current

DC +

Shielding Gas

100% CO₂

Diameter / Packaging

Diameter	Spool			Pac		
mm (in)	12.5kg (28lbs)	15kg (33lbs)	20kg (44lbs)	100kg (221lbs)	200kg (441lbs)	250kg (551lbs)
1.2 (0.045)	✓					
1.4 (0.052)	✓					

Typical Chemical Composition of All-Weld Metal (%)

C	Si	Mn	P	S	Ni
0.04	0.25	1.25	0.010	0.010	2.30

Typical Mechanical Properties of All-Weld Metal

YS Mpa(lbs/in ²)	TS Mpa(lbs/in ²)	EL (%)	Temp °C(°F)	CVN-Impact Value J (ft-lbs)
644 (93,380)	676 (98,020)	22.8	-60 (-80)	80 (59)

Typical Welding Parameters

Diameter, Polarity Shielding Gas	CTWD mm (in)	Wire Feed Speed m/min (in/min)	Amp. (A)	Volt. (V)	Deposition Rate kg/hr (lb/hr)	Efficiency (%)
1.2mm (0.045 in) DC+						
100% CO ₂	25 (1)	All Position				86~88
		4.4 (175)	110~140	23~28	1.6 (3.5)	
		5.1 (200)	120~150	24~29	1.8 (4.0)	
		6.4 (250)	130~160	25~30	2.3 (5.0)	
		7.6 (300)	160~190	25~30	2.7 (6.0)	
		8.9 (350)	170~210	26~31	3.2 (7.0)	
		9.5 (375)	190~230	26~31	3.4 (7.5)	
		10.8 (425)	220~250	27~32	3.8 (8.5)	
		Flat & Horizontal				
		12.1 (475)	240~270	28~33	4.9 (10.8)	
12.7 (500)	250~280	29~34	5.2 (11.4)			
1.4mm (0.052 in) DC+						
100% CO ₂	25 (1)	All Position				86~88
		3.8 (150)	120~150	23~28	1.8 (3.9)	
		4.7 (180)	130~160	24~29	2.2 (4.8)	
		5.7 (225)	160~190	24~29	2.7 (5.9)	
		6.4 (250)	190~220	25~30	2.9 (6.5)	
		6.9 (275)	200~230	25~30	3.2 (7.2)	
		7.6 (300)	220~250	26~31	3.5 (7.8)	
		Flat & Horizontal				
		8.5 (335)	240~270	26~31	4.0 (8.7)	
		9.5 (375)	260~290	27~32	4.4 (9.8)	
10.2 (400)	280~310	27~34	4.7 (10.4)			

Supercored 110

Type : Rutile

Conformances

AWS A5.36/ ASME SFA5.36 E111T1-C1A4-G H4
(AWS A5.29/ ASME SFA5.29 E111T1-GC H4)
EN ISO 18276-A-T 69 4 ZMn2.5NiMo P C1 1
ABS AWS A5.29 E111T1-GC-H4 (IV-40°C ≥41J)

KR 3Y69S(C) H5

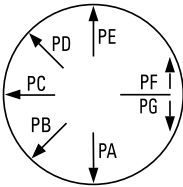
Applications

- Offshore structure
- High tensile welded structure

Features

- Good impact value at low temperature
- Pre-heat recommended

Welding Position



Current

DC +

Shielding Gas

100% CO₂

Diameter / Packaging

Diameter	Spool			Pac		
	mm (in)	12.5kg (28lbs)	15kg (33lbs)	20kg (44lbs)	100kg (221lbs)	200kg (441lbs) 250kg (551lbs)
1.2 (0.045)		✓	✓	✓		

Typical Chemical Composition of All-Weld Metal (%)

C	Si	Mn	P	S	Ni	Mo
0.06	0.35	1.55	0.016	0.007	2.20	0.50

Typical Mechanical Properties of All-Weld Metal

YS MPa(lbs/in ²)	TS MPa(lbs/in ²)	EL (%)	Temp °C(°F)	CVN-Impact Value J (ft-lbs)
780 (113,000)	830 (121,000)	19.9	-40 (-40)	60 (44)

Typical Welding Parameters

Diameter, Polarity Shielding Gas	CTWD mm (in)	Wire Feed Speed m/min (in/min)	Amp. (A)	Volt. (V)	Deposition Rate kg/hr (lb/hr)	Efficiency (%)
1.2mm (0.045 in) DC+						
100% CO ₂	25 (1)	All Position				86-88
		4.4 (175)	140	23~28	1.6 (3.5)	
		5.1 (200)	150	24~29	1.8 (4.0)	
		6.4 (250)	165	25~30	2.3 (5.0)	
		7.6 (300)	190	25~30	2.7 (6.0)	
		8.9 (350)	205	26~31	3.2 (7.0)	
		9.5 (375)	225	26~31	3.4 (7.5)	
		10.8 (425)	245	27~32	3.8 (8.5)	
		Flat & Horizontal				
		12.1 (475)	265	28~33	4.9 (10.8)	
		12.7 (500)	275	29~34	5.2 (11.4)	

SMW

SAW

GMW

GTAW

FCW

Non-FERROUS

APPENDIX

SC-110M Cored

Type : Metal-Cored

Conformances

AWS A5.36/ ASME SFA5.36 E110T15-M21A6-G
(AWS A5.28/ ASME SFA5.28 E110C-G)
EN ISO 18276-A-T 69 4 Mn2NiMo M M21 3 H5

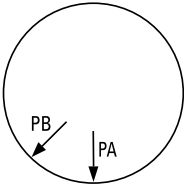
Applications

- High tensile welded structure
- Shipbuilding
- Heavy equipment

Features

- Good performance and low spatter
- Smooth and stable arc with a fast freezing slag
- Pre-heat recommended
- Good anti-porosity

Welding Position



Current

DC +

Shielding Gas

Ar + 20~25% CO₂

Diameter / Packaging

Diameter	Spool			Pac		
mm (in)	5kg (11lbs)	15kg (33lbs)	20kg (44lbs)	250kg (551lbs)	300kg (661lbs)	350kg (771lbs)
1.2 (0.045)	✓	✓	✓	✓	✓	✓

Typical Chemical Composition of All-Weld Metal (%)

C	Si	Mn	P	S	Cr	Ni	Mo
0.04	0.70	1.80	0.015	0.015	0.10	2.00	0.60

Typical Mechanical Properties of All-Weld Metal

YS MPa(lbs/in ²)	TS MPa(lbs/in ²)	EL (%)	Temp °C(°F)	CVN-Impact Value J (ft-lbs)
730 (105,900)	800 (116,100)	20	-50 (-58)	40 (30)

Typical Welding Parameters

Diameter, Polarity Shielding Gas	CTWD mm (in)	Wire Feed Speed m/min (in/min)	Amp. (A)	Volt. (V)	Deposition Rate kg/hr (lb/hr)	Efficiency (%)
1.2mm (0.045 in) DC+						
80% Ar + 20% CO ₂	19-25 (3/4-1)	Flat & Horizontal				
		9.5 (374)	230~250	26~29	3.9 (8.6)	90~96
		12.2 (480)	280~300	28~31	5.3 (11.6)	
		14.8 (582)	320~340	30~33	6.5 (14.2)	

SF-70W

Type : Rutile

Conformances

AWS A5.36/ ASME SFA5.36 E71T1-C1A0-G(W)
JIS Z3320 YFA-50W

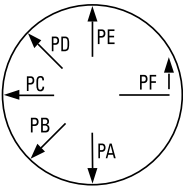
Applications

- Bridge construction
- Civil construction

Features

- Good weather proof

Welding Position



Current

DC +

Shielding Gas

100% CO₂

Diameter / Packaging

Diameter	Spool			Pac		
mm (in)	12.5kg (28lbs)	15kg (33lbs)	20kg (44lbs)	100kg (221lbs)	200kg (441lbs)	250kg (551lbs)
1.0 (0.040)						
1.2 (0.045)	✓	✓	✓			
1.4 (0.052)	✓	✓	✓			
1.6 (1/16)	✓	✓	✓			

Typical Chemical Composition of All-Weld Metal (%)

C	Si	Mn	P	S	Cr	Ni	Cu
0.04	0.45	1.05	0.017	0.011	0.5	0.35	0.4

Typical Mechanical Properties of All-Weld Metal

YS MPa(lbs/in ²)	TS MPa(lbs/in ²)	EL (%)	Temp °C(°F)	CVN-Impact Value J (ft-lbs)
510 (74,000)	580 (84,200)	28	-20 (4)	46 (34)

Typical Welding Parameters

Diameter, Polarity Shielding Gas	CTWD mm (in)	Wire Feed Speed m/min (in/min)	Amp. (A)	Volt. (V)	Deposition Rate kg/hr (lb/hr)	Efficiency (%)
1.2mm (0.045 in) DC+						
100% CO ₂	25 (1)	4.5 (175)	120~160	18~23	1.6 (3.5)	86~88
		6.4 (250)	135~175	19~25	2.3 (5.1)	
		7.6 (300)	150~180	20~26	2.6 (5.7)	
		8.9 (350)	175~205	23~28	3.1 (6.8)	
		10.2 (400)	185~220	25~30	3.6 (7.9)	
		11.5 (450)	220~260	26~31	3.9 (8.6)	
		12.8 (500)	250~290	27~32	4.5 (9.8)	
	15.3 (600)	280~320	28~33	5.3 (11.6)		
1.4mm (0.052 in) DC+						
100% CO ₂	25 (1)	3.8 (150)	130~170	20~25	2.0 (4.3)	86~88
		5.1 (200)	160~200	21~26	2.5 (5.5)	
		6.4 (250)	180~230	22~28	3.0 (6.6)	
		7.6 (300)	220~260	23~29	4.2 (9.2)	
		10.2 (400)	270~320	27~32	5.6 (12.3)	
		12.8 (500)	300~350	28~34	6.1 (13.4)	
1.6mm (1/16 in) DC+						
100% CO ₂	25 (1)	3.2 (125)	170~210	22~25	2.1 (4.6)	85~87
		3.8 (150)	180~220	23~26	2.6 (5.7)	
		5.1 (200)	220~260	25~29	3.2 (7.0)	
		6.4 (250)	270~320	26~32	4.0 (8.8)	
		7.6 (300)	300~350	28~34	5.1 (11.2)	
		10.2 (400)	350~400	34~38	6.5 (14.2)	

SF-80W

Type : Rutile

Conformances

AWS A5.36/ ASME SFA5.36 E81T1-C1A2-W2
(AWS A5.29/ ASME SFA5.29 E81T1-W2C)
JIS Z3320 YFA-58W

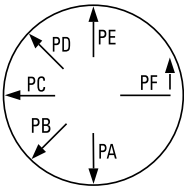
Applications

- Bridge construction
- Civil construction

Features

- Good weather proof

Welding Position



Current

DC +

Shielding Gas

100% CO₂

Diameter / Packaging

Diameter	Spool			Pac		
mm (in)	12.5kg (28lbs)	15kg (33lbs)	20kg (44lbs)	100kg (221lbs)	200kg (441lbs)	250kg (551lbs)
1.0 (0.040)						
1.2 (0.045)	✓	✓	✓			
1.4 (0.052)	✓	✓	✓			
1.6 (1/16)	✓	✓	✓			

Typical Chemical Composition of All-Weld Metal (%)

C	Si	Mn	P	S	Cr	Ni	Cu
0.04	0.4	0.92	0.016	0.012	0.5	0.5	0.4

Typical Mechanical Properties of All-Weld Metal

YS MPa(lbs/in ²)	TS MPa(lbs/in ²)	EL (%)	Temp °C(°F)	CVN-Impact Value J (ft-lbs)
530 (77,000)	610 (88,600)	26	-30 (-22)	40 (30)

Typical Welding Parameters

Diameter, Polarity Shielding Gas	CTWD mm (in)	Wire Feed Speed m/min (in/min)	Amp. (A)	Volt. (V)	Deposition Rate kg/hr (lb/hr)	Efficiency (%)
1.2mm (0.045 in) DC+						
100% CO ₂	25 (1)	4.5 (175)	120~160	18~23	1.5 (3.3)	86~88
		6.4 (250)	135~175	19~25	2.2 (4.8)	
		7.6 (300)	150~180	20~26	2.5 (5.5)	
		8.9 (350)	175~205	23~28	3.0 (6.6)	
		10.2 (400)	185~220	25~30	3.5 (7.6)	
		11.5 (450)	220~260	26~31	3.8 (8.4)	
		12.8 (500)	250~290	27~32	4.4 (9.6)	
	15.3 (600)	280~320	28~33	5.3 (11.6)		
1.4mm (0.052 in) DC+						
100% CO ₂	25 (1)	3.8 (150)	130~170	20~25	1.9 (4.1)	85~88
		5.1 (200)	160~200	21~26	2.5 (5.5)	
		6.4 (250)	180~230	22~28	3.0 (6.6)	
		7.6 (300)	220~260	23~29	4.2 (9.2)	
		10.2 (400)	270~320	27~32	5.5 (12.1)	
		12.8 (500)	300~350	28~34	6.0 (13.2)	
1.6mm (1/16 in) DC+						
100% CO ₂	25 (1)	3.2 (125)	170~210	22~25	2.0 (4.4)	84~87
		3.8 (150)	180~220	23~26	2.5 (5.5)	
		5.1 (200)	220~260	25~29	3.2 (7.0)	
		6.4 (250)	270~320	26~32	4.0 (8.8)	
		7.6 (300)	300~350	28~34	5.0 (11.0)	
		10.2 (400)	350~400	34~38	6.4 (14.0)	

SC-81WM

Type : Rutile

Conformances

AWS A5.36/ ASME SFA5.36 E81T1-M21A2-W2
(AWS A5.29/ ASME SFA5.29 E81T1-W2M)

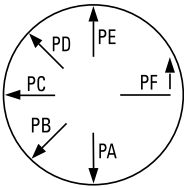
Applications

- Bridge construction
- Civil construction
- Structural fabrication

Features

- Good weldability, low spatter
- Good bead appearance
- Easy to remove slag
- Corrosion resistance of weathering steels
- Good mechanical properties

Welding Position



Current

DC +

Shielding Gas

Ar + 20~25% CO₂

Diameter / Packaging

Diameter	Spool			Pac		
mm (in)	5kg (11lbs)	15kg (33lbs)	20kg (44lbs)	250kg (551lbs)	300kg (661lbs)	350kg (771lbs)
1.0 (0.040)						
1.2 (0.045)		✓				
1.4 (0.052)						
1.6 (1/16)		✓				

Typical Chemical Composition of All-Weld Metal (%)

C	Si	Mn	P	S	Cr	Ni	Cu
0.04	0.38	1.04	0.005	0.004	0.54	0.55	0.43

Typical Mechanical Properties of All-Weld Metal

YS MPa(lbs/in ²)	TS MPa(lbs/in ²)	EL (%)	Temp °C(°F)	CVN-Impact Value J (ft-lbs)
590 (85,600)	650 (94,300)	24.9	-30 (-22)	45 (33)

Typical Welding Parameters

Diameter, Polarity Shielding Gas	CTWD mm (in)	Wire Feed Speed m/min (in/min)	Amp. (A)	Volt. (V)	Deposition Rate kg/hr (lb/hr)	Efficiency (%)
1.2mm (0.045 in) DC+						
80%Ar + 20% CO ₂	25 (1)	All Position				86~88
		4.4 (175)	110~140	22~27	1.6 (3.5)	
		5.1 (200)	120~150	23~28	1.8 (4.0)	
		6.4 (250)	130~160	24~29	2.3 (5.0)	
		7.6 (300)	160~190	24~29	2.7 (6.0)	
		8.9 (350)	170~200	25~30	3.2 (7.0)	
		9.5 (375)	190~220	25~30	3.4 (7.5)	
		Flat & Horizontal				
		10.8 (425)	210~240	26~31	3.8 (8.5)	
		12.1 (475)	230~260	27~32	4.3 (9.5)	
		12.7 (500)	240~270	28~33	4.5 (10.0)	
1.6mm (1/16 in) DC+						
80%Ar + 20% CO ₂	25 (1)	All Position				86~88
		3.8 (150)	170~200	22~27	2.5 (5.5)	
		4.4 (175)	180~210	23~28	2.9 (6.4)	
		5.1 (200)	200~230	24~29	3.3 (7.3)	
		5.7 (225)	230~260	24~29	3.7 (8.2)	
		6.4 (250)	250~280	25~30	4.2 (9.2)	
		6.9 (275)	270~300	25~31	4.6 (10.1)	
		Flat & Horizontal				
		8.3 (325)	300~330	26~32	5.4 (11.9)	
		8.9 (350)	330~360	27~33	5.8 (12.8)	

SF-71R

Type : Rutile

Conformances

AWS A5.36/ ASME SFA5.36 E71T1-C1A0-CS1 H4
E71T1-C1P0-CS1 H4
(AWS A5.20/ ASME SFA5.20 E71T-1C H4)
JIS Z3313 T49 2 T1-1 C AP H5
EN ISO 17632-A-T 46 2 P C1 1 H5
ABS 3YSA H5, AWS A5.36 E71T1-C1A(P)0-CS1

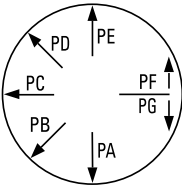
Applications

- Pipe line
- Offshore structure
- Pressure vessel

Features

- Good impact value at low temperature (As Welded and PHWT)

Welding Position



Current

DC +

Shielding Gas

100% CO₂

Diameter / Packaging

Diameter	Spool			Pac		
	12.5kg (28lbs)	15kg (33lbs)	20kg (44lbs)	100kg (221lbs)	200kg (441lbs)	250kg (551lbs)
1.2 (0.045)	✓	✓	✓			
1.4 (0.052)	✓	✓	✓			

Typical Chemical Composition of All-Weld Metal (%)

C	Si	Mn	P	S
0.05	0.48	1.39	0.010	0.006

Typical Mechanical Properties of All-Weld Metal

YS MPa(lbs/in ²)	TS MPa(lbs/in ²)	EL (%)	Temp °C(°F)	CVN-Impact Value J (ft-lbs)	
520 (75,400)	585 (84,825)	28.5	0 (32) -20 (-4)	104 (77) 84 (62)	As Welded
500 (72,500)	570 (82,650)	30.0	0 (32) -20 (-4)	94 (69) 66 (49)	PWHT (620 @2hr)

Typical Welding Parameters

Diameter, Polarity Shielding Gas	CTWD mm (in)	Wire Feed Speed m/min (in/min)	Amp. (A)	Volt. (V)	Deposition Rate kg/hr (lb/hr)	Efficiency (%)
1.2mm (0.045 in) DC+						
100% CO ₂	25 (1)	All Position				86~88
		4.4 (175)	100~130	20~25	1.6 (3.5)	
		5.7 (225)	120~150	21~26	2.0 (4.5)	
		7.0 (275)	130~160	22~27	2.5 (5.5)	
		8.3 (325)	160~190	23~28	2.9 (6.5)	
		8.9 (350)	170~200	24~29	3.2 (7.0)	
		10.2 (400)	200~230	25~30	3.6 (8.0)	
		Flat & Horizontal				
		11.4 (450)	210~240	26~31	4.1 (9.1)	
		12.1 (475)	230~260	27~32	4.3 (9.5)	
13.3 (525)	250~280	28~33	4.7 (10.4)			
1.4mm (0.052 in) DC+						
100% CO ₂	25 (1)	All Position				86~88
		3.8 (150)	130~160	22~27	1.8 (3.9)	
		5.1 (200)	140~170	23~28	2.4 (5.2)	
		6.4 (250)	160~190	24~29	2.9 (6.5)	
		7.6 (300)	180~210	26~31	3.5 (7.8)	
		8.9 (350)	200~230	27~32	4.1 (9.1)	
		9.5 (375)	220~250	28~33	4.4 (9.8)	
		Flat & Horizontal				
		10.8 (425)	240~270	30~35	5.0 (11.1)	
		12.1 (475)	260~290	31~36	5.6 (12.4)	
12.7 (500)	310~340	32~37	5.9 (13.0)			

SF-71P

Type : Rutile

Conformances

AWS A5.36/ ASME SFA5.36 E71T1-C1A4-CS1 H4
E71T1-C1P4-CS1 H4
(AWS A5.20/ ASME SFA5.20 E71T-9C-J H4)
JIS Z3313 T49 4 T1-1 C AP H5
EN ISO 17632-A-T 46 4 P C1 1 H5
ABS 4YSA H5, AWS A5.36 E71T1-C1A(P)4-CS1

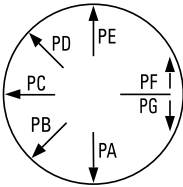
Applications

- Pipe line
- Offshore structure
- Pressure vessel

Features

- Good impact value at low temperature (As Welded and PHWT)

Welding Position



Current

DC +

Shielding Gas

100% CO₂

Diameter / Packaging

Diameter	Spool			Pac		
	12.5kg (28lbs)	15kg (33lbs)	20kg (44lbs)	100kg (221lbs)	200kg (441lbs)	250kg (551lbs)
1.2 (0.045)	✓	✓	✓			
1.4 (0.052)	✓	✓	✓			

Typical Chemical Composition of All-Weld Metal (%)

C	Si	Mn	P	S	Ni
0.04	0.44	1.31	0.009	0.005	0.46

Typical Mechanical Properties of All-Weld Metal

YS MPa(lbs/in ²)	TS MPa(lbs/in ²)	EL (%)	Temp °C(°F)	CVN-Impact Value J (ft-lbs)	
545 (79,025)	590 (85,550)	28.0	-30 (-22) -40 (-40)	88 (65) 73 (54)	As Welded
530 (76,850)	555 (80,475)	30.0	-30 (-22) -40 (-40)	74 (55) 57 (42)	PWHT (620 @2hr)

Typical Welding Parameters

Diameter, Polarity Shielding Gas	CTWD mm (in)	Wire Feed Speed m/min (in/min)	Amp. (A)	Volt. (V)	Deposition Rate kg/hr (lb/hr)	Efficiency (%)
1.2mm (0.045 in) DC+						
100% CO ₂	25 (1)	All Position				86~88
		4.4 (175)	100~130	20~25	1.6 (3.5)	
		5.7 (225)	120~150	21~26	2.0 (4.5)	
		7.0 (275)	130~160	22~27	2.5 (5.5)	
		8.3 (325)	160~190	23~28	2.9 (6.5)	
		8.9 (350)	170~200	24~29	3.2 (7.0)	
		10.2 (400)	200~230	25~30	3.6 (8.0)	
		Flat & Horizontal				
		11.4 (450)	210~240	26~31	4.1 (9.1)	
		12.1 (475)	230~260	27~32	4.3 (9.5)	
13.3 (525)	250~280	28~33	4.7 (10.4)			
1.4mm (0.052 in) DC+						
100% CO ₂	25 (1)	All Position				86~88
		3.8 (150)	130~160	22~27	1.8 (3.9)	
		5.1 (200)	140~170	23~28	2.4 (5.2)	
		6.4 (250)	160~190	24~29	2.9 (6.5)	
		7.6 (300)	180~210	26~31	3.5 (7.8)	
		8.9 (350)	200~230	27~32	4.1 (9.1)	
		9.5 (375)	220~250	28~33	4.4 (9.8)	
		Flat & Horizontal				
		10.8 (425)	240~270	30~35	5.0 (11.1)	
		12.1 (475)	260~290	31~36	5.6 (12.4)	
12.7 (500)	310~340	32~37	5.9 (13.0)			

SC-71SR

Type : Rutile



Conformances

AWS A5.36/ ASME SFA5.36 E71T1-C1A6-CS2 H4
E71T1-C1P6-CS2 H4
(AWS A5.20/ ASME SFA5.20 E71T1C/-9C-J/12C-J H4)
JIS Z3313 T49 4 T1-1 C AP H5
EN ISO 17632-A-T 42 4 P C1 1 H5
ABS 4Y400SA H5
LR 4Y40S H5

BV SA4Y40 HHH
DNV-GL IVY40MSH5
CWB CSA W48 E491T-12J-H4
(-45 Degree)
CCS 4Y40S H5
CE

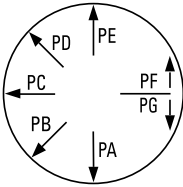
Applications

- Pipe line
- Offshore structure
- Pressure vessel

Features

- Good impact value at low temperature (As Welded and PHWT)

Welding Position



Current

DC +

Shielding Gas

100% CO₂

Diameter / Packaging

Diameter	Spool			Pac		
	12.5kg (28lbs)	15kg (33lbs)	20kg (44lbs)	100kg (221lbs)	200kg (441lbs)	250kg (551lbs)
1.2 (0.045)	✓	✓	✓			
1.4 (0.052)	✓	✓	✓			

Typical Chemical Composition of All-Weld Metal (%)

C	Si	Mn	P	S	Ni
0.05	0.40	1.20	0.011	0.010	0.38

Typical Mechanical Properties of All-Weld Metal

YS MPa(lbs/in ²)	TS MPa(lbs/in ²)	EL (%)	Temp °C(°F)	CVN-Impact Value J (ft-lbs)	
560 (81,300)	580 (84,200)	28.0	-45 (-49) -50 (-58)	80 (59) 65 (48)	As Welded
540 (78,400)	560 (81,300)	30.0	-45 (-49) -50 (-58)	60 (44) 45 (33)	PWHT (620 @2hr)

Typical Welding Parameters

Diameter, Polarity Shielding Gas	CTWD mm (in)	Wire Feed Speed m/min (in/min)	Amp. (A)	Volt. (V)	Deposition Rate kg/hr (lb/hr)	Efficiency (%)
1.2mm (0.045 in) DC+						
100% CO ₂	25 (1)	All Position				86~88
		4.4 (175)	100~130	20~25	1.6 (3.5)	
		5.7 (225)	120~150	21~26	2.0 (4.5)	
		7.0 (275)	130~160	22~27	2.5 (5.5)	
		8.3 (325)	160~190	23~28	2.9 (6.5)	
		8.9 (350)	170~200	24~29	3.2 (7.0)	
		10.2 (400)	200~230	25~30	3.6 (8.0)	
		Flat & Horizontal				
		11.4 (450)	210~240	26~31	4.1 (9.1)	
		12.1 (475)	230~260	27~32	4.3 (9.5)	
		13.3 (525)	250~280	28~33	4.7 (10.4)	
1.4mm (0.052 in) DC+						
100% CO ₂	25 (1)	All Position				86~88
		3.8 (150)	130~160	22~27	1.8 (3.9)	
		5.1 (200)	140~170	23~28	2.4 (5.2)	
		6.4 (250)	160~190	24~29	2.9 (6.5)	
		7.6 (300)	180~210	26~31	3.5 (7.8)	
		8.9 (350)	200~230	27~32	4.1 (9.1)	
		9.5 (375)	220~250	28~33	4.4 (9.8)	
		Flat & Horizontal				
		10.8 (425)	240~270	30~35	5.0 (11.1)	
		12.1 (475)	260~290	31~36	5.6 (12.4)	
		12.7 (500)	310~340	32~37	5.9 (13.0)	

SC-71MSR

Type : Rutile



Conformances

AWS A5.36/ ASME SFA5.36 E71T1-M21A5-CS2
E71T1-M21P5-CS2
(AWS A5.20/ ASME SFA5.20 E71T-1M/-9M/-12M-J H4)
EN ISO 17632-A-T 46 4 P M21 1 H5
ABS 4Y400SA H5
LR 4Y40S H5
BV SA4Y40M HHH

DNV-GL IVY40MSH5
TÜV EN ISO 17632-A - T46 4 P M 1 H5
DB DIN EN ISO 17632-A-T46 4 P M21 2 H5
CE
CWB CSA W48 E491T-12MJ-H8

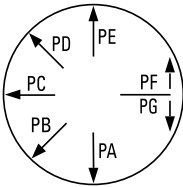
Applications

- Pipe line
- Offshore structure
- Pressure vessel

Features

- Good impact value at low temperature (As Welded and PHWT)

Welding Position



Current

DC +

Shielding Gas

Ar + 20~25% CO₂

Diameter / Packaging

Diameter	Spool			Pac		
mm (in)	12.5kg (28lbs)	15kg (33lbs)	20kg (44lbs)	100kg (221lbs)	200kg (441lbs)	250kg (551lbs)
1.2 (0.045)	✓	✓	✓			

Typical Chemical Composition of All-Weld Metal (%)

C	Si	Mn	P	S	Ni
0.06	0.35	1.24	0.012	0.012	0.45

Typical Mechanical Properties of All-Weld Metal

YS MPa(lbs/in ²)	TS MPa(lbs/in ²)	EL (%)	Temp °C(°F)	CVN-Impact Value J (ft-lbs)	
542 (78,600)	577 (83,600)	30.0	-45 (-49) -50 (-58)	81 (60) 64 (47)	As Welded
523 (75,700)	552 (80,000)	33.0	-45 (-49) -50 (-58)	57 (42) 49 (36)	PWHT (620 @2hr)

Typical Welding Parameters

Diameter, Polarity Shielding Gas	CTWD mm (in)	Wire Feed Speed m/min (in/min)	Amp. (A)	Volt. (V)	Deposition Rate kg/hr (lb/hr)	Efficiency (%)
1.2mm (0.045 in) DC+						
80% Ar + 20% CO ₂	25 (1)	All Position				86~88
		4.4 (175)	110~140	20~25	1.6 (3.5)	
		5.7 (225)	120~150	21~26	2.0 (4.5)	
		7.0 (275)	130~160	22~27	2.5 (5.5)	
		8.3 (325)	160~190	22~27	2.9 (6.5)	
		8.9 (350)	170~200	23~28	3.2 (7.0)	
		10.2 (400)	200~230	24~29	3.6 (8.0)	
		Flat & Horizontal				
		11.4 (450)	210~240	25~31	4.1 (9.1)	
		12.1 (475)	230~260	26~32	4.3 (9.5)	
		13.3 (525)	250~280	27~33	4.7 (10.4)	

SC-70ML

Type : Metal-Cored



Conformances

AWS A5.36/ ASME SFA5.36 E70T15-M21A4-CS1

(AWS A5.18/ ASME SFA5.18 E70C-6M)

JIS Z3313 T49 4 T15-1 M A-U H5

EN ISO 17632-A-T 46 4 M M21 2 H5

ABS 4Y400SA H5

LR 4Y40S H5

BV SA4Y40M HHH

DNV-GL IVY40MS H5

TÜV EN ISO 17362-A - T46 4 M M2 H5

DB DIN EN ISO 17632-A-T 46 4 M M21 2 H5

CE

CWB CSA W48 E491C-6MJ-H4

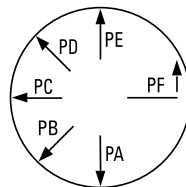
Applications

- General fabrication
- Heavy equipment
- Offshore structure

Features

- Good impact value at low temperature
- Semi-automatic and automatic applications
- Good anti-porosity

Welding Position



Current

DC +

Shielding Gas

Ar + 20~25% CO₂

Diameter / Packaging

Diameter mm (in)	Spool			Pac		
	5kg (11lbs)	15kg (33lbs)	20kg (44lbs)	250kg (551lbs)	300kg (661lbs)	350kg (771lbs)
1.2 (0.045)	✓	✓	✓	✓	✓	✓
1.4 (0.052)	✓	✓	✓	✓	✓	✓
1.6 (1/16)	✓	✓	✓	✓	✓	✓

Typical Chemical Composition of All-Weld Metal (%)

C	Si	Mn	P	S	Ni
0.04	0.56	1.57	0.011	0.014	0.35

Typical Mechanical Properties of All-Weld Metal

YS MPa(lbs/in ²)	TS MPa(lbs/in ²)	EL (%)	Temp °C(°F)	CVN-Impact Value J (ft-lbs)
476 (73,950)	553 (81,200)	27	-40 (-40)	75 (55)

Typical Welding Parameters

Diameter, Polarity Shielding Gas	CTWD mm (in)	Wire Feed Speed m/min (in/min)	Amp. (A)	Volt. (V)	Deposition Rate kg/hr (lb/hr)	Efficiency (%)
1.2mm (0.045 in) DC+						
80% Ar + 20% CO ₂	19-25 (3/4-1)	Flat & Horizontal				
		7.3 (288)	190~210	22~26	3.4 (7.6)	90~96
		9.7 (382)	240~260	23~27	4.5 (9.7)	
		12.2 (489)	280~310	24~30	5.9 (12.8)	
1.4mm (0.052 in) DC+						
80% Ar + 20% CO ₂	19-25 (3/4-1)	Flat & Horizontal				
		6.7 (261)	250~270	22~26	3.8 (8.3)	91~96
		7.8 (307)	290~310	25~31	4.9 (10.4)	
		9.4 (370)	330~350	28~32	5.5 (12.0)	
1.6mm (1/16 in) DC+						
80% Ar + 20% CO ₂	25-32 (1-1 1/4)	Flat & Horizontal				
		5.6 (220)	290~310	26~32	4.5 (9.3)	92~96
		6.8 (270)	340~350	29~33	5.6 (12.1)	
		7.8 (310)	350~370	31~34	6.7 (14.3)	

SC-80MR

Type : Metal-Cored



Conformances

AWS A5.36/ ASME SFA5.36 E80T15-M21A8-G
(AWS A5.28/ ASME SFA5.28 E80C-G)
EN ISO 17632-A-T 50 6 1.5Ni M M21 2 H5

DNV-GL VY40MS H5
CE

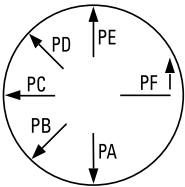
Applications

- Offshore structure
- Heavy equipment
- General fabrication

Features

- Suitable for root-pass and multipass welding
- Good impact value at low temperature
- Low spatter
- Good anti-porosity

Welding Position



Current

DC +

Shielding Gas

Ar + 20~25% CO₂

Diameter / Packaging

Diameter	Spool			Pac		
	5kg (11lbs)	15kg (33lbs)	20kg (44lbs)	250kg (551lbs)	300kg (661lbs)	350kg (771lbs)
1.2 (0.045)	✓	✓	✓	✓	✓	✓
1.4 (0.052)	✓	✓	✓	✓	✓	✓

Typical Chemical Composition of All-Weld Metal (%)

C	Si	Mn	P	S	Ni
0.07	0.35	1.55	0.014	0.007	1.55

Typical Mechanical Properties of All-Weld Metal

YS MPa(lbs/in ²)	TS MPa(lbs/in ²)	EL (%)	Temp °C(°F)	CVN-Impact Value J (ft-lbs)
612 (88,700)	658 (95,400)	25.5	-60 (-76)	88 (65)

Typical Welding Parameters

Diameter, Polarity Shielding Gas	CTWD mm (in)	Wire Feed Speed m/min (in/min)	Amp. (A)	Volt. (V)	Deposition Rate kg/hr (lb/hr)	Efficiency (%)
1.2mm (0.045 in) DC+						
80% Ar + 20% CO ₂	19-25 (3/4-1)	Flat & Horizontal				
		7.8 (307)	240~260	22~26	3.5 (7.5)	90~96
		9.4 (374)	270~290	22~27	4.0 (9.2)	
		10.3 (405)	300~320	23~27	4.5 (10.8)	
1.4mm (0.052 in) DC+						
80% Ar + 20% CO ₂	19-25 (3/4-1)	Flat & Horizontal				
		7.2 (283)	280~300	24~28	4.1 (8.9)	94~98
		7.7 (303)	310~330	26~29	4.9 (10.8)	
		10.9 (410)	350~370	27~30	6.6 (14.2)	

SMW

SAW

GMW

GTAW

FCAW

Non-FERROUS

APPENDIX

SC-81M

Type : Rutile



Conformances

AWS A5.36/ ASME SFA5.36 E81T1-M21 A8-Ni1 H4
(AWS A5.29/ ASME SFA5.29 E81T1-Ni1M-J H4)
EN ISO 17632-A-T 50 6 1Ni P M21 1 H5

CE

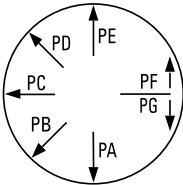
Applications

- Construction machinery
- Bridge structures
- Mining

Features

- Smooth and stable arc with a fast freezing slag
- Good impact value at low temperature
- Designed for welding with Ar+CO₂ mixture

Welding Position



Current

DC +

Shielding Gas

Ar + 20~25% CO₂

Diameter / Packaging

Diameter	Spool			Pac		
	12.5kg (28lbs)	15kg (33lbs)	20kg (44lbs)	250kg (551lbs)	300kg (661lbs)	350kg (771lbs)
1.2 (0.045)	✓	✓				
1.4 (0.052)	✓	✓				
1.6 (1/16)	✓	✓				

Typical Chemical Composition of All-Weld Metal(%)

C	Si	Mn	P	S	Ni
0.04	0.34	1.15	0.008	0.008	0.91

Typical Mechanical Properties of All-Weld Metal

YS MPa(lbs/in ²)	TS MPa(lbs/in ²)	EL (%)	Temp °C(°F)	CVN-Impact Value J (ft.-lbs)
550 (79,750)	590 (85,550)	26.0	-60 (-76)	70 (52)

Typical Welding Parameters

Diameter, Polarity Shielding Gas	CTWD mm (in)	Wire Feed Speed m/min (in/min)	Amp. (A)	Volt. (V)	Deposition Rate kg/hr (lb/hr)	Efficiency (%)
1.2mm (0.045 in) DC+						
80%Ar+20% CO ₂	25 (1)	All Position				86-88
		4.4 (175)	140	22~27	1.6 (3.5)	
		5.1 (200)	150	23~28	1.8 (4.0)	
		6.4 (250)	165	24~29	2.3 (5.0)	
		7.6 (300)	190	24~29	2.7 (6.0)	
		8.9 (350)	205	25~30	3.2 (7.0)	
		9.5 (375)	225	25~30	3.4 (7.5)	
		Flat & Horizontal				
		10.8 (425)	245	26~31	3.8 (8.5)	
		12.1 (475)	265	27~32	4.3 (9.5)	
		12.7 (500)	275	28~33	4.5 (10.0)	
1.4mm (0.052in), DC +						
80%Ar+20% CO ₂	25 (1)	All Position				86-88
		3.8 (150)	150	22~27	1.8 (3.9)	
		4.7 (180)	165	23~28	2.2 (4.8)	
		5.7 (225)	190	23~28	2.7 (5.9)	
		6.4 (250)	215	24~29	2.9 (6.5)	
		6.9 (275)	235	24~29	3.2 (7.2)	
		7.6 (300)	255	25~30	3.5 (7.8)	
		Flat & Horizontal				
		8.5 (335)	275	25~31	4.0 (8.7)	
		9.5 (375)	295	26~32	4.4 (9.8)	
		10.2 (400)	310	26~33	4.7 (10.4)	
1.6mm (1/16 in) DC+						
80%Ar+20% CO ₂	25 (1)	All Position				86-88
		3.8 (150)	200	22~27	2.5 (5.5)	
		4.4 (175)	210	23~28	2.9 (6.4)	
		5.1 (200)	235	24~29	3.3 (7.3)	
		5.7 (225)	265	24~29	3.7 (8.2)	
		6.4 (250)	285	25~30	4.2 (9.2)	
		6.9 (275)	305	25~31	4.6 (10.1)	
		Flat & Horizontal				
		8.3 (325)	335	26~32	5.4 (11.9)	
		8.9 (350)	365	27~33	5.8 (12.8)	

SMAW

SAW

GMAW

GTAW

FCAW

Non-FERROUS

APPENDIX

Supercored 81MAG

Type : Rutile



Conformances

AWS A5.36/ ASME SFA5.36 E81T1-M21A8-Ni1 H4

E81T1-M21P5-Ni1 H4

(AWS A5.29/ ASME SFA5.29 E81T1-Ni1M H4)

EN ISO 17632-A-T 46 6 1Ni P M21 2 H5

ABS 5Y400SA H5

LR 5Y40S H5

BV SA5Y40M HHH

DNV-GL VY40MS H5

RINA 5Y40S H5

RS 5Y42SM H5

TÜV EN ISO 17632-A - T 46 6 1Ni P M 2 H5

DB DIN EN ISO 17632-A-T 46 6 1Ni P M 21 2 H5

CWB AWSA5.29E81T1-Ni1M-H4(-46 Degree)

CE

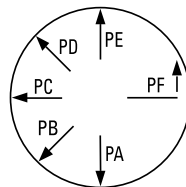
Applications

- Offshore structure
- Shipbuilding
- Mining
- Petrochemical industry

Features

- Good impact value at low temperature (as welded and PHWT)
- Low hydrogen level (H4)

Welding Position



Current

DC +

Shielding Gas

Ar + 20~25% CO₂

Diameter / Packaging

Diameter mm (in)	Spool			Pac		
	12.5kg (28lbs)	15kg (33lbs)	20kg (44lbs)	100kg (221lbs)	200kg (441lbs)	250kg (551lbs)
1.2 (0.045)	✓	✓	✓			
1.4 (0.052)	✓	✓	✓			
1.6 (1/16)	✓	✓	✓			

Typical Chemical Composition of All-Weld Metal (%)

C	Si	Mn	P	S	Ni
0.05	0.28	1.20	0.008	0.012	0.93

Typical Mechanical Properties of All-Weld Metal

YS MPa(lbs/in ²)	TS MPa(lbs/in ²)	EL (%)	Temp °C(°F)	CVN-Impact Value J (ft-lbs)	
550 (79,900)	590 (85,700)	26.0	-60 (-76)	60 (44)	As welded
510 (74,100)	570 (82,800)	28.0	-46 (-50)	90 (66)	PWHT (620 @2hr)

Typical Welding Parameters

Diameter, Polarity Shielding Gas	CTWD mm (in)	Wire Feed Speed m/min (in/min)	Amp. (A)	Volt. (V)	Deposition Rate kg/hr (lb/hr)	Efficiency (%)
1.2mm (0.045 in) DC+						
80% Ar + 20% CO ₂	25 (1)	All Position				86~88
		4.4 (175)	140	22~27	1.6 (3.5)	
		5.1 (200)	150	23~28	1.8 (4.0)	
		6.4 (250)	165	24~29	2.3 (5.0)	
		7.6 (300)	190	24~29	2.7 (6.0)	
		8.9 (350)	205	25~30	3.2 (7.0)	
		9.5 (375)	225	25~30	3.4 (7.5)	
		Flat & Horizontal				
		10.8 (425)	245	26~31	3.8 (8.5)	
		12.1 (475)	265	27~32	4.3 (9.5)	
		12.7 (500)	275	28~33	4.5 (10.0)	
1.4mm (0.052 in) DC+						
80% Ar + 20% CO ₂	25 (1)	All Position				86~88
		3.8 (150)	150	22~27	1.8 (3.9)	
		4.7 (180)	165	23~28	2.2 (4.8)	
		5.7 (225)	190	23~28	2.7 (5.9)	
		6.4 (250)	215	24~29	2.9 (6.5)	
		6.9 (275)	235	24~29	3.2 (7.2)	
		7.6 (300)	255	25~30	3.5 (7.8)	
		Flat & Horizontal				
		8.5 (335)	275	25~31	4.0 (8.7)	
		9.5 (375)	295	26~32	4.4 (9.8)	
		10.2 (400)	310	26~33	4.7 (10.4)	
1.6mm (1/16 in) DC+						
80% Ar + 20% CO ₂	25 (1)	All Position				86~88
		3.8 (150)	200	22~27	2.5 (5.5)	
		4.4 (175)	210	23~28	2.9 (6.4)	
		5.1 (200)	235	24~29	3.3 (7.3)	
		5.7 (225)	265	24~29	3.7 (8.2)	
		6.4 (250)	285	25~30	4.2 (9.2)	
		6.9 (275)	305	25~31	4.6 (10.1)	
		Flat & Horizontal				
		8.3 (325)	335	26~32	5.4 (11.9)	
		8.9 (350)	365	27~33	5.8 (12.8)	

Supercored 81-K2

Type : Rutile



Conformances

AWS A5.36/ ASME SFA5.36 E81T1-C1A8-K2 H4

(AWS A5.29/ ASME SFA5.29 E81T1-K2C H4)

JIS Z3313 T55 6 T1-1 C A-N3 H5

EN ISO 17632-A-T 46 6 1.5Ni P C 1 H5

KR 5Y40SG(C) H5, L3SG(C) H5

ABS 5Y400SA H5

LR 5Y40S H5

BV SA5Y40M HHH

DNV-GL VY40MS H5, NV2-4L, 4-4L

NK KSWL3SG(C) H5

KSW54Y40G(C)H5

(-60°C ≥47J, ≥34J (Butt))

CWB AWS A5.29 E81T1-K2C-H4 (-46 Degree)

CCS 5Y40S H5

RINA 5YS H10

RS 5Y40SM H5

CE

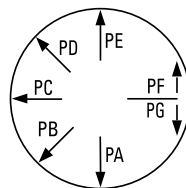
Applications

- Offshore
- Shipbuilding
- General fabrication

Features

- Good impact value at low temperature
- Smooth and stable arc with a fast freezing slag
- Low hydrogen level (H4)

Welding Position



Current

DC +

Shielding Gas

100% CO₂

Diameter / Packaging

Diameter mm (in)	Spool			Pac		
	12.5kg (28lbs)	15kg (33lbs)	20kg (44lbs)	100kg (221lbs)	200kg (441lbs)	250kg (551lbs)
1.2 (0.045)	✓	✓	✓	✓	✓	✓
1.4 (0.052)	✓	✓	✓	✓	✓	✓
1.6 (1/16)	✓	✓	✓	✓	✓	✓

Typical Chemical Composition of All-Weld Metal (%)

C	Si	Mn	P	S	Ni
0.04	0.35	1.35	0.012	0.011	1.50

Typical Mechanical Properties of All-Weld Metal

YS MPa(lbs/in ²)	TS MPa(lbs/in ²)	EL (%)	Temp °C(°F)	CVN-Impact Value J (ft-lbs)
540 (78,400)	620 (90,000)	28.0	-30 (-22) -60 (-76)	110 (81) 60 (44)

Typical Welding Parameters

Diameter, Polarity Shielding Gas	CTWD mm (in)	Wire Feed Speed m/min (in/min)	Amp. (A)	Volt. (V)	Deposition Rate kg/hr (lb/hr)	Efficiency (%)
1.2mm (0.045 in) DC+						
100% CO ₂	25 (1)	All Position				86~88
		4.4 (175)	140	23~28	1.6 (3.5)	
		5.1 (200)	150	24~29	1.8 (4.0)	
		6.4 (250)	165	25~30	2.3 (5.0)	
		7.6 (300)	190	25~30	2.7 (6.0)	
		8.9 (350)	205	26~31	3.2 (7.0)	
		9.5 (375)	225	26~31	3.4 (7.5)	
		10.8 (425)	245	27~32	3.8 (8.5)	
		Flat & Horizontal				
		12.1 (475)	265	28~33	4.9 (10.8)	
12.7 (500)	275	29~34	5.2 (11.4)			
1.4mm (0.052 in) DC+						
100% CO ₂	25 (1)	All Position				86~88
		3.8 (150)	150	23~28	1.8 (3.9)	
		4.7 (180)	165	24~29	2.2 (4.8)	
		5.7 (225)	190	24~29	2.7 (5.9)	
		6.4 (250)	215	25~30	2.9 (6.5)	
		6.9 (275)	235	25~30	3.2 (7.2)	
		7.6 (300)	255	26~31	3.5 (7.8)	
		Flat & Horizontal				
		8.5 (335)	275	26~31	4.0 (8.7)	
		9.5 (375)	295	27~32	4.4 (9.8)	
10.2 (400)	310	27~34	4.7 (10.4)			
1.6mm (1/16 in) DC+						
100% CO ₂	25 (1)	All Position				86~88
		3.8 (150)	200	24~29	2.5 (5.5)	
		4.4 (175)	210	24~30	2.9 (6.4)	
		5.1 (200)	235	25~30	3.3 (7.3)	
		5.7 (225)	265	25~31	3.7 (8.2)	
		6.4 (250)	285	26~31	4.2 (9.2)	
		6.9 (275)	305	26~32	4.6 (10.1)	
		Flat & Horizontal				
		8.3 (325)	335	27~32	5.4 (11.9)	
		8.9 (350)	365	28~34	5.8 (12.8)	

SC-460

Type : Rutile

Conformances

AWS A5.36/ ASME SFA5.36 E81T1-C1A6-K2
(AWS A5.29/ ASME SFA5.29 E81T1-K2C)
JIS Z3313 T55 6 T1-1 C A-N3 H5
EN ISO 17632-A-T 46 6 1.5Ni P C1 1 H5
KR 5Y46SG(C1) H5
ABS 5YQ460SA H5
LR 5Y46 H5

BV SA5Y46 HHH
DNV-GL VY46MS (H5)
NK KSW5Y46G(C) H5
KSW63Y47G(C) H5
(-20°C≥53J)

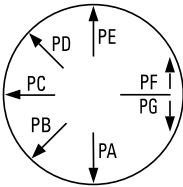
Applications

- Shipbuilding
- Structural fabrication
- Offshore structure

Features

- Good impact value at low temperature service steel
- Low hydrogen level (H5)
- High tensile steel (EH47 Grade)

Welding Position



Current

DC +

Shielding Gas

100% CO₂

Diameter / Packaging

Diameter	Spool			Pac		
	12.5kg (28lbs)	15kg (33lbs)	20kg (44lbs)	100kg (221lbs)	200kg (441lbs)	250kg (551lbs)
1.2 (0.045)	✓	✓	✓			
1.4 (0.052)	✓	✓	✓			

Typical Chemical Composition of All-Weld Metal (%)

C	Si	Mn	P	S	Ni
0.06	0.35	1.20	0.008	0.011	1.50

Typical Mechanical Properties of All-Weld Metal

YS MPa(lbs/in ²)	TS MPa(lbs/in ²)	EL (%)	Temp °C(°F)	CVN-Impact Value J (ft-lbs)
580 (84,200)	630 (91,400)	26.0	-60 (-76)	60 (44)

Typical Welding Parameters

Diameter, Polarity Shielding Gas	CTWD mm (in)	Wire Feed Speed m/min (in/min)	Amp. (A)	Volt. (V)	Deposition Rate kg/hr (lb/hr)	Efficiency (%)
1.2mm (0.045 in) DC+						
100% CO ₂	25 (1)	All Position				86-88
		4.4 (175)	120-140	23-28	1.6 (3.5)	
		5.1 (200)	130-150	24-29	1.8 (4.0)	
		6.4 (250)	140-160	25-30	2.3 (5.0)	
		7.6 (300)	160-190	25-30	2.7 (6.0)	
		8.9 (350)	190-210	26-31	3.2 (7.0)	
		9.5 (375)	210-230	26-31	3.4 (7.5)	
		10.8 (425)	220-240	27-32	3.8 (8.5)	
		Flat & Horizontal				
		12.1 (475)	240-270	28-33	4.9 (10.8)	
12.7 (500)	250-280	29-34	5.2 (11.4)			
1.4mm (0.052 in) DC+						
100% CO ₂	25 (1)	All Position				86-88
		3.8 (150)	120-150	23-28	1.8 (3.9)	
		4.7 (180)	150-170	24-29	2.2 (4.8)	
		5.7 (225)	170-190	24-29	2.7 (5.9)	
		6.4 (250)	190-210	25-30	2.9 (6.5)	
		6.9 (275)	210-240	25-30	3.2 (7.2)	
		7.6 (300)	220-250	26-31	3.5 (7.8)	
		Flat & Horizontal				
		8.5 (335)	250-280	26-31	4.0 (8.7)	
		9.5 (375)	280-300	27-32	4.4 (9.8)	
10.2 (400)	290-310	27-34	4.7 (10.4)			

SC-81LT

Type : Rutile

Conformances

AWS A5.36/ ASME SFA5.36 E81T1-C1A6-K2
(AWS A5.29/ ASME SFA5.29 E81T1-K2C)
JIS Z3313 T55 6 T1-1 C A-N3 H5
EN ISO 17632-A-T 46 6 1.5Ni P C1 1 H5
KR 5Y40SG(C) H5, L3SG(C) H5

ABS 5Y, 5Y400SA H5
LR 5Y40S H5
BV SA5Y40M HHH
DNV-GL VY40MSH5, NV4-4L, VY
NK KSWL3G(C) H5
KSW54Y40G(C) H5

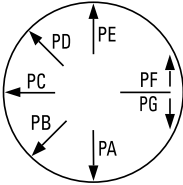
Applications

- Shipbuilding
- Offshore structure
- Structural fabrication

Features

- Good impact value at low temperature
- Smooth and stable arc with a fast freezing slag
- Good CTOD value

Welding Position



Current

DC +

Shielding Gas

100% CO₂

Diameter / Packaging

Diameter	Spool			Pac		
	12.5kg (28lbs)	15kg (33lbs)	20kg (44lbs)	100kg (221lbs)	200kg (441lbs)	250kg (551lbs)
1.2 (0.045)	✓					
1.4 (0.052)	✓					

Typical Chemical Composition of All-Weld Metal (%)

C	Si	Mn	P	S	Ni
0.04	0.26	1.20	0.010	0.010	1.50

Typical Mechanical Properties of All-Weld Metal

YS MPa(lbs/in ²)	TS MPa(lbs/in ²)	EL (%)	Temp °C(°F)	CVN-Impact Value J (ft.-lbs)
520 (75,500)	610 (88,600)	28.0	-40 (-40) -60 (-76)	120 (89) 85 (63)

Typical Welding Parameters

Diameter, Polarity Shielding Gas	CTWD mm (in)	Wire Feed Speed m/min (in/min)	Amp. (A)	Volt. (V)	Deposition Rate kg/hr (lb/hr)	Efficiency (%)
1.2mm (0.045 in) DC+						
100% CO ₂	25 (1)	All Position				86~88
		4.4 (175)	120~140	23~28	1.6 (3.5)	
		5.1 (200)	130~150	24~29	1.8 (4.0)	
		6.4 (250)	140~160	25~30	2.3 (5.0)	
		7.6 (300)	160~190	25~30	2.7 (6.0)	
		8.9 (350)	190~210	26~31	3.2 (7.0)	
		9.5 (375)	210~230	26~31	3.4 (7.5)	
		10.8 (425)	220~240	27~32	3.8 (8.5)	
		Flat & Horizontal				
		12.1 (475)	240~270	28~33	4.9 (10.8)	
		12.7 (500)	250~280	29~34	5.2 (11.4)	
1.4mm (0.052 in) DC+						
100% CO ₂	25 (1)	All Position				86~88
		3.8 (150)	120~150	23~28	1.8 (3.9)	
		4.7 (180)	150~170	24~29	2.2 (4.8)	
		5.7 (225)	170~190	24~29	2.7 (5.9)	
		6.4 (250)	190~210	25~30	2.9 (6.5)	
		6.9 (275)	210~240	25~30	3.2 (7.2)	
		7.6 (300)	220~250	26~31	3.5 (7.8)	
		Flat & Horizontal				
		8.5 (335)	250~280	26~31	4.0 (8.7)	
		9.5 (375)	280~300	27~32	4.4 (9.8)	
		10.2 (400)	290~310	27~34	4.7 (10.4)	

SC-81SR

Type : Rutile

Conformances

AWS A5.36/ ASME SFA5.36 E81T1-C1A(P)8-K2
(AWS A5.29/ ASME SFA5.29 E81T1-K2C)
JIS Z3313 T55 6 T1-1 C A-N3-U H5
EN ISO 17632-A-T 46 6 1.5Ni P C1 1 H5
ABS 5Y400SA H5
LR 5Y40S H5, 5Y40srS
DNV VY40MS H5, NV2-4L, 4-4L

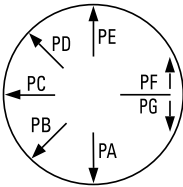
Applications

- Shipbuilding
- Offshore structure
- Pipe line
- Pressure vessel

Features

- Good impact value at low temperature (As Welded and PHWT)

Welding Position



Current

DC +

Shielding Gas

100% CO₂

Diameter / Packaging

Diameter	Spool			Pac		
	12.5kg (28lbs)	15kg (33lbs)	20kg (44lbs)	100kg (221lbs)	200kg (441lbs)	250kg (551lbs)
1.2 (0.045)	✓	✓	✓			
1.4 (0.052)	✓	✓	✓			

Typical Chemical Composition of All-Weld Metal (%)

C	Si	Mn	P	S	Ni
0.05	0.28	1.20	0.012	0.011	1.50

Typical Mechanical Properties of All-Weld Metal

YS MPa(lbs/in ²)	TS MPa(lbs/in ²)	EL (%)	Temp °C(°F)	CVN-Impact Value J (ft-lbs)	
580 (84,100)	620 (89,900)	28.0	-60 (-80)	90 (66)	As welded
560 (81,200)	600 (87,000)	32.0	-60 (-80)	70 (52)	PWHT (620 @2hr)

Typical Welding Parameters

Diameter, Polarity Shielding Gas	CTWD mm (in)	Wire Feed Speed m/min (in/min)	Amp. (A)	Volt. (V)	Deposition Rate kg/hr (lb/hr)	Efficiency (%)
1.2mm (0.045 in) DC+						
100% CO ₂	25 (1)	All Position				86~88
		4.4 (175)	120~140	23~28	1.6 (3.5)	
		5.1 (200)	130~150	24~29	1.8 (4.0)	
		6.4 (250)	140~160	25~30	2.3 (5.0)	
		7.6 (300)	160~190	25~30	2.7 (6.0)	
		8.9 (350)	190~210	26~31	3.2 (7.0)	
		9.5 (375)	210~230	26~31	3.4 (7.5)	
		10.8 (425)	220~240	27~32	3.8 (8.5)	
		Flat & Horizontal				
		12.1 (475)	240~270	28~33	4.9 (10.8)	
12.7 (500)	250~280	29~34	5.2 (11.4)			
1.4mm (0.052 in) DC+						
100% CO ₂	25 (1)	All Position				86~88
		3.8 (150)	120~150	23~28	1.8 (3.9)	
		4.7 (180)	150~170	24~29	2.2 (4.8)	
		5.7 (225)	170~190	24~29	2.7 (5.9)	
		6.4 (250)	190~210	25~30	2.9 (6.5)	
		6.9 (275)	210~240	25~30	3.2 (7.2)	
		7.6 (300)	220~250	26~31	3.5 (7.8)	
		Flat & Horizontal				
		8.5 (335)	240~270	26~31	4.0 (8.7)	
		9.5 (375)	260~290	27~32	4.4 (9.8)	
10.2 (400)	280~310	27~34	4.7 (10.4)			

SC-81Ni2

Type : Rutile

Conformances

AWS A5.36/ ASME SFA5.36 E81T1-C1A8-Ni2
(AWS A5.29/ ASME SFA5.29 E81T1-Ni2C)
JIS Z3313 T55 6 T1-1 C A-N5 H5
EN ISO 17632-A-T 46 6 2Ni P C1 1 H5
KR 5Y46SG(C1) H5
ABS 5YQ460SA H5
LR 4Y47S H5

BV SA5Y46 HHH
DNV-GL VY46MS(H5)
NK KSW63Y47G(C)H5
CWB CSA W48 E551T1-C1A6-Ni2
(E81T1-C1A8-Ni2)

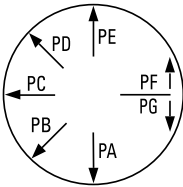
Applications

- Shipbuilding
- Offshore structure
- Structural fabrication

Features

- Good impact value at low temperature
- Good CTOD value

Welding Position



Current

DC +

Shielding Gas

100% CO₂

Diameter / Packaging

Diameter	Spool			Pac		
mm (in)	12.5kg (28lbs)	15kg (33lbs)	20kg (44lbs)	100kg (221lbs)	200kg (441lbs)	250kg (551lbs)
1.2 (0.045)	✓				✓	
1.4 (0.052)	✓				✓	

Typical Chemical Composition of All-Weld Metal (%)

C	Si	Mn	P	S	Ni
0.05	0.27	1.21	0.010	0.010	2.20

Typical Mechanical Properties of All-Weld Metal

YS MPa(lbs/in ²)	TS MPa(lbs/in ²)	EL (%)	Temp °C(°F)	CVN-Impact Value J (ft.-lbs)
590 (85,600)	630 (91,400)	25.0	-40 (-40) -60 (-76)	100 (74) 80 (59)

Typical Welding Parameters

Diameter, Polarity Shielding Gas	CTWD mm (in)	Wire Feed Speed m/min (in/min)	Amp. (A)	Volt. (V)	Deposition Rate kg/hr (lb/hr)	Efficiency (%)
1.2mm (0.045 in) DC+						
100% CO ₂	25 (1)	All Position				86~88
		4.4 (175)	110~140	23~28	1.6 (3.5)	
		5.1 (200)	120~150	24~29	1.8 (4.0)	
		6.4 (250)	130~160	25~30	2.3 (5.0)	
		7.6 (300)	160~190	25~30	2.7 (6.0)	
		8.9 (350)	170~210	26~31	3.2 (7.0)	
		9.5 (375)	190~230	26~31	3.4 (7.5)	
		10.8 (425)	220~250	27~32	3.8 (8.5)	
		Flat & Horizontal				
		12.1 (475)	240~270	28~33	4.9 (10.8)	
12.7 (500)	250~280	29~34	5.2 (11.4)			
1.4mm (0.052 in) DC+						
100% CO ₂	25 (1)	All Position				86~88
		3.8 (150)	120~150	23~28	1.8 (3.9)	
		4.7 (180)	130~160	24~29	2.2 (4.8)	
		5.7 (225)	160~190	24~29	2.7 (5.9)	
		6.4 (250)	190~220	25~30	2.9 (6.5)	
		6.9 (275)	200~230	25~30	3.2 (7.2)	
		7.6 (300)	220~250	26~31	3.5 (7.8)	
		Flat & Horizontal				
		8.5 (335)	240~270	26~31	4.0 (8.7)	
		9.5 (375)	260~290	27~32	4.4 (9.8)	
10.2 (400)	280~310	27~34	4.7 (10.4)			

SMW

SAW

GMAW

GTAW

FCAW

Non-FERROUS

APPENDIX

SC-81Ni2M

Type : Rutile

Conformances

AWS A5.36/ ASME SFA5.36 E81T1-M21A8-Ni2
(AWS A5.29/ ASME SFA5.29 E81T1-Ni2M)
JIS Z3313 T55 6 T1-1 M A-N5 H5
EN ISO 17632-A-T 46 6 2Ni P M21 2 H5
LR 4Y47S H5

DNV-GL VY46MS(H5)
BV SA5Y46 HHH
CWB CSA W48 E551T1-M21A6-Ni2
(E81T1-M21A6-Ni2)

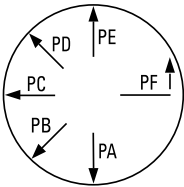
Applications

- Offshore structure
- Shipbuilding

Features

- Good impact value at low temperature
- Good CTOD value

Welding Position



Current

DC +

Shielding Gas

Ar + 20~25% CO₂

Diameter / Packaging

Diameter	Spool			Pac		
mm (in)	12.5kg (28lbs)	15kg (33lbs)	20kg (44lbs)	100kg (221lbs)	200kg (441lbs)	250kg (551lbs)
1.2 (0.045)	✓					
1.4 (0.052)	✓					

Typical Chemical Composition of All-Weld Metal (%)

C	Si	Mn	P	S	Ni
0.05	0.24	1.15	0.010	0.010	2.25

Typical Mechanical Properties of All-Weld Metal

YS MPa(lbs/in ²)	TS MPa(lbs/in ²)	EL (%)	Temp °C(°F)	CVN-Impact Value J (ft-lbs)
580 (84,200)	620 (90,000)	24.8	-50 (-58) -60 (-76)	110 (81) 90 (66)

Typical Welding Parameters

Diameter, Polarity Shielding Gas	CTWD mm (in)	Wire Feed Speed m/min (in/min)	Amp. (A)	Volt. (V)	Deposition Rate kg/hr (lb/hr)	Efficiency (%)
1.2mm (0.045 in) DC+						
80% Ar + 20% CO ₂	25 (1)	All Position				86~88
		4.4 (175)	110~140	23~28	1.6 (3.5)	
		5.1 (200)	120~150	24~29	1.8 (4.0)	
		6.4 (250)	130~160	25~30	2.3 (5.0)	
		7.6 (300)	160~190	25~30	2.7 (6.0)	
		8.9 (350)	170~200	26~31	3.2 (7.0)	
		9.5 (375)	190~220	26~31	3.4 (7.5)	
		10.8 (425)	210~240	27~32	3.8 (8.5)	
		Flat & Horizontal				
		12.1 (475)	230~260	28~33	4.9 (10.8)	
		12.7 (500)	240~270	29~34	5.2 (11.4)	

Supercored 81-K2MAG

Type : Rutile



Conformances

AWS A5.36/ ASME SFA5.36 E81T1-M21A8-K2
(AWS A5.29/ ASME SFA5.29 E81T1-K2M)
JIS Z3313 T55 6 T1-1 M A-N3 H5
EN ISO 17632-A-T 46 6 1.5Ni P M21 2 H5
ABS 5Y400SA H5
LR 5Y40S H5
BV SA5Y40M HHH

DNV-GL VY40MS H5
RS 5Y42SM H5
TÜV EN ISO 17632-A - T 46 6 1.5 Ni P M 2
DB DIN EN ISO 17632-A-T 46 6 1.5Ni P M21 2
CE

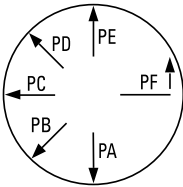
Applications

- Offshore structure
- Shipbuilding

Features

- Good impact value at low temperature
- Smooth arc and low spatter level

Welding Position



Current

DC +

Shielding Gas

Ar + 20~25% CO₂

Diameter / Packaging

Diameter	Spool			Pac		
mm (in)	12.5kg (28lbs)	15kg (33lbs)	20kg (44lbs)	100kg (221lbs)	200kg (441lbs)	250kg (551lbs)
1.2 (0.045)	✓	✓	✓			

Typical Chemical Composition of All-Weld Metal (%)

C	Si	Mn	P	S	Ni
0.03	0.35	1.25	0.012	0.010	1.55

Typical Mechanical Properties of All-Weld Metal

YS MPa(lbs/in ²)	TS MPa(lbs/in ²)	EL (%)	Temp °C(°F)	CVN-Impact Value J (ft-lbs)
590 (85,600)	610 (88,500)	27.0	-30 (-22) -60 (-76)	110 (81) 70 (52)

Typical Welding Parameters

Diameter, Polarity Shielding Gas	CTWD mm (in)	Wire Feed Speed m/min (in/min)	Amp. (A)	Volt. (V)	Deposition Rate kg/hr (lb/hr)	Efficiency (%)
1.2mm (0.045 in) DC+						
80% Ar + 20% CO ₂	25 (1)	All Position				86~88
		4.4 (175)	110~140	20~25	1.6 (3.5)	
		5.7 (225)	120~150	21~26	2.0 (4.5)	
		7.0 (275)	130~160	22~27	2.5 (5.5)	
		8.3 (325)	160~190	22~27	2.9 (6.5)	
		8.9 (350)	170~200	23~28	3.2 (7.0)	
		10.2 (400)	200~230	24~29	3.6 (8.0)	
		Flat & Horizontal				
		11.4 (450)	210~240	25~31	4.1 (9.1)	
		12.1 (475)	230~260	26~32	4.3 (9.5)	
		13.3 (525)	250~280	27~33	4.7 (10.4)	

SC-80K2

Type : Semi-Metal

Conformances

AWS A5.36/ ASME SFA5.36 E80T1-C1A8-K2 H4
(AWS A5.29/ ASME SFA5.29 E80T1-K2C)
JIS Z3313 T55 6 T1-0 C A-N3 H5
EN ISO 17632-A-T 46 6 1.5Ni R C1 3 H5
KR 4Y40SG(C) H5, 4Y40MG(C)
ABS 5Y400SA H5
LR 5Y40S H5, 5Y40M H5
BV SA5Y40 HHH

DNV-GL VY40MS H5, NV4-4L
NK KAW54Y40MG(C),
KSW54Y40MG(C)H5
(-60°C≥34J)
RS 5Y40S H5

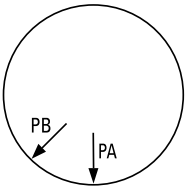
Applications

- LPG and LNG storage tank
- Shipbuilding
- Offshore structure

Features

- High speed single or twin tandem welding
- Low hydrogen level (H4)
- Low temperature service

Welding Position



Current

DC +

Shielding Gas

100% CO₂

Diameter / Packaging

Diameter	Spool			Pac		
	5kg (11lbs)	15kg (33lbs)	20kg (44lbs)	250kg (551lbs)	300kg (661lbs)	500kg (771lbs)
1.2 (0.045)		✓		✓	✓	✓
1.4 (0.052)		✓		✓	✓	✓

Typical Chemical Composition of All-Weld Metal (%)

C	Si	Mn	P	S	Ni
0.06	0.43	1.45	0.011	0.008	1.57

Typical Mechanical Properties of All-Weld Metal

YS MPa(lbs/in ²)	TS MPa(lbs/in ²)	EL (%)	Temp °C(°F)	CVN-Impact Value J (ft-lbs)
575 (83,375)	635 (92,075)	26.5	-60 (-76)	60 (44)

Typical Welding Parameters

Diameter, Polarity Shielding Gas	CTWD mm (in)	Wire Feed Speed m/min (in/min)	Amp. (A)	Volt. (V)	Deposition Rate kg/hr (lb/hr)	Efficiency (%)
1.2mm (0.045 in) DC+						
100% CO ₂	20~25 (51/64~1)	10.4 (410)	200	26	3.5 (7.7)	85~87
		12.7 (500)	250	30	4.7 (10.4)	87~89
		15.3 (600)	300	33	6.3 (13.9)	91~93
1.4mm (0.052 in) DC+						
100% CO ₂	20~25 (51/64~1)	12.0 (470)	300	31	5.6 (12.3)	90~92
		13.3 (520)	350	36	6.7 (14.8)	91~93

SC-81B2

Type : Rutile

Conformances

AWS A5.36/ ASME SFA5.36 E81T1-C1PZ-B2
(AWS A5.29/ ASME SFA5.29 E81T1-B2C)
EN ISO 17632-A-T CrMo1 P C1 2

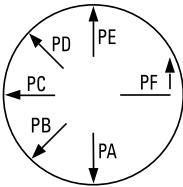
Applications

- Petrochemical industry
- Pressure vessel

Features

- Stable arc and low spatter level

Welding Position



Current

DC +

Shielding Gas

100% CO₂

Diameter / Packaging

Diameter	Spool			Pac		
	5kg (11lbs)	15kg (33lbs)	20kg (44lbs)	100kg (221lbs)	200kg (441lbs)	250kg (551lbs)
1.2 (0.045)		✓				
1.4 (0.052)		✓				
1.6 (1/16)		✓				

Typical Chemical Composition of All-Weld Metal (%)

C	Si	Mn	P	S	Cr	Mo
0.066	0.41	0.83	0.016	0.017	1.19	0.51

Typical Mechanical Properties of All-Weld Metal

YS MPa(lbs/in ²)	TS MPa(lbs/in ²)	EL (%)	PWHT
575 (83,500)	656 (95,200)	22.4	690±15°C X 1Hr

Typical Welding Parameters

Diameter, Polarity Shielding Gas	CTWD mm (in)	Wire Feed Speed m/min (in/min)	Amp. (A)	Volt. (V)	Deposition Rate kg/hr (lb/hr)	Efficiency (%)
1.2mm (0.045 in) DC+						
100% CO ₂	20~25 (51/64~1)	10.2 (400)	180~220	25~27	3.4 (7.5)	84~87
		11.5 (450)	230~270	27~29	4.5 (9.9)	85~88
		15.3 (600)	280~320	32~34	5.2 (11.4)	86~88
1.4mm (0.052 in) DC+						
100% CO ₂	20~25 (51/64~1)	7.6 (300)	230~270	27~29	3.9 (8.6)	85~87
		10.2 (400)	280~320	31~33	4.8 (10.6)	85~88
		12.8 (500)	310~350	35~37	5.8 (12.8)	86~89
1.6mm (1/16 in) DC+						
100% CO ₂	20~25 (51/64~1)	6.4 (250)	260~300	30~32	4.2 (9.2)	85~88
		7.6 (300)	310~350	32~34	4.8 (10.6)	86~88
		8.1 (320)	330~370	33~35	5.3 (11.7)	87~89
		9.2 (360)	380~420	37~39	5.7 (12.5)	87~90

SMW

SAW

GMW

GTAW

FCW

Non-FERROUS

APPENDIX

SC-91B3

Type : Rutile

Conformances

AWS A5.36/ ASME SFA5.36E91T1-C1PZ-B3
(AWS A5.29/ ASME SFA5.29 E91T1-B3C)
EN ISO 17632-A-T CrMo2 P C1 2

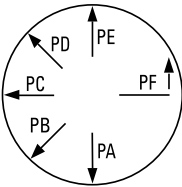
Applications

- Petrochemical industry
- Pressure vessel

Features

- Stable arc and low spatter level

Welding Position



Current

DC +

Shielding Gas

100% CO₂

Diameter / Packaging

Diameter	Spool			Pac		
	5kg (11lbs)	15kg (33lbs)	20kg (44lbs)	100kg (221lbs)	200kg (441lbs)	250kg (551lbs)
1.2 (0.045)		✓				
1.4 (0.052)		✓				
1.6 (1/16)		✓				

Typical Chemical Composition of All-Weld Metal (%)

C	Si	Mn	P	S	Cr	Mo
0.063	0.47	0.83	0.022	0.017	2.32	0.99

Typical Mechanical Properties of All-Weld Metal

YS MPa(lbs/in ²)	TS MPa(lbs/in ²)	EL (%)	PWHT
643 (93,300)	730 (106,000)	20.0	690±15°C X 1Hr

Typical Welding Parameters

Diameter, Polarity Shielding Gas	CTWD mm (in)	Wire FeedSpeed m/min (in/min)	Amp. (A)	Volt. (V)	Deposition Rate kg/hr (lb/hr)	Efficiency (%)
1.2mm (0.045 in) DC+						
100% CO ₂	20~25 (51/64~1)	10.2 (400)	180~220	25~27	3.4 (7.5)	84~87
		11.5 (450)	230~270	27~29	4.5 (9.9)	85~88
		15.3 (600)	280~320	32~34	5.2 (11.4)	86~88
1.4mm (0.052 in) DC+						
100% CO ₂	20~25 (51/64~1)	7.6 (300)	230~270	27~29	3.9 (8.6)	85~87
		10.2 (400)	280~320	31~33	4.8 (10.6)	85~88
		12.8 (500)	310~350	35~37	5.8 (12.8)	86~89
1.6mm (1/16 in) DC+						
100% CO ₂	20~25 (51/64~1)	6.4 (250)	260~300	30~32	4.2 (9.2)	85~88
		7.6 (300)	310~350	32~34	4.8 (10.6)	86~88
		8.1 (320)	330~370	33~35	5.3 (11.7)	87~89
		9.2 (360)	380~420	37~39	5.7 (12.5)	87~90

SMW

SAW

GMW

GTAW

FCAW

Non-FERROUS

APPENDIX

SC-91B9

Type : Rutile

Conformances

AWS A5.36/ ASME SFA5.36 E91T1-C1PZ-B91 H4
E91T1-M21PZ-B91 H4
(AWS A5.29/ ASME SFA5.29 E91T1-B9C/M H4)
EN ISO 17634-B-T 69T1-1M21/C1- 9C1MV

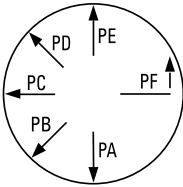
Applications

- Petrochemical industry
- Pressure vessel

Features

- Good performance in all positions
- Good heat-resistance(P91 grade steel)

Welding Position



Current

DC +

Shielding Gas

Ar + 20~25% CO₂
100% CO₂

Diameter / Packaging

Diameter	Spool			Pac		
	5kg (11lbs)	12.5kg (27.6lbs)	15kg (33lbs)	100kg (221lbs)	200kg (441lbs)	250kg (551lbs)
mm (in)						
1.2 (0.045)	✓	✓	✓			
1.6 (1/16)		✓	✓			

Typical Chemical Composition of All-Weld Metal (%)

C	Si	Mn	Cr	Ni	Mo	V	Nb	N	HDM (ml/100g)
0.09	0.1	0.5	9.0	0.5	1.0	0.2	0.05	0.03	2.01

Typical Mechanical Properties of All-Weld Metal

YS MPa(lbs/in ²)	TS MPa(lbs/in ²)	EL (%)	Temp °C(°F)	CVN-Impact Value J (ft-lbs)	Condition
560 (81,300)	740 (107,400)	21	20 (68)	30 (22)	SR1: 2h/760°C

Typical Welding Parameters

Diameter, Polarity Shielding Gas	CTWD mm (in)	Wire Feed Speed m/min (in/min)	Amp. (A)	Volt. (V)	Deposition Rate kg/hr (lb/hr)	Efficiency (%)
1.2mm (0.045 in) DC+						
100% CO ₂	20~25 (51/64~1)	10.2 (400)	180~220	25~27	3.4 (7.5)	84~87
		11.5 (450)	230~270	27~29	4.5 (9.9)	85~88
		15.3 (600)	280~320	32~34	5.2 (11.4)	86~88
80% Ar + 20% CO ₂	20~25 (51/64~1)	10.2 (400)	180~220	24~26	3.4 (7.5)	84~87
		11.5 (450)	230~270	26~28	4.5 (9.9)	85~88
		15.3 (600)	280~320	31~33	5.2 (11.4)	86~88
1.6mm (1/16 in) DC+						
100% CO ₂	20~25 (51/64~1)	6.4 (250)	260~300	30~32	4.2 (9.2)	85~88
		7.6 (300)	310~350	32~34	4.8 (10.6)	86~88
		8.1 (320)	330~370	33~35	5.3 (11.7)	87~89
80% Ar + 20% CO ₂	20~25 (51/64~1)	6.4 (250)	260~300	29~31	4.2 (9.2)	85~88
		7.6 (300)	310~350	31~33	4.8 (10.6)	86~88
		8.1 (320)	330~370	32~33	5.3 (11.7)	87~89

SMW

SAW

GMW

GTAW

FCW

Non-FERROUS

APPENDIX

SC-80D2

Type : Metal-Cored

Conformances

AWS A5.36/ ASME SFA5.36 E80T15-M21A0-G
(AWS A5.28/ ASME SFA5.28 E80C-G)
JIS Z3318 YFM-G
EN ISO 17632-A-T 46 0 MnMo M M21 3

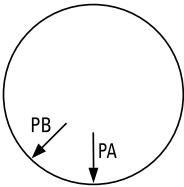
Applications

- Heavy equipment
- Petrochemical industry
- Pressure vessel

Features

- Smooth and stable arc
- Low spatter
- Good crack resistance
- Good impact value
- Good porosity resistance

Welding Position



Current

DC +

Shielding Gas

Ar + 20~25% CO₂

Diameter / Packaging

Diameter	Spool			Pac		
mm (in)	5kg (11lbs)	15kg (33lbs)	20kg (44lbs)	250kg (551lbs)	300kg (661lbs)	350kg (771lbs)
1.2 (0.045)	✓	✓	✓	✓	✓	✓

Typical Chemical Composition of All-Weld Metal (%)

C	Si	Mn	P	S	Mo
0.05	0.61	1.62	0.012	0.010	0.50

Typical Mechanical Properties of All-Weld Metal

YS MPa(lbs/in ²)	TS MPa(lbs/in ²)	EL (%)	Temp °C(°F)	CVN-Impact Value J (ft-lbs)
604 (85,600)	675 (95,700)	27	-20 (-4)	60 (44)

Typical Welding Parameters

Diameter, Polarity Shielding Gas	CTWD mm (in)	Wire Feed Speed m/min (in/min)	Amp. (A)	Volt. (V)	Deposition Rate kg/hr (lb/hr)	Efficiency (%)
1.2mm (0.045 in) DC+						
80% Ar + 20% CO ₂	19-25 (3/4-1)	Flat & Horizontal				
		7.8 (307)	240~260	22~26	3.5 (7.5)	90~96
		9.4 (374)	270~290	22~27	4.0 (9.2)	
		10.3 (405)	300~320	23~27	4.5 (10.8)	

SMW

SAW

GMW

GTAW

FCAW

Non-FERROUS

APPENDIX

Supercored 1CM

Type : Metal-Cored

Conformances

AWS A5.36/ ASME SFA5.36 E80T15-M21PZ-G(B2)
(AWS A5.28/ ASME SFA5.28 E80C-G)
JIS Z3318 YF1CM-G
EN ISO 17634-A-T CrMo1 M M21 3

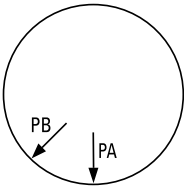
Applications

- Petrochemical industry
- Pressure vessel

Features

- Smooth and stable arc
- Low spatter
- Good porosity resistance

Welding Position



Current

DC +

Shielding Gas

Ar + 20~25% CO₂

Diameter / Packaging

Diameter	Spool			Pac		
mm (in)	5kg (11lbs)	15kg (33lbs)	20kg (44lbs)	250kg (551lbs)	300kg (661lbs)	350kg (771lbs)
1.2 (0.045)	✓	✓	✓	✓	✓	✓

Typical Chemical Composition of All-Weld Metal (%)

C	Si	Mn	P	S	Cr	Mo
0.07	0.39	0.81	0.013	0.010	1.25	0.51

Typical Mechanical Properties of All-Weld Metal

YS MPa(lbs/in ²)	TS MPa(lbs/in ²)	EL (%)	Temp °C(°F)	CVN-Impact Value J (ft-lbs)	PWHT
560 (81,300)	630 (91,400)	20	0 (32)	90 (66)	620/1Hr
510 (74,100)	600 (87,100)	25	0 (32)	110 (81)	620/8Hr

Typical Welding Parameters

Diameter, Polarity Shielding Gas	CTWD mm (in)	Wire Feed Speed m/min (in/min)	Amp. (A)	Volt. (V)	Deposition Rate kg/hr (lb/hr)	Efficiency (%)
1.2mm (0.045 in) DC+						
80% Ar + 20% CO ₂	19-25 (3/4-1)	Flat & Horizontal				
		9.5 (374)	230-250	26-29	3.9 (8.6)	90-96
		12.2 (480)	280-300	28-31	5.3 (11.6)	
		14.8 (582)	320-340	30-33	6.5 (14.2)	

Supershield 11

Type : Self-Shielded



Conformances

AWS A5.36/ ASME SFA5.36 E71T11-AZ-CS3
(AWS A5.20/ ASME SFA5.20 E71T-11)
JIS Z3313 T49 T14-1 N A
EN ISO 17632-A-T 42 Y Z Z N0 1
CE

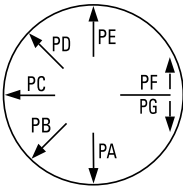
Applications

- General fabrication
- Galvanized steel
- Civil construction

Features

- All position self-shielded flux cored wire
- Single & multi-pass welding of thin plate

Welding Position



Current

DC -

Shielding Gas

No shielding gas

Diameter / Packaging

Diameter mm (in)	Spool	
	15kg (33lbs)	20kg (44lbs)
1.0 (0.040)	✓	✓
1.2 (0.045)	✓	✓
1.4 (0.052)	✓	✓
1.6 (1/16)	✓	✓

Typical Chemical Composition of All-Weld Metal (%)

C	Si	Mn	P	S	Al
0.18	0.34	0.50	0.012	0.006	1.35

Typical Mechanical Properties of All-Weld Metal

YS MPa(lbs/in ²)	TS MPa(lbs/in ²)	EL (%)
510 (74,000)	580 (84,100)	24

Typical Welding Parameters

Diameter, Polarity Shielding Gas	CTWD mm (in)	Wire Feed Speed m/min (in/min)	Amp. (A)	Volt. (V)	Deposition Rate kg/hr (lb/hr)	Efficiency (%)
1.6mm (1/16 in) DC+						
No shielding gas	25 (1)	2.5 (98)	130~180	14~18	0.9 (2.0)	77~81
		3.4 (134)	180~240	16~20	1.2 (2.6)	
		4.0 (157)	220~280	18~23	2.2 (4.8)	

Supershield 71GS

Type : Self-Shielded

Conformances

AWS A5.36/ ASME SFA5.36 E71TGS
(AWS A5.20/ ASME SFA5.20 E71T-GS)
JIS Z3313 T49 T14-1 N S
EN ISO 17632-A-T 42 Z Z V NO 1

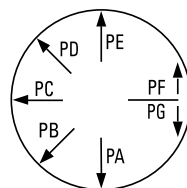
Applications

- General fabrications
- Galvanized steel
- Civil construction

Features

- All position self-shielded flux cored wire
- Single pass welding of thin plate

Welding Position



Current

DC -

Shielding Gas

No shielding gas

Diameter / Packaging

Diameter mm (in)	Spool	
	15kg (33lbs)	20kg (44lbs)
1.0 (0.040)	✓	✓
1.2 (0.045)	✓	✓
1.4 (0.052)	✓	✓
1.6 (1/16)	✓	✓

Typical Chemical Composition of All-Weld Metal (%)

C	Si	Mn	P	S	Al
0.26	0.50	0.91	0.016	0.014	2.05

Typical Mechanical Properties of All-Weld Metal

	AS welded
Transverse Tensile Strength MPa(lbs/in ²) (Specimen broken in the base metal)	586 (85,000)
Longitudinal Guided Bend Test	Satisfactory

Typical Welding Parameters

Diameter, Polarity Shielding Gas	CTWD mm (in)	Wire Feed Speed m/min (in/min)	Amp. (A)	Volt. (V)	Deposition Rate kg/hr (lb/hr)	Efficiency (%)
1.6mm (1/16 in) DC+						
No shielding gas	25 (1)	2.4 (94)	130~180	14~18	0.9 (2.0)	76~80
		3.3 (130)	180~240	16~20	1.1 (2.4)	
		4.0 (157)	220~280	18~23	2.1 (4.6)	

SMW

SAW

GMW

GTAW

FCW

Non-FERROUS

APPENDIX

Supershield 4

Type : Self-Shielded

Conformances

AWS A5.36/ ASME SFA5.36 E70T4-AZ-CS3

(AWS A5.20/ ASME SFA5.20 E70T-4)

EN ISO 17632-A-T 42 Z Z W NO 3

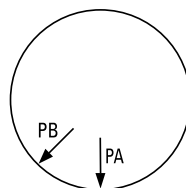
Applications

- Heavy equipment
- Machinery

Features

- High deposition rate
- Good crack resistance
- Good porosity resistance

Welding Position



Current

DC +

Shielding Gas

No shielding gas

Diameter / Packaging

Diameter	Spool	Coil
mm (in)	12.5kg (28lbs)	25kg (55lbs)
2.0 (0.078 in)	✓	✓
2.4 (0.094 in)		✓

Typical Chemical Composition of All-Weld Metal (%)

C	Si	Mn	P	S	Al
0.21	0.36	0.38	0.011	0.003	1.21

Typical Mechanical Properties of All-Weld Metal

YS MPa(lbs/in ²)	TS MPa(lbs/in ²)	EL (%)
450 (65,300)	580 (84,100)	24

Typical Welding Parameters

Diameter, Polarity Shielding Gas	CTWD mm (in)	Wire Feed Speed m/min (in/min)	Amp. (A)	Volt. (V)	Deposition Rate kg/hr (lb/hr)	Efficiency (%)
2.0mm (0.078 in) DC+						
No shielding gas	50 (2)	5.1 (200)	260-300	29-31	1.6 (3.5)	81-84
		6.1 (240)	290-330	30-32	2.3 (5.1)	
		6.6 (260)	310-350	30-32	2.6 (5.7)	
		7.6 (300)	330-370	31-33	3.1 (6.8)	
2.4mm (0.094 in) DC+						
No shielding gas	76 (3)	2.8 (110)	230-270	28-30	2.0 (4.3)	80-85
		3.8 (150)	280-320	29-31	2.5 (5.5)	
		4.7 (185)	330-370	30-32	3.0 (6.6)	
		5.8 (230)	380-420	31-33	4.2 (9.2)	
		7.0 (275)	430-470	32-34	5.6 (12.3)	

Supershield 7

Type : Self-Shielded

Conformances

AWS A5.36/ ASME SFA5.36 E70T7-AZ-CS3

(AWS A5.20/ ASME SFA5.20 E70T-7)

EN ISO 17632-A-T 46 Z Z W NO 3

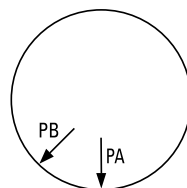
Applications

- general fabrication
- Heavy equipment
- Machinery

Features

- High deposition rate
- Easy slag removal
- Good crack resistance
- Good porosity resistance

Welding Position



Current

DC -

Shielding Gas

No shielding gas

Diameter / Packaging

Diameter	Spool	Coil
mm (in)	12.5kg (28lbs)	25kg (55lbs)
2.0 (0.078 in)	✓	✓
2.4 (0.094 in)		✓

Typical Chemical Composition of All-Weld Metal (%)

C	Si	Mn	P	S	Al
0.26	0.17	0.25	0.011	0.005	1.54

Typical Mechanical Properties of All-Weld Metal

YS Mpa(lbs/in ²)	TS Mpa(lbs/in ²)	EL (%)
492 (71,400)	635 (92,100)	23

Typical Welding Parameters

Diameter, Polarity Shielding Gas	CTWD mm (in)	Wire Feed Speed m/min (in/min)	Amp. (A)	Volt. (V)	Deposition Rate kg/hr (lb/hr)	Efficiency (%)
2.0mm (0.078 in) DC-						
No shielding gas	40 (1.57)	3.9 (155)	250-280	23-27	3.5 (7.7)	78-82
		5.0 (200)	290-320	24-28	4.3 (9.4)	
		6.2 (245)	330-360	24-29	5.3 (11.6)	
2.4mm (0.094 in) DC-						
No shielding gas	45 (1.77)	3.3 (130)	270-300	23-26	4.4 (9.7)	79-84
		4.0 (160)	310-340	24-27	5.6 (12.3)	
		4.6 (185)	350-380	24-28	6.6 (14.5)	
		5.4 (215)	390-420	25-30	7.4 (16.3)	

SMW

SAW

GMW

GTAW

FCW

Non-FERROUS

APPENDIX

Supershield 71-T8

Type : Self-shielded



Conformances

AWS A5.36 / ASME SFA5.36 E71T8-A2-CS3 H8
(AWS A5.20/ ASME SFA5.20 E71T-8 H8)
EN ISO 17632-A-T 42 3 Y NO 2 H10

CE

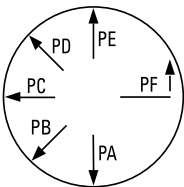
Applications

- General fabrication
- Bridge & Civil construction
- Shipbuilding
- AWS D1.8 Seismic requirements

Features

- Excellent mechanical properties
- Easy slag removal
- Excellent resistance to cracking
- Suitable for outdoor welding

Welding Position



Current

DC -

Shielding Gas

No shielding gas

Diameter / Packaging

Diameter	Spool		Coil	Bucket
mm (in)	12.5kg (28lbs)	15kg (33lbs)	25kg (55lbs)	19.5kg Sealed (6.5kg Basket)
1.6 (1/16)	✓	✓		✓
1.8 (0.072)	✓	✓		✓
2.0 (5/64)	✓	✓	✓	✓

Typical Chemical Composition of All-Weld Metal (%)

C	Si	Mn	P	S	Al
0.16	0.15	0.63	0.003	0.003	0.48

Typical Mechanical Properties of All-Weld Metal

YS Mpa(lbs/in ²)	TS Mpa(lbs/in ²)	EL (%)	Temp °C(°F)	CVN-Impact Value J (ft-lbs)
447 (64,800)	565 (82,000)	32	-30 (-22)	65 (48)

Typical Welding Parameters

Diameter, Polarity Shielding Gas	CTWD mm (in)	Wire Feed Speed m/min (in/min)	Amp. (A)	Volt. (V)	Deposition Rate kg/hr (lb/hr)	Efficiency (%)
1.6mm (1/16 in) DC-						
No shielding gas	25 (1)	4.0 (160)	190~220	18~21	1.7 (3.7)	75~79
		4.8 (190)	210~240	20~22	2.0 (4.4)	
		5.4 (215)	230~260	21~23	2.4 (5.2)	
		6.4 (255)	250~280	22~23	2.7 (5.9)	
1.8mm (0.072 in) DC-						
No shielding gas	25 (1)	3.8 (150)	220~250	21~23	2.6 (5.7)	79~83
		4.3 (170)	250~280	22~23	2.9 (6.3)	
		5.4 (215)	280~310	23~24	3.7 (8.1)	
2.0mm (5/64 in) DC-						
No shielding gas	25 (1)	3.0 (120)	230~260	21~23	2.4 (5.2)	77~81
		3.9 (155)	260~290	22~23	3.0 (6.6)	
		5.2 (205)	290~320	23~24	3.8 (8.3)	

SMW

SAW

GMW

GTAW

FCW

Non-FERROUS

APPENDIX

Supershield EG-72T

Type : Self-Shielded

Conformances

AWS A5.26/ ASME SFA5.26 EG72T-1

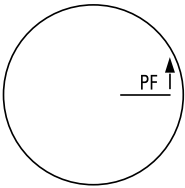
Applications

- Storage tank
- Pressure vessels

Features

- Electro gas arc welding(EGW)
- Vertical-up, V-groove & Square Butt joint single pass EGW process

Welding Position



Current

DC +

Shielding Gas

No shielding gas

Diameter / Packaging

Diameter	Coil
mm (in)	25kg (55lbs)
2.4 (3/32)	✓

Typical Chemical Composition of All-Weld Metal (%)

C	Si	Mn	P	S	Mo
0.05	0.33	1.30	0.004	0.003	0.18

Typical Mechanical Properties of All-Weld Metal

YS MPa(lbs/in ²)	TS MPa(lbs/in ²)	EL (%)	Temp °C(°F)	CVN-Impact Value J (ft-lbs)
450 (65,300)	605 (87,800)	26	-30 (-20)	45 (33)

Typical Welding Parameters

Diameter, Polarity Shielding Gas	CTWD mm (in)	Wire Feed Speed m/min (in/min)	Amp. (A)	Volt. (V)	Deposition Rate kg/hr (lb/hr)
2.4mm (3/32 in) DC+					
No shielding gas	38 (1.49)	6.4 (250)	380~450	34	10 (22.0)
		7.6 (300)	450~480	36	12 (26.5)
		8.9 (350)	480~550	38	15 (33.1)
		10.2 (400)	550~600	45	18 (39.7)

Supershield EG-82T

Type : Self-Shielded

Conformances

AWS A5.26/ ASME SFA5.26 EG82T-G

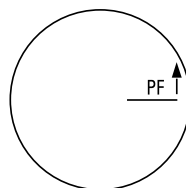
Applications

- Storage tank
- Pressure vessels

Features

- Electro gas arc welding (EGW)
- Vertical- up, V-groove & Square Butt joint single pass EGW process
- Good impact value at low-temperature

Welding Position



Current

DC +

Shielding Gas

No shielding gas

Diameter / Packaging

Diameter	Coil
mm (in)	25kg (55lbs)
2.4 (3/32)	✓

Typical Chemical Composition of All-Weld Metal (%)

C	Si	Mn	P	S	Mo	Ni
0.05	0.37	1.50	0.005	0.003	0.35	1.22

Typical Mechanical Properties of All-Weld Metal

YS MPa(lbs/in ²)	TS MPa(lbs/in ²)	EL (%)	Temp °C(°F)	CVN-Impact Value J (ft-lbs)
539 (78,200)	681 (98,800)	24	-40 (-40)	50 (37)

Typical Welding Parameters

Diameter, Polarity Shielding Gas	CTWD mm (in)	Wire Feed Speed m/min (in/min)	Amp. (A)	Volt. (V)	Deposition Rate kg/hr (lb/hr)
2.4mm (3/32 in) DC+					
No shielding gas	38 (1.49)	6.4 (250)	380~450	34	10 (22.0)
		7.6 (300)	450~480	36	12 (26.5)
		8.9 (350)	480~550	38	15 (33.1)
		10.2 (400)	550~600	45	18 (39.7)

SMW

SAW

GMW

GTAW

FCAW

Non-FERROUS

APPENDIX

SW-307NS Cored

Type : Metal Cored

Conformances

EN ISO 17633-A-T 18 8 Mn M M13/I1

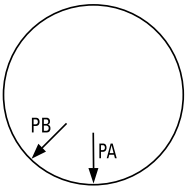
Applications

- Joining and overlay applications on 13Mn steels
- Cladding Carbon steels
- Welding of dissimilar steels (high Mn to carbon steel)

Features

- Flat and horizontal fillet position welding
- High deposition rate and efficiency

Welding Position



Current

DC +

Shielding Gas

Ar + 2% O₂

Diameter / Packaging

Diameter	Spool			Pac		
mm (in)	5kg (11lbs)	12.5kg (27.6lbs)	15kg (33lbs)	250kg (551lbs)	300kg (661lbs)	350kg (771lbs)
1.2 (0.045)		✓	✓	✓	✓	✓
1.6 (1/16)		✓	✓	✓	✓	✓

Typical Chemical Composition of All-Weld Metal (%)

C	Si	Mn	P	S	Cr	Ni	Mo
0.07	0.6	7.3	0.021	0.008	18.3	8.6	0.1

Typical Mechanical Properties of All-Weld Metal

TS MPa(lbs/in ²)	EL (%)	Temp °C(°F)	CVN-Impact Value J (ft.-lbs)
610 (88,500)	43	-20 (-4) -60 (-76)	106 (78) 71 (52)

Typical Welding Parameters

Diameter, Polarity Shielding Gas	CTWD mm (in)	Wire Feed Speed m/min (in/min)	Amp. (A)	Volt. (V)	Deposition Rate kg/hr (lb/hr)
1.2mm (0.045 in) DC+					
Ar + 2% O ₂	20 (0.78)	5.5 (216)	190	23~25	4.2 (9.1)
		6.6 (260)	220	25~27	5 (10.9)
		8.1 (320)	250	26~28	6 (13.0)

SW-307 Cored

Type : Rutile

Conformances

EN ISO 17633-A-T18 8 Mn P M21/C1 2

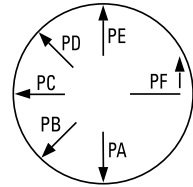
Applications

- Joining and overlay applications on 13Mn steels
- Cladding Carbon steels
- Welding of dissimilar steels (high Mn to carbon steel)

Features

- Good porosity resistance
- Good performance in all positions

Welding Position



Current

DC +

Shielding Gas

100% CO₂
Ar + 20~25% CO₂

Diameter / Packaging

Diameter Spool Pac						
mm (in)	5kg (11lbs)	12.5kg (27.6lbs)	15kg (33lbs)	250kg (551lbs)	300kg (661lbs)	350kg (771lbs)
0.9 (0.035)		✓	✓			
1.0 (0.040)		✓	✓			
1.2 (0.045)	✓	✓	✓			
1.4 (0.052)		✓	✓			
1.6 (1/16)	✓	✓	✓			

Typical Chemical Composition of All-Weld Metal (%)

	C	Si	Mn	P	S	Cr	Ni	Mo
100% CO ₂	0.047	0.88	5.74	0.012	0.008	17.9	8.93	0.01
80% Ar + 20% CO ₂	0.037	0.79	5.15	0.012	0.007	17.9	9.17	0.01

Typical Mechanical Properties of All-Weld Metal

	TS MPa(lbs/in ²)	EL (%)	Temp °C(°F)	CVN-Impact Value J (ft.-lbs)
100% CO ₂	595 (86,275)	47.2	-60 (-76)	67 (49.4)
80% Ar + 20% CO ₂	602(87,290)	46.6	-60 (-76)	62 (45.7)

Typical Welding Parameters

Diameter, Polarity Shielding Gas	CTWD mm (in)	Wire Feed Speed m/min (in/min)	Amp. (A)	Volt. (V)	Deposition Rate kg/hr (lb/hr)
1.2mm (0.045 in) DC+					
100% CO ₂	20 (4/5)	6.2 (244)	140	23~26	2.6 (5.7)
		9.0 (354)	180	27~30	3.8 (8.4)
		12.0 (472)	210	28~31	4.6 (10.1)
80% Ar + 20% CO ₂	20 (4/5)	6.2 (244)	140	23~26	2.7 (5.9)
		9.0 (354)	180	27~30	3.7 (8.3)
		12.0 (472)	210	27~30	4.8 (10.6)
1.6mm (1/16 in) DC+					
100% CO ₂	25 (1)	3.7 (146)	180	24~27	3.0 (6.6)
		6.4 (250)	250	25~28	4.5 (9.9)
		8.9 (350)	290	26~29	5.5 (12.1)
80% Ar + 20% CO ₂	25 (1)	3.7 (146)	180	24~27	3.1 (6.8)
		6.4 (250)	250	25~28	4.6 (10.1)
		8.9 (350)	290	26~29	5.7 (12.6)

SW-308L Cored

Type : Rutile



Conformances

AWS A5.22/ ASME SFA5.22 E308LT1-1/-4

JIS Z3323 TS308L-FB1

EN ISO 17633-A-T 19 9 L P M21/C1 2

ABS AWS A5.22 E308LT1-1 (-120°C 29J)

LR 304L (-120°C)

BV UP (KV -120°C)

DNV-GL VL 308L (-120°C)

NK KW308LG(C)

TÜV EN ISO 17633-A - T 19 9 L P M21/C1 2

DB DIN EN ISO 17633-A-T 19 9 L P M21/C1 2

CWB AWS A5.22 E308LT1-1/4

CE

RS A-5(304L) (C1)

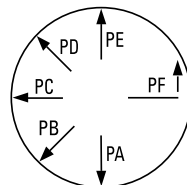
Applications

- 18%Cr-8%Ni stainless steel

Features

- Good porosity resistance
- Good performance in all positions

Welding Position



Current

DC +

Shielding Gas

100% CO₂

Ar + 20~25% CO₂

Diameter / Packaging

Diameter mm (in)	Spool			Pac		
	5kg (11lbs)	12.5kg (27.6lbs)	15kg (33lbs)	250kg (551lbs)	300kg (661lbs)	350kg (771lbs)
0.9 (0.035)	✓	✓	✓			
1.0 (0.040)	✓	✓	✓			
1.2 (0.045)	✓	✓	✓			
1.4 (0.052)	✓	✓	✓			
1.6 (1/16)		✓	✓			

SMW

SAW

GMAW

GTAW

FCAW

Non-FERROUS

APPENDIX

Typical Chemical Composition of All-Weld Metal (%)

	C	Si	Mn	P	S	Cr	Ni	Mo
100% CO ₂	0.019	0.76	1.52	0.015	0.010	18.4	10.6	0.02
80% Ar + 20% CO ₂	0.019	0.76	1.52	0.015	0.010	18.4	9.66	0.02

Typical Mechanical Properties of All-Weld Metal

	TS MPa(lbs/in ²)	EL (%)	Temp °C(°F)	CVN-Impact Value J (ft-lbs)
100% CO ₂	567 (82,215)	48.4	-60 (-76)	53 (39.1)
80% Ar + 20% CO ₂	573 (83,085)	48.4	-60 (-76)	54 (39.8)

Typical Welding Parameters

Diameter, Polarity Shielding Gas	CTWD mm (in)	Wire Feed Speed m/min (in/min)	Amp. (A)	Volt. (V)	Deposition Rate kg/hr (lb/hr)
1.2mm (0.045 in) DC+					
100% CO ₂	20 (4/5)	6.2 (244)	140	23~26	2.6 (5.7)
		9.0 (354)	180	27~30	3.8 (8.4)
		12.0 (472)	210	28~31	4.6 (10.1)
80% Ar + 20% CO ₂	20 (4/5)	6.2 (244)	140	23~26	2.7 (5.9)
		9.0 (354)	180	27~30	3.7 (8.3)
		12.0 (472)	210	27~30	4.8 (10.6)
1.6mm (1/16 in) DC+					
100% CO ₂	25 (1)	3.7 (146)	180	24~27	3.0 (6.6)
		6.4 (250)	250	25~28	4.5 (9.9)
		8.9 (350)	290	26~29	5.5 (12.1)
80% Ar + 20% CO ₂	25 (1)	3.7 (146)	180	24~27	3.1 (6.8)
		6.4 (250)	250	25~28	4.6 (10.1)
		8.9 (350)	290	26~29	5.7 (12.6)

SW-308LT

Type : Rutile

Conformances

AWS A5.22/ ASME SFA5.22 E308LT1-1/-4
JIS Z3323 TS308L-FB1
EN ISO 17633-A-T 19 9 L P M21/C1 2

ABS AWS A5.22 E308LT1-1
(-196°C ≥27 J)

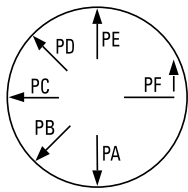
Applications

- Cryogenic service such as LNG storage tank
- 18% Cr-8%Ni stainless steels

Features

- Good impact value at cryogenic temperatures
- Good performance in all positions

Welding Position



Current

DC +

Shielding Gas

100% CO₂
Ar + 20~25% CO₂

Diameter / Packaging

Diameter	Spool			Pac		
mm (in)	5kg (11lbs)	12.5kg (27.6lbs)	15kg (33lbs)	250kg (551lbs)	300kg (661lbs)	350kg (771lbs)
1.2 (0.045)	✓	✓	✓			

SWAW

SAW

GMW

GTAW

FCAW

Non-FERROUS

APPENDIX

Typical Chemical Composition of All-Weld Metal (%)

	C	Si	Mn	P	S	Cr	Ni	Mo
100% CO ₂	0.019	0.76	1.52	0.015	0.010	10.66	18.40	0.02
80% Ar + 20% CO ₂	0.019	0.76	1.52	0.015	0.010	9.66	18.40	0.02

Typical Mechanical Properties of All-Weld Metal

	TS MPa(lbs/in ²)	EL (%)	Temp °C(°F)	CVN-Impact Value J (ft-lbs)
100% CO ₂	567 (82,215)	48.4	-196 (-321)	34 (25.1)
80% Ar + 20% CO ₂	573 (83,085)	48.4	-196 (-321)	36 (25.6)

Typical Welding Parameters

Diameter, Polarity Shielding Gas	CTWD mm (in)	Wire Feed Speed m/min (in/min)	Amp. (A)	Volt. (V)	Deposition Rate kg/hr (lb/hr)
1.2mm (0.045 in) DC+					
100% CO ₂	20 (4/5)	6.2 (244)	140	23~26	2.6 (5.7)
		9.2 (362)	180	27~30	3.5 (7.7)
		12.2 (480)	210	28~31	4.8 (10.6)
80% Ar + 20% CO ₂	20 (4/5)	6.2 (244)	140	23~26	2.6 (5.7)
		9.0 (354)	180	27~30	3.6 (7.9)
		12.0 (472)	210	27~30	4.9 (10.8)

SW-309L Cored

Type : Rutile



Conformances

AWS A5.22/ ASME SFA5.22 E309LT1-1/-4
 JIS Z3323 TS309L-FB1
 EN ISO 17633-A-T 23 12 L P M21/C1 2
 KR RW309LG (C) (-20°C ≥34J)
 ABS AWS A5.22 E309LT1-1
 LR SS/CMn(C1), Dup/CMn, SS/CMn(M21)
 BV 309L with KV at -20°C (-20°C ≥34J)
 DNV-GL VL 309L(C1)

NK KW309LG(C)
 TÜV EN ISO 17633-A-T 23 12 L P M21/C12
 DB DIN EN ISO 17633-A-T 23 12 L P M21/C12
 CWB AWS A5.22 E309LT1-1/4
 CE
 RS A-9sp(309) (C1)

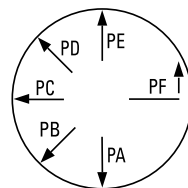
Applications

- 23.5%Cr-13%Ni stainless steels
- Dissimilar welds between carbon, low alloy steels to stainless steels
- Buffer layer welding for cladding, overlays

Features

- Good performance in all positions

Welding Position



Current

DC +

Shielding Gas

100% CO₂
 Ar + 20~25% CO₂

Diameter / Packaging

Diameter mm (in)	Spool			Pac		
	5kg (11lbs)	12.5kg (27.6lbs)	15kg (33lbs)	250kg (551lbs)	300kg (661lbs)	350kg (771lbs)
0.9 (0.035)	✓	✓	✓			
1.0 (0.040)	✓	✓	✓			
1.2 (0.045)	✓	✓	✓			
1.4 (0.052)	✓	✓	✓			
1.6 (1/16)		✓	✓			

SWAW

SAW

GMWAW

GTAW

FCWAW

Non-FERROUS

APPENDIX

Typical Chemical Composition of All-Weld Metal (%)

	C	Si	Mn	P	S	Cr	Ni	Mo
100% CO ₂	0.027	0.74	1.27	0.021	0.006	12.99	23.36	0.130
80% Ar + 20% CO ₂	0.026	0.86	1.43	0.021	0.006	12.82	23.52	0.130

Typical Mechanical Properties of All-Weld Metal

	TS MPa(lbs/in ²)	EL (%)	Temp °C(°F)	CVN-Impact Value J (ft-lbs)
100% CO ₂	540 (78,300)	41	-60 (-76)	46 (33.9)
80% Ar + 20% CO ₂	580 (84,100)	39	-60 (-76)	40 (29.5)

Typical Welding Parameters

Diameter, Polarity Shielding Gas	CTWD mm (in)	Wire Feed Speed m/min (in/min)	Amp. (A)	Volt. (V)	Deposition Rate kg/hr (lb/hr)
1.2mm (0.045 in) DC+					
100% CO ₂	20 (4/5)	6.3 (248)	140	23~26	2.6 (5.7)
		9.0 (354)	180	27~30	3.7 (8.2)
		12.2 (480)	210	28~31	4.7 (10.4)
80% Ar + 20% CO ₂	20 (4/5)	6.2 (244)	140	23~26	2.8 (6.2)
		9.0 (354)	180	27~30	3.8 (8.4)
		12.0 (472)	210	27~30	4.9 (10.8)
1.6mm (1/16 in) DC+					
100% CO ₂	25 (1)	3.7 (146)	180	24~27	3.0 (6.6)
		6.4 (252)	250	25~28	4.6 (10.1)
		8.8 (346)	290	26~29	5.7 (12.6)
80% Ar + 20% CO ₂	25 (1)	3.7 (146)	180	24~27	3.2 (7.1)
		6.3 (248)	250	25~28	4.7 (10.4)
		8.8 (346)	290	26~29	5.9 (13.0)

SW-309LNS Cored

Type : Metal-Cored

Conformances

AWS A5.9/ ASME SFA5.9 EC309L

JIS Z3323 TS309L-MA0

EN ISO 17633-A-T 23 12 L M M21/I1

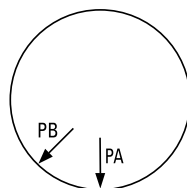
Applications

- Automotive mufflers
- Welding of dissimilar metals such as stainless and carbon a low alloy steels

Features

- Non-slag type
- Low spatter

Welding Position



Current

DC +

Shielding Gas

Ar + 2% O₂

Diameter / Packaging

Diameter mm (in)	Spool			Pac		
	5kg (11lbs)	12.5kg (27.6lbs)	15kg (33lbs)	250kg (551lbs)	300kg (661lbs)	350kg (771lbs)
1.2 (0.045)		✓	✓	✓	✓	✓
1.6 (1/16)		✓	✓	✓	✓	✓

Typical Chemical Composition of All-Weld Metal (%)

C	Si	Mn	P	S	Cr	Ni	Mo	Cu
0.025	0.5	1.8	0.02	0.01	24.0	13.0	0.13	0.12

Typical Mechanical Properties of All-Weld Metal

TS MPa(lbs/in ²)	EL (%)	Temp °C(°F)	CVN-Impact Value J (ft-lbs)
590 (85,600)	45	-20 (-4)	60 (44)

Typical Welding Parameters

Diameter, Polarity Shielding Gas	CTWD mm (in)	Wire Feed Speed m/min (in/min)	Amp. (A)	Volt. (V)	Deposition Rate kg/hr (lb/hr)
1.2mm (0.045 in) DC+					
Ar + 2% O ₂	20 (0.78)	5.5 (216)	190	23~25	4.2 (9.1)
		6.6 (260)	220	25~27	5 (10.9)
		8.1 (320)	250	26~28	6 (13.0)

SWAW

SAW

GMWAW

GTAW

FCAW

Non-FERROUS

APPENDIX

SW-309MoL Cored

Type : Rutile

Conformances

AWS A5.22/ ASME SFA5.22 E309LMoT1-1/-4
JIS Z3323 TS309LMo-FB1
EN ISO 17633-A-T 23 12 2 L P M21/C1 2
KR RW 309MoLG(C)
ABS AWS A5.22 E309LMoT1-1/4
LR AWS A5.22 E309LMoT1-1
BV 309Mo (C1)

DNV-GL VL 309MoL (-20°C)
NK KW309MoLG(C)
CWB AWS A5.22 E309LMoT1-1/4
RINA 309Mo
RS A-9sp(309Mo) (C1)

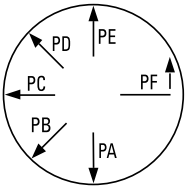
Applications

- 22%Cr-12%Ni-2.5%Mo stainless steels
- Dissimilar welds between carbon, low alloy steels to stainless steels
- Buffer layer welding for cladding, overlays

Features

- Good performance in all positions

Welding Position



Current

DC +

Shielding Gas

100% CO₂
Ar + 20~25% CO₂

Diameter / Packaging

Diameter mm (in)	Spool			Pac		
	5kg (11lbs)	12.5kg (27.6lbs)	15kg (33lbs)	250kg (551lbs)	300kg (661lbs)	350kg (771lbs)
0.9 (0.035)	✓	✓	✓			
1.0 (0.040)	✓	✓	✓			
1.2 (0.045)	✓	✓	✓			
1.4 (0.052)	✓	✓	✓			
1.6 (1/16)		✓	✓			

Typical Chemical Composition of All-Weld Metal (%)

	C	Si	Mn	P	S	Cr	Ni	Mo
100% CO ₂	0.031	0.64	1.39	0.021	0.010	12.42	22.24	2.37
80% Ar + 20% CO ₂	0.035	0.75	1.35	0.021	0.015	12.47	22.34	2.20

Typical Mechanical Properties of All-Weld Metal

	TS MPa(lbs/in ²)	EL (%)	Temp °C(°F)	CVN-Impact Value J (ft-lbs)
100% CO ₂	693 (100,485)	32.4	-60 (-76)	44 (32.4)
80% Ar + 20% CO ₂	661 (95,845)	29.6	-60 (-76)	44 (32.4)

Typical Welding Parameters

Diameter, Polarity Shielding Gas	CTWD mm (in)	Wire Feed Speed m/min (in/min)	Amp. (A)	Volt. (V)	Deposition Rate kg/hr (lb/hr)
1.2mm (0.045 in) DC+					
100% CO ₂	20 (4/5)	6.0 (236)	140	23~26	2.5 (5.5)
		9.0 (354)	180	27~30	3.6 (7.9)
		12.0 (472)	210	28~31	4.6 (10.1)
80% Ar + 20% CO ₂	20 (4/5)	6.2 (244)	140	23~26	2.6 (5.7)
		9.1 (358)	180	27~30	3.6 (7.9)
		12.0 (472)	210	27~30	4.7 (10.4)
1.6mm (1/16 in) DC+					
100% CO ₂	25 (1)	3.8 (150)	180	24~27	2.9 (6.4)
		6.2 (244)	250	25~28	4.4 (10.1)
		8.8 (346)	290	26~29	5.6 (12.3)
80% Ar + 20% CO ₂	25 (1)	3.6 (142)	180	24~27	3.1 (6.8)
		6.3 (248)	250	25~28	4.5 (9.9)
		8.7 (343)	290	26~29	5.5 (12.1)

SW-316L Cored

Type : Rutile



Conformances

AWS A5.22/ASME SFA5.22 E316LT1-1/-4

JIS Z3323 TS316L-FB1

EN ISO 17633-A-T 19 12 3 L P M21/C1 2

KR RW316LG (C) (-60°C ≥ 34J)

ABS AWS A5.22 E316LT1-1/-4

LR 316L (C1)

BV 316L (-60°C) (C1)

DNV-GL VL 316L (C1)

NK KW316LG(C)

TÜV EN ISO 17633-A-T 19 12 3 L P M21/C1 2

DB DIN EN ISO 17633-A-T 19 12 3 L P M21/C1 2

CWB AWS A5.22 E316LT1-1/-4

CE

RS A-6(316L) (C1)

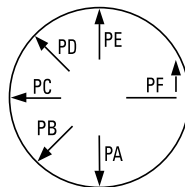
Applications

- 18%Cr-12%Ni-2%Mo stainless steels

Features

- Good performance in all positions

Welding Position



Current

DC +

Shielding Gas

100% CO₂

Ar + 20~25% CO₂

Diameter / Packaging

Diameter mm (in)	Spool			Pac		
	5kg (11lbs)	12.5kg (27.6lbs)	15kg (33lbs)	250kg (551lbs)	300kg (661lbs)	350kg (771lbs)
0.9 (0.035)	✓	✓	✓			
1.0 (0.040)	✓	✓	✓			
1.2 (0.045)	✓	✓	✓			
1.4 (0.052)	✓	✓	✓			
1.6 (1/16)		✓	✓			

Typical Chemical Composition of All-Weld Metal (%)

	C	Si	Mn	P	S	Cr	Ni	Mo
100% CO ₂	0.025	0.90	1.25	0.013	0.008	11.80	17.54	2.63
80% Ar + 20% CO ₂	0.025	0.92	1.38	0.013	0.008	11.73	17.54	2.63

Typical Mechanical Properties of All-Weld Metal

	TS MPa(lbs/in ²)	EL (%)	Temp °C(°F)	CVN-Impact Value J (ft-lbs)
100% CO ₂	550 (79,750)	45.6	-60 (-76)	45 (33)
80% Ar + 20% CO ₂	555 (80,475)	42.4	-60 (-76)	45 (33)

Typical Welding Parameters

Diameter, Polarity Shielding Gas	CTWD mm (in)	Wire Feed Speed m/min (in/min)	Amp. (A)	Volt. (V)	Deposition Rate kg/hr (lb/hr)
1.2mm (0.045 in) DC+					
100% CO ₂	20 (4/5)	6.0 (236)	140	23~26	2.5 (5.5)
		9.2 (362)	180	27~30	3.4 (7.5)
		12.0 (472)	210	28~31	4.5 (9.9)
80% Ar + 20% CO ₂	20 (4/5)	6.1 (240)	140	23~26	2.6 (5.7)
		9.0 (354)	180	27~30	3.6 (7.9)
		11.5 (453)	210	27~30	4.6 (10.1)
1.6mm (1/16 in) DC+					
100% CO ₂	25 (1)	3.8 (150)	180	24~27	3.0 (6.6)
		6.5 (256)	250	25~28	4.6 (10.1)
		8.9 (350)	290	26~29	5.9 (13.0)
80% Ar + 20% CO ₂	25 (1)	3.7 (146)	180	24~27	3.1 (6.8)
		6.4 (250)	250	25~28	4.8 (10.6)
		8.8 (346)	290	26~29	6.1 (13.4)

SW-316LT

Type : Rutile

Conformances

AWS A5.22/ ASME SFA5.22 E316LT1-1/-4
JIS Z3323 TS316L-FB1
EN ISO 17633-A-T 19 12 3 L P M21/C1 2

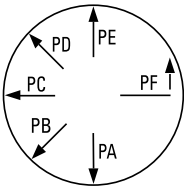
Applications

- Cryogenic service such as LNG storage tank
- 18% Cr-12%Ni-2%Mo stainless steels

Features

- Good impact value at cryogenic temperature
- Good performance in all position

Welding Position



Current

DC +

Shielding Gas

100% CO₂
Ar + 20~25% CO₂

Diameter / Packaging

Diameter	Spool			Pac		
mm (in)	5kg (11lbs)	12.5kg (27.6lbs)	15kg (33lbs)	250kg (551lbs)	300kg (661lbs)	350kg (771lbs)
1.2 (0.045)	✓	✓	✓			

Typical Chemical Composition of All-Weld Metal (%)

	C	Si	Mn	P	S	Cr	Ni	Mo
100% CO ₂	0.018	0.77	1.51	0.015	0.009	17.24	12.23	2.2
80% Ar + 20% CO ₂	0.018	0.77	1.51	0.015	0.009	17.24	12.23	2.2

Typical Mechanical Properties of All-Weld Metal

	TS MPa(lbs/in ²)	EL (%)	Temp °C(°F)	CVN-Impact Value J (ft-lbs)
100% CO ₂	535 (77,575)	47	-196 (-321)	32 (23.6)
80% Ar + 20% CO ₂	542 (78,590)	46	-196 (-321)	33 (24.3)

Typical Welding Parameters

Diameter, Polarity Shielding Gas	CTWD mm (in)	Wire Feed Speed m/min (in/min)	Amp. (A)	Volt. (V)	Deposition Rate kg/hr (lb/hr)
1.2mm (0.045 in) DC+					
100% CO ₂	20 (4/5)	6.0 (236)	140	23~26	2.6 (5.7)
		9.1 (358)	180	27~30	3.5 (7.7)
		12.2 (480)	210	28~31	4.6 (10.1)
80% Ar + 20% CO ₂	20 (4/5)	6.0 (236)	140	23~26	2.6 (5.7)
		9.0 (354)	180	27~30	3.6 (7.9)
		12.0 (472)	210	27~30	4.6 (10.1)

SW-317L Cored

Type : Rutile

Conformances

AWS A5.22/ ASME SFA5.22 E317LT1-1/-4

JIS Z3323 TS317L-FB1

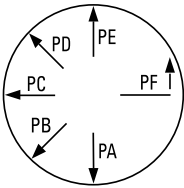
Applications

- 316, 317 type stainless steels

Features

- Good performance in all positions

Welding Position



Current

DC +

Shielding Gas

100% CO₂

Ar + 20~25% CO₂

Diameter / Packaging

Diameter	Spool			Pac		
mm (in)	5kg (11lbs)	12.5kg (27.6lbs)	15kg (33lbs)	250kg (551lbs)	300kg (661lbs)	350kg (771lbs)
0.9 (0.035)	✓	✓	✓			
1.0 (0.040)	✓	✓	✓			
1.2 (0.045)	✓	✓	✓			
1.6 (1/16)		✓	✓			

Typical Chemical Composition of All-Weld Metal (%)

	C	Si	Mn	P	S	Cr	Ni	Mo
100% CO ₂	0.029	0.61	1.41	0.022	0.007	18.71	12.40	3.17
80% Ar + 20% CO ₂	0.028	0.67	1.55	0.022	0.007	18.90	12.55	3.25

Typical Mechanical Properties of All-Weld Metal

	TS MPa(lbs/in ²)	EL (%)	Temp °C(°F)	CVN-Impact Value J (ft-lbs)
100% CO ₂	585 (84,825)	36.8	-60 (-76)	32 (23.6)
80% Ar + 20% CO ₂	595 (86,275)	35.4	-60 (-76)	31 (22.8)

Typical Welding Parameters

Diameter, Polarity Shielding Gas	CTWD mm (in)	Wire Feed Speed m/min (in/min)	Amp. (A)	Volt. (V)	Deposition Rate kg/hr (lb/hr)
1.2mm (0.045 in) DC+					
100% CO ₂	20 (4/5)	6.0 (236)	140	23~26	2.5 (5.5)
		8.9 (350)	180	27~30	3.4 (7.5)
		12.0 (472)	210	28~31	4.5 (9.9)
80% Ar + 20% CO ₂	20 (4/5)	6.0 (236)	140	23~26	2.6 (5.7)
		9.0 (354)	180	27~30	3.5 (7.7)
		11.5 (453)	210	27~30	4.5 (9.9)
1.6mm (1/16 in) DC+					
100% CO ₂	25 (1)	3.8 (150)	180	24~27	3.1 (6.8)
		6.5 (256)	250	25~28	4.6 (10.1)
		8.9 (350)	290	26~29	6.0 (13.2)
80% Ar + 20% CO ₂	25 (1)	3.7 (146)	180	24~27	3.2 (7.1)
		6.4 (250)	250	25~28	4.8 (10.6)
		9.0 (354)	290	26~29	6.2 (13.7)

SW-347 Cored

Type : Rutile

Conformances

AWS A5.22/ ASME SFA5.22 E347T1-1/-4
JIS Z3323 TS347-FB1
EN ISO 17633-A-T 19 9 Nb P M21/C1 2

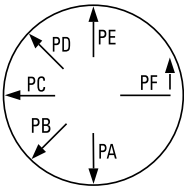
Applications

- Stainless steel boilers and gas turbine
- 347 and 321 type stainless steels

Features

- Good performance in all positions

Welding Position



Current

DC +

Shielding Gas

100% CO₂
Ar + 20~25% CO₂

Diameter / Packaging

Diameter	Spool			Pac		
	5kg (11lbs)	12.5kg (27.6lbs)	15kg (33lbs)	250kg (551lbs)	300kg (661lbs)	350kg (771lbs)
0.9 (0.035)	✓	✓	✓			
1.2 (0.045)	✓	✓	✓			
1.6 (1/16)		✓	✓			

Typical Chemical Composition of All-Weld Metal (%)

	C	Si	Mn	P	S	Cr	Ni	Nb
100% CO ₂	0.053	0.72	1.20	0.014	0.008	18.71	10.12	0.60
80% Ar + 20% CO ₂	0.053	0.72	1.15	0.014	0.008	18.81	10.12	0.60

Typical Mechanical Properties of All-Weld Metal

	TS MPa(lbs/in ²)	EL (%)	Temp °C(°F)	CVN-Impact Value J (ft-lbs)
100% CO ₂	640 (92,800)	40.8	-60 (-76)	53 (39.1)
80% Ar + 20% CO ₂	648 (93,960)	40.6	-60 (-76)	52 (38.3)

Typical Welding Parameters

Diameter, Polarity Shielding Gas	CTWD mm (in)	Wire Feed Speed m/min (in/min)	Amp. (A)	Volt. (V)	Deposition Rate kg/hr (lb/hr)
1.2mm (0.045 in) DC+					
100% CO ₂	20 (4/5)	6.5 (256)	140	23~26	2.6 (5.7)
		9.2 (362)	180	27~30	3.7 (8.2)
		12.5 (492)	210	28~31	4.8 (10.6)
80% Ar + 20% CO ₂	20 (4/5)	6.2 (244)	140	23~26	2.7 (6.0)
		9.0 (354)	180	27~30	3.7 (8.2)
		12.0 (472)	210	27~30	4.9 (10.8)
1.6mm (1/16 in) DC+					
100% CO ₂	25 (1)	3.8 (150)	180	24~27	3.2 (7.1)
		6.5 (256)	250	25~28	4.5 (9.9)
		9.0 (354)	290	26~29	5.6 (12.3)
80% Ar + 20% CO ₂	25 (1)	3.7 (146)	180	24~27	3.3 (7.3)
		6.4 (252)	250	25~28	4.8 (10.6)
		8.9 (350)	290	26~29	5.9 (13.0)

SW-308HBF

Type : Rutiles

Conformances

AWS A5.22/ ASME SFA5.22 E308HT1-1/-4

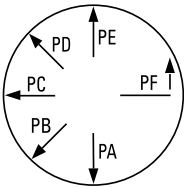
Applications

- Welding of 18%Cr-8%Ni stainless steels for high temperature service

Features

- Designed for welding with 100% CO₂ or Ar+15~25%CO₂ shielding gas
- Excellent all position weldability
- Smooth and stable arc with a fast freezing slag

Welding Position



Current

DC +

Shielding Gas

100% CO₂ / Ar+20~25% CO₂

Diameter / Packaging

Diameter mm (in)	Spool			Pac		
	5kg (11lbs)	12.5kg (27.6lbs)	15kg (33lbs)	250kg (551lbs)	300kg (661lbs)	350kg (771lbs)
0.9 (0.035)	✓	✓	✓			
1.2 (0.045)	✓	✓	✓			
1.6 (1/16)		✓	✓			

Typical Chemical Composition of All-Weld Metal (%)

	C	Si	Mn	P	S	Cr	Ni	Nb
100% CO ₂	0.053	0.68	1.09	0.014	0.009	18.5	10.2	0.02
80% Ar + 20% CO ₂	0.050	0.63	1.00	0.019	0.008	19.1	10.2	0.02

Typical Mechanical Properties of All-Weld Metal

	TS MPa(lbs/in ²)	EL (%)	Temp °C(°F)	CVN-Impact Value J (ft-lbs)
100% CO ₂	580 (84,100)	41.0	-60 (-76)	52 (38.3)
80% Ar + 20% CO ₂	585 (54,825)	42.0	-60 (-76)	53 (39.1)

Typical Welding Parameters

Diameter, Polarity Shielding Gas	CTWD mm (in)	Wire Feed Speed m/min (in/min)	Amp. (A)	Volt. (V)	Deposition Rate kg/hr (lb/hr)
1.2mm (0.045 in) DC+					
100% CO ₂	20 (4/5)	6.5 (256)	140	23~26	2.6 (5.7)
		9.2 (362)	180	27~30	3.7 (8.2)
		12.5 (492)	210	28~31	4.8 (10.6)
80% Ar + 20% CO ₂	20 (4/5)	6.2 (244)	140	23~26	2.7 (6.0)
		9.0 (354)	180	27~30	3.7 (8.2)
		12.0 (472)	210	27~30	4.9 (10.8)
1.6mm (1/16 in) DC+					
100% CO ₂	25 (1)	3.8 (150)	180	24~27	3.2 (7.1)
		6.5 (256)	250	25~28	4.5 (9.9)
		9.0 (354)	290	26~29	5.6 (12.3)
80% Ar + 20% CO ₂	25 (1)	3.7 (146)	180	24~27	3.3 (7.3)
		6.4 (252)	250	25~28	4.8 (10.6)
		8.9 (350)	290	26~29	5.9 (13.0)

SW-309HBF

Type : Rutilés

Conformances

AWS A5.22/ ASME SFA5.22 E309HT1-1/-4

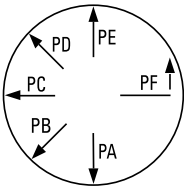
Applications

- Welding of dissimilar metals such as stainless steel and carbon steel or stainless steel and low alloy

Features

- Designed for welding with 100% CO₂ or Ar+15~25%CO₂ shielding gas
- Excellent all position weldability
- Smooth and stable arc with a fast freezing slag

Welding Position



Current

DC +

Shielding Gas

100% CO₂ / Ar+20~25% CO₂

Diameter / Packaging

Diameter mm (in)	Spool			Pac		
	5kg (11lbs)	12.5kg (27.6lbs)	15kg (33lbs)	250kg (551lbs)	300kg (661lbs)	350kg (771lbs)
0.9 (0.035)	✓	✓	✓			
1.2 (0.045)	✓	✓	✓			
1.6 (1/16)		✓	✓			

Typical Chemical Composition of All-Weld Metal (%)

	C	Si	Mn	P	S	Cr	Ni	Nb
100% CO ₂	0.063	0.79	1.51	0.014	0.009	22.8	12.3	0.02
80% Ar + 20% CO ₂	0.060	0.78	1.49	0.015	0.008	22.7	12.2	0.02

Typical Mechanical Properties of All-Weld Metal

	TS MPa(lbs/in ²)	EL (%)	Temp °C(°F)	CVN-Impact Value J (ft-lbs)
100% CO ₂	570 (82,650)	40.0	-60 (-76)	50 (39.9)
80% Ar + 20% CO ₂	574 (83,230)	42.6	-60 (-76)	54 (39.8)

Typical Welding Parameters

Diameter, Polarity Shielding Gas	CTWD mm (in)	Wire Feed Speed m/min (in/min)	Amp. (A)	Volt. (V)	Deposition Rate kg/hr (lb/hr)
1.2mm (0.045 in) DC+					
100% CO ₂	20 (4/5)	6.5 (256)	140	23~26	2.6 (5.7)
		9.2 (362)	180	27~30	3.7 (8.2)
		12.5 (492)	210	28~31	4.8 (10.6)
80% Ar + 20% CO ₂	20 (4/5)	6.2 (244)	140	23~26	2.7 (6.0)
		9.0 (354)	180	27~30	3.7 (8.2)
		12.0 (472)	210	27~30	4.9 (10.8)
1.6mm (1/16 in) DC+					
100% CO ₂	25 (1)	3.8 (150)	180	24~27	3.2 (7.1)
		6.5 (256)	250	25~28	4.5 (9.9)
		9.0 (354)	290	26~29	5.6 (12.3)
80% Ar + 20% CO ₂	25 (1)	3.7 (146)	180	24~27	3.3 (7.3)
		6.4 (252)	250	25~28	4.8 (10.6)
		8.9 (350)	290	26~29	5.9 (13.0)

SMW

SAW

GMW

GTAW

FCW

Non-FERROUS

APPENDIX

SW-316HBF

Conformances

AWS A5.22/ ASME SFA5.22 E316HT1-1/-4

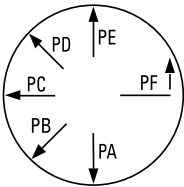
Applications

- Welding of 18%Cr-12%Ni-2% Mo stainless steels for high temperature service.

Features

- Designed for welding with 100% CO₂ or Ar+15~25%CO₂ shielding gas
- Excellent all position weldability
- Smooth and stable arc with a fast freezing slag

Welding Position



Current

DC +

Shielding Gas

100% CO₂
Ar + 20~25% CO₂

Diameter / Packaging

Diameter	Spool			Pac		
	12.5kg (28lbs)	15kg (33lbs)	20kg (44lbs)	250kg (551lbs)	300kg (661lbs)	350kg (771lbs)
mm (in)						
1.2 (0.045)	✓	✓				
1.4 (0.052)						
1.6 (1/16)						

Typical Chemical Composition of All-Weld Metal (%)

	C	Si	Mn	P	S	Cr	Ni	Nb
100% CO ₂	0.056	0.71	1.64	0.016	0.008	18.2	12.5	2.75
80% Ar + 20% CO ₂	0.052	0.71	1.54	0.016	0.008	18.2	12.5	2.59

Typical Mechanical Properties of All-Weld Metal

	TS MPa(lbs/in ²)	EL (%)	Temp °C(°F)	CVN-Impact Value J (ft-lbs)
100% CO ₂	577 (83,665)	41.8	-60 (-76)	60 (44.2)
80% Ar + 20% CO ₂	575 (83,375)	41.9	-60 (-76)	60 (44.2)

Typical Welding Parameters

Diameter, Polarity Shielding Gas	CTWD mm (in)	Wire Feed Speed m/min (in/min)	Amp. (A)	Volt. (V)	Deposition Rate kg/hr (lb/hr)
1.2mm (0.045 in) DC+					
100% CO ₂	20 (4/5)	6.0 (236)	140	23~26	2.5 (5.5)
		9.2 (362)	180	27~30	3.4 (7.5)
		12.0 (472)	210	28~31	4.5 (9.9)
80% Ar + 20% CO ₂	20 (4/5)	6.1 (240)	140	23~26	2.6 (5.7)
		9.0 (354)	180	27~30	3.6 (7.9)
		11.5 (453)	210	27~30	4.6 (10.1)

SW-410 Cored

Type : Rutile

Conformances

AWS A5.22/ ASME SFA5.22 E410T1-1/-4

JIS Z3323 TS410-FB1

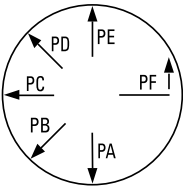
Applications

- 410, 410S, 405 stainless steels
- Welding of ASTM CA6NM castings

Features

- Weld metal of martensite stainless steel
- Good hardness and anti-abrasion properties

Welding Position



Current

DC +

Shielding Gas

100% CO₂

Ar + 20~25% CO₂

Diameter / Packaging

Diameter	Spool			Pac		
mm (in)	5kg (11lbs)	12.5kg (27.6lbs)	15kg (33lbs)	250kg (551lbs)	300kg (661lbs)	350kg (771lbs)
0.8 (0.033)						
0.9 (0.035)						
1.0 (0.040)						
1.2 (0.045)		✓	✓			
1.4 (0.052)						
1.6 (1/16)		✓	✓			

Typical Chemical Composition of All-Weld Metal (%)

	C	Si	Mn	P	S	Cr	Ni	Mo	Cu
100% CO ₂	0.07	0.5	0.4	0.008	0.01	12.5	0.4	0.01	0.03
80% Ar + 20% CO ₂	0.06	0.5	0.4	0.008	0.008	12.5	0.4	0.01	0.03

Typical Mechanical Properties of All-Weld Metal

	TS MPa(lbs/in ²)	EL (%)	Temp °C(°F)	CVN-Impact Value J (ft-lbs)	Heat Treatment
100% CO ₂	610 (88,500)	23	0 (32)	14 (10)	750°C X 1hr
80% Ar + 20% CO ₂	600 (87,000)	23	0 (32)	13 (9)	

Typical Welding Parameters

Diameter, Polarity Shielding Gas	CTWD mm (in)	Wire Feed Speed m/min (in/min)	Amp. (A)	Volt. (V)	Deposition Rate kg/hr (lb/hr)
1.2mm (0.045 in) DC+					
100% CO ₂	20 (0.78)	12.7 (500)	260	29~31	1.3 (2.86)
		16 (628)	280	30~32	1.5 (3.30)
		16.5 (648)	300	31~33	1.8 (3.96)
1.6mm (1/16 in) DC+					
80% Ar + 20% CO ₂	20 (0.78)	7.6 (300)	300	31~33	1.7 (3.74)
		8.0 (314)	320	32~34	2.0 (4.40)
		8.9 (350)	340	32~34	2.3 (5.07)

SW-410NiMo Cored

Type : Rutile

Conformances

AWS A5.22/ ASME SFA5.22 E410NiMoT1-1/-4
JIS Z3323 TS410NiMo-FB1
EN ISO 17633-A-T 13 4 P M21/C1 2

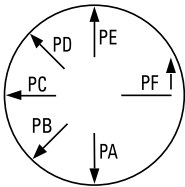
Applications

- Martensite stainless steels (ASTM, CA6NM)
- Hardfacing of continuous casting rolls, valve seat, etc
- Power plant

Features

- Good performance in all positions

Welding Position



Current

DC +

Shielding Gas

100% CO₂
Ar + 20~25% CO₂

Diameter / Packaging

Diameter	Spool			Pac		
	5kg (11lbs)	12.5kg (27.6lbs)	15kg (33lbs)	250kg (551lbs)	300kg (661lbs)	350kg (771lbs)
1.2 (0.045)		✓	✓			
1.6 (1/16)		✓	✓			

Typical Chemical Composition of All-Weld Metal (%)

	C	Si	Mn	P	S	Cr	Ni	Mo
100% CO ₂	0.04	0.65	0.45	0.02	0.01	11.5	4.3	0.45
80% Ar + 20% CO ₂	0.04	0.70	0.50	0.02	0.01	11.5	4.5	0.50

Typical Mechanical Properties of All-Weld Metal

	TS MPa(lbs/in ²)	EL (%)	Temp °C(°F)	CVN-Impact Value J (ft-lbs)	Hardness (HRc)	PWHT
100% CO ₂	890 (129,050)	17	0 (32)	40 (30)	As weld : 37 PWHT : 26	600°C, 1hr, AC
80% Ar + 20% CO ₂	900 (130,500)	17	0 (32)	40 (30)	As weld : 37 PWHT : 27	600°C, 1hr, AC

Typical Welding Parameters

Diameter, Polarity Shielding Gas	CTWD mm (in)	Wire Feed Speed m/min (in/min)	Amp. (A)	Volt. (V)	Deposition Rate kg/hr (lb/hr)
1.2mm (0.045 in) DC+					
100% CO ₂	20 (4/5)	6.2 (244)	140	23~26	2.5 (5.5)
		9.0 (354)	180	27~30	3.6 (7.9)
		12.5 (492)	210	28~31	4.7 (10.4)
80% Ar + 20% CO ₂	20 (4/5)	6.2 (244)	140	23~26	2.6 (5.7)
		9.0 (354)	180	27~30	3.5 (7.7)
		12.0 (472)	210	27~30	4.8 (10.6)
1.6mm (1/16 in) DC+					
100% CO ₂	25 (1)	3.6 (142)	180	24~27	2.9 (6.4)
		6.5 (256)	250	25~28	4.6 (10.1)
		8.8 (346)	290	26~29	5.6 (12.3)
80% Ar + 20% CO ₂	25 (1)	3.7 (146)	180	24~27	3.0 (6.6)
		6.6 (260)	250	25~28	4.6 (10.1)
		8.9 (350)	290	26~29	5.8 (12.8)

SWAW

SAW

GMW

GTAW

FCAW

Non-FERROUS

APPENDIX

SW-2209 Cored

Type : Rutile

Conformances

AWS A5.22/ ASME SFA5.22 E2209T1-1/-4
JIS Z3323 TS2209-FB1
EN ISO 17633-A-T 22 9 3 N L M21/C1 2
KR AWS A5.22 E2209T1-1
ABS AWS A5.22 E2209T1-1(-46°C)
LR S31803

BV UP (KV -20°C ≥41 J)
DNV-GL Duplex Stainless Steel (M21)
NK KW2209G(C)
RS AF-8dup (M21)

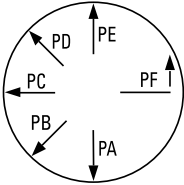
Applications

- Duplex stainless steel (NAS 329J3L, UNS S31803)

Features

- Good performance in all positions

Welding Position



Current

DC +

Shielding Gas

100% CO₂
Ar + 20~25% CO₂

Diameter / Packaging

Diameter mm (in)	Spool			Pac		
	5kg (11lbs)	12.5kg (27.6lbs)	15kg (33lbs)	250kg (551lbs)	300kg (661lbs)	350kg (771lbs)
0.9 (0.035)	✓	✓	✓			
1.2 (0.045)	✓	✓	✓			
1.6 (1/16)		✓	✓			

Typical Chemical Composition of All-Weld Metal (%)

	C	Si	Mn	P	S	Cr	Ni	Mo	N	PREN
100% CO ₂	0.03	0.60	0.7	0.022	0.006	23.0	8.7	3.3	0.13	36
80% Ar + 20% CO ₂	0.03	0.50	1.1	0.010	0.009	23.3	8.8	3.7	0.11	37.5

Typical Mechanical Properties of All-Weld Metal

	TS MPa(lbs/in ²)	EL (%)	Temp °C(°F)	CVN-Impact Value J (ft-lbs)
100% CO ₂	830 (120,350)	29.0	-20 (-4) -50 (-58)	45 (33.2) 35 (25.8)
80% Ar + 20% CO ₂	840 (121,800)	27.0	-20 (-4) -50 (-58)	44 (32.4) 35 (25.8)

Typical Welding Parameters

Diameter, Polarity Shielding Gas	CTWD mm (in)	Wire Feed Speed m/min (in/min)	Amp. (A)	Volt. (V)	Deposition Rate kg/hr (lb/hr)
1.2mm (0.045 in) DC+					
100% CO ₂	20 (4/5)	6.5 (256)	140	23~26	2.6 (5.7)
		9.8 (386)	180	27~30	3.8 (8.4)
		12.5 (492)	210	28~31	4.9 (10.8)
80% Ar + 20% CO ₂	20 (4/5)	6.5 (256)	140	23~26	2.8 (6.2)
		9.5 (374)	180	27~30	4.0 (8.8)
		12.0 (472)	210	27~30	5.0 (11.0)
1.6mm (1/16 in) DC+					
100% CO ₂	25 (1)	3.6 (142)	180	24~27	3.0 (6.6)
		6.5 (256)	250	25~28	4.5 (9.9)
		9.0 (354)	290	26~29	5.3 (11.7)
80% Ar + 20% CO ₂	25 (1)	3.5 (138)	180	24~27	3.2 (7.1)
		6.4 (252)	250	25~28	4.8 (10.6)
		8.9 (350)	290	26~29	5.5 (12.10)

SW-2594 Cored

Type : Rutile

Conformances

AWS A5.22/ASME SFA 5.22 E2594T1-1/-4

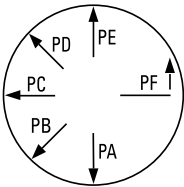
Applications

- Welding of Super Duplex stainless steel(NAS 329J4L, UNS S32750)

Features

- Good porosity resistance
- Good performance in all positions

Welding Position



Current

DC +

Shielding Gas

100% CO₂
Ar+20% CO₂

Diameter / Packaging

Diameter Spool Pac

mm (in)	5kg (11lbs)	12.5kg (27.6lbs)	15kg (33lbs)	250kg (551lbs)	300kg (661lbs)	350kg (771lbs)
0.9 (0.035)		✓	✓			
1.0 (0.040)		✓	✓			
1.2 (0.045)	✓	✓	✓			
1.4 (0.052)		✓	✓			
1.6 (1/16)		✓	✓			

Typical Chemical Composition of All-Weld Metal (%)

	C	Si	Mn	P	S	Cr	Ni	Mo	N	PREN
100% CO ₂	0.023	0.42	0.74	0.018	0.002	25.5	9.15	3.74	0.24	41.8
80% Ar + 20% CO ₂	0.031	0.52	0.75	0.012	0.001	25.7	9.11	3.78	0.23	41.9

Typical Mechanical Properties of All-Weld Metal

	TS MPa(lbs/in ²)	EL (%)	Temp °C(°F)	CVN-Impact Value J (ft-lbs)
100% CO ₂	896 (129,920)	24.2	-20 (-4)	27 (19.9)
80% Ar + 20% CO ₂	891 (129,195)	26	-20 (-4)	37 (27.3)

Typical Welding Parameters

Diameter, Polarity Shielding Gas	CTWD mm (in)	Wire Feed Speed m/min (in/min)	Amp. (A)	Volt. (V)	Deposition Rate kg/hr (lb/hr)
1.2mm (0.045 in) DC+					
100% CO ₂	20 (4/5)	6.2 (244)	140	23~26	2.6 (5.7)
		9.0 (354)	180	27~30	3.8 (8.4)
		12.0 (472)	210	28~31	4.6 (10.1)
80% Ar + 20% CO ₂	20 (4/5)	6.2 (244)	140	23~26	2.7 (5.9)
		9.0 (354)	180	27~30	3.7 (8.3)
		12.0 (472)	210	27~30	4.8 (10.6)
1.6mm (1/16 in) DC+					
100% CO ₂	25 (1)	3.7 (146)	180	24~27	3.0 (6.6)
		6.4 (250)	250	25~28	4.5 (9.9)
		8.9 (350)	290	26~29	5.5 (12.1)
80% Ar + 20% CO ₂	25 (1)	3.7 (146)	180	24~27	3.1 (6.8)
		6.4 (250)	250	25~28	4.6 (10.1)
		8.9 (350)	290	26~29	5.7 (12.6)

Supercored 308L

Type : Rutile



Conformances

AWS A5.22/ ASME SFA5.22 E308LT0-1/-4
JIS Z3323 TS308L-FB0
EN ISO 17633-A-T 19 9 L R M21/C1 3
TÜV EN ISO 17633-A-T 19 9 L R M21/C1 3
DB DIN EN ISO 17633-A-T 19 9 L R M21/C1 3

CE

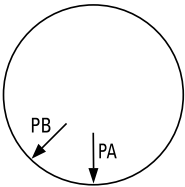
Applications

- 18%Cr-8%Ni stainless steel

Features

- Flat and horizontal fillet position welding
- High deposition rate and efficiency

Welding Position



Current

DC +

Shielding Gas

100% CO₂
Ar + 20~25% CO₂

Diameter / Packaging

Diameter mm (in)	Spool			Pac		
	5kg (11lbs)	12.5kg (27.6lbs)	15kg (33lbs)	250kg (551lbs)	300kg (661lbs)	350kg (771lbs)
0.9 (0.035)	✓	✓	✓			
1.0 (0.040)	✓	✓	✓			
1.2 (0.045)	✓	✓	✓			
1.6 (1/16)		✓	✓			

Typical Chemical Composition of All-Weld Metal (%)

	C	Si	Mn	P	S	Cr	Ni	Mo
100% CO ₂	0.03	0.50	1.50	0.02	0.01	19.0	9.5	0.05
80% Ar + 20% CO ₂	0.03	0.60	1.60	0.02	0.01	19.5	9.6	0.05

Typical Mechanical Properties of All-Weld Metal

	TS MPa(lbs/in ²)	EL (%)	Temp °C(°F)	CVN-Impact Value J (ft-lbs)	Ferrite Number
100% CO ₂	550 (79,750)	44	-20 (-4)	50 (37)	7-10
80% Ar + 20% CO ₂	570 (82,650)	43	-20 (-4)	55 (41)	7-10

Typical Welding Parameters

Diameter, Polarity Shielding Gas	CTWD mm (in)	Wire Feed Speed m/min (in/min)	Amp. (A)	Volt. (V)	Deposition Rate kg/hr (lb/hr)
1.2mm (0.045 in) DC+					
100% CO ₂	20 (4/5)	6.2 (244)	140	23~26	2.7 (6.0)
		9.0 (354)	180	27~30	3.9 (8.6)
		12.0 (472)	210	28~31	5.0 (11.0)
80% Ar + 20% CO ₂	20 (4/5)	6.2 (244)	140	23~26	2.8 (6.2)
		9.0 (354)	180	27~30	4.0 (8.8)
		12.0 (472)	210	27~30	5.1 (11.2)
1.6mm (1/16 in) DC+					
100% CO ₂	25 (1)	3.7 (146)	180	24~27	3.0 (6.6)
		6.4 (250)	250	25~28	4.8 (10.6)
		8.9 (350)	290	26~29	6.3 (13.9)
80% Ar + 20% CO ₂	25 (1)	3.7 (146)	180	24~27	3.1 (6.8)
		6.4 (250)	250	25~28	5.0 (11.0)
		8.9 (350)	290	26~29	6.5 (14.3)

Supercored 309L

Type : Rutile



Conformances

AWS A5.22/ ASME SFA5.22 E309LT0-1/-4

JIS Z3323 TS309L-FB0

EN ISO 17633-A-T 23 12 L R M21/C1 3

TÜV EN ISO 17633-A-T 23 12 L R M21/C1 3

DB DIN EN ISO 17633-A-T 23 12 L R M21/C1 3

CE

LR SS/CMn (M21)

BV 309L (M21)

DNV-GL VL 309L (-20°C) (M21)

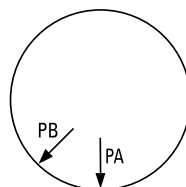
Applications

- 23.5%Cr-13%Ni stainless steels
- Dissimilar welds between carbon, low alloy steels to stainless steels
- Buffer layer welding for cladding, overlays

Features

- Flat and horizontal fillet position welding
- High deposition rate and efficiency

Welding Position



Current

DC +

Shielding Gas

100% CO₂

Ar + 20~25% CO₂

Diameter / Packaging

Diameter mm (in)	Spool			Pac		
	5kg (11lbs)	12.5kg (27.6lbs)	15kg (33lbs)	250kg (551lbs)	300kg (661lbs)	350kg (771lbs)
0.9 (0.035)	✓	✓	✓			
1.0 (0.040)	✓	✓	✓			
1.2 (0.045)	✓	✓	✓			
1.6 (1/16)		✓	✓			

Typical Chemical Composition of All-Weld Metal (%)

	C	Si	Mn	P	S	Cr	Ni	Mo	Cu
100% CO ₂	0.033	0.50	1.61	0.020	0.006	22.5	12.37	0.12	0.12
80% Ar + 20% CO ₂	0.030	0.60	1.66	0.015	0.007	22.6	12.45	0.12	0.15

Typical Mechanical Properties of All-Weld Metal

	TS MPa(lbs/in ²)	EL (%)	Temp °C(°F)	CVN-Impact Value J (ft-lbs)	Ferrite Number
100% CO ₂	570 (82,650)	35	-20 (-4)	45 (33)	18-20
80% Ar + 20% CO ₂	580 (84,100)	34	-20 (-4)	40 (30)	18-20

Typical Welding Parameters

Diameter, Polarity Shielding Gas	CTWD mm (in)	Wire Feed Speed m/min (in/min)	Amp. (A)	Volt. (V)	Deposition Rate kg/hr (lb/hr)
1.2mm (0.045 in) DC+					
100% CO ₂	20 (4/5)	6.2 (244)	140	23~26	2.6 (5.7)
		9.0 (354)	180	27-30	3.8 (8.4)
		12.0 (472)	210	28~31	5.0 (11.0)
80% Ar + 20% CO ₂	20 (4/5)	6.2 (244)	140	23~26	2.8 (6.2)
		9.5 (374)	180	27~30	4.1 (9.0)
		12.0 (472)	210	27-30	5.2 (11.5)
1.6mm (1/16 in) DC+					
100% CO ₂	25 (1)	3.7 (146)	180	24~27	3.3 (7.3)
		6.4 (250)	250	25~28	5.2 (11.5)
		8.9 (350)	290	26~29	6.6 (14.6)
80% Ar + 20% CO ₂	25 (1)	3.7 (146)	180	24~27	3.4 (7.5)
		6.4 (250)	250	25~28	5.4 (11.9)
		8.9 (350)	290	26~29	6.8 (15.0)

Supercored 309MoL

Type : Rutile

Conformances

AWS A5.22/ ASME SFA5.22 E309LMoT0-1/-4
JIS Z3323 TS309LMo-FB0
EN ISO 17633-A-T 23 12 2 L R M21/C1 3
LR SS/CMn (M21)

BV 309LMo (M21)
DNV-GL VL 309MoL (-20°C) (M21)

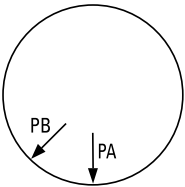
Applications

- 22%Cr-12%Ni-2.5%Mo stainless steels
- Dissimilar welds between carbon, low alloy steels to stainless steels
- Buffer layer welding for cladding, overlays

Features

- Flat and horizontal fillet position welding
- High deposition rate and efficiency

Welding Position



Current

DC +

Shielding Gas

100% CO₂
Ar + 20~25% CO₂

Diameter / Packaging

Diameter mm (in)	Spool			Pac		
	5kg (11lbs)	12.5kg (27.6lbs)	15kg (33lbs)	250kg (551lbs)	300kg (661lbs)	350kg (771lbs)
0.9 (0.035)	✓	✓	✓			
1.0 (0.040)	✓	✓	✓			
1.2 (0.045)	✓	✓	✓			
1.6 (1/16)		✓	✓			

Typical Chemical Composition of All-Weld Metal (%)

	C	Si	Mn	P	S	Cr	Ni	Mo
100% CO ₂	0.03	0.50	1.10	0.02	0.01	22.0	12.2	2.2
80% Ar + 20% CO ₂	0.03	0.60	1.20	0.02	0.01	22.5	12.5	2.3

Typical Mechanical Properties of All-Weld Metal

	TS MPa(lbs/in ²)	EL (%)	Temp °C(°F)	CVN-Impact Value J (ft-lbs)	Ferrite Number
100% CO ₂	680 (98,600)	35	-20 (-4)	50 (37)	17-20
80% Ar + 20% CO ₂	690 (100,050)	32	-20 (-4)	55 (40)	17-20

Typical Welding Parameters

Diameter, Polarity Shielding Gas	CTWD mm (in)	Wire Feed Speed m/min (in/min)	Amp. (A)	Volt. (V)	Deposition Rate kg/hr (lb/hr)
1.2mm (0.045 in) DC+					
100% CO ₂	20 (4/5)	6.2 (244)	140	23~26	2.6 (5.7)
		9.1 (358)	180	27~30	3.9 (8.6)
		12.0 (472)	210	28~31	5.0 (11.0)
80% Ar + 20% CO ₂	20 (4/5)	6.2 (244)	140	23~26	2.8 (6.2)
		9.2 (362)	180	27~30	4.0 (8.8)
		12.0 (472)	210	27~30	5.1 (11.2)
1.6mm (1/16 in) DC+					
100% CO ₂	25 (1)	3.7 (146)	180	24~27	3.3 (7.3)
		6.4 (250)	250	25~28	5.3 (11.7)
		9.0 (354)	290	26~29	6.6 (14.6)
80% Ar + 20% CO ₂	25 (1)	3.6 (142)	180	24~27	3.2 (7.1)
		6.4 (250)	250	25~28	5.5 (12.1)
		9.0 (354)	290	26~29	6.7 (14.8)

Supercored 316L

Type : Rutile



Conformances

AWS A5.22/ ASME SFA5.22 E316LT0-1/-4
JIS Z3323 TS316L-FB0
EN ISO 17633-A-T 19 12 3 L R M21/C1 3
TÜV EN ISO 17633-A-T 19 12 3 L R M21/C1 3
DB DIN EN ISO 17633-A-T 19 12 3 L R M21/C1 3

CE
LR 316L (M21)
BV 316L (M21)
DNV-GL VL 316L (-20°C) (M21)

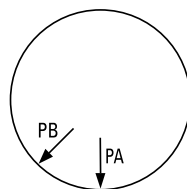
Applications

- 18%Cr-12%Ni-2%Mo stainless steels

Features

- Flat and horizontal fillet position welding
- High deposition rate and efficiency

Welding Position



Current

DC +

Shielding Gas

100% CO₂
Ar + 20~25% CO₂

Diameter / Packaging

Diameter mm (in)	Spool			Pac		
	5kg (11lbs)	12.5kg (27.6lbs)	15kg (33lbs)	250kg (551lbs)	300kg (661lbs)	350kg (771lbs)
0.9 (0.035)	✓	✓	✓			
1.0 (0.040)	✓	✓	✓			
1.2 (0.045)	✓	✓	✓			
1.6 (1/16)		✓	✓			

Typical Chemical Composition of All-Weld Metal (%)

	C	Si	Mn	P	S	Cr	Ni	Mo
100% CO ₂	0.03	0.50	1.50	0.02	0.01	17.8	11.8	2.7
80% Ar + 20% CO ₂	0.03	0.60	1.60	0.02	0.01	18.0	12.0	2.8

Typical Mechanical Properties of All-Weld Metal

	TS MPa(lbs/in ²)	EL (%)	Temp °C(°F)	CVN-Impact Value J (ft-lbs)	Ferrite Number
100% CO ₂	550 (79,750)	40	-20 (-4)	50 (37)	8-10
80% Ar + 20% CO ₂	560 (81,200)	39	-20 (-4)	45 (33)	8-10

Typical Welding Parameters

Diameter, Polarity Shielding Gas	CTWD mm (in)	Wire Feed Speed m/min (in/min)	Amp. (A)	Volt. (V)	Deposition Rate kg/hr (lb/hr)
1.2mm (0.045 in) DC+					
100% CO ₂	20 (4/5)	6.0 (236)	140	23~26	2.7 (5.9)
		9.2 (362)	180	27~30	3.6 (7.9)
		12.0 (472)	210	28~31	4.7 (10.4)
80% Ar + 20% CO ₂	20 (4/5)	6.1 (240)	140	23~26	2.7 (5.9)
		9.0 (354)	180	27~30	3.7 (8.2)
		11.5 (453)	210	27~30	4.8 (10.6)
1.6mm (1/16 in) DC+					
100% CO ₂	25 (1)	3.8 (150)	180	24~27	3.4 (7.5)
		6.5 (256)	250	25~28	4.9 (10.8)
		8.9 (350)	290	26~29	6.3 (13.9)
80% Ar + 20% CO ₂	25 (1)	3.7 (146)	180	24~27	3.5 (7.7)
		6.4 (250)	250	25~28	5.0 (11.0)
		8.8 (346)	290	26~29	6.4 (14.1)

SF-409Ti

Type : Metal-Cored

Conformances

AWS A5.9/ ASME SFA5.9 EC409

JIS Z3323 TS409-MA0

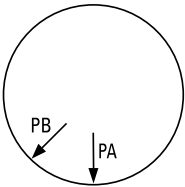
Applications

- Stainless steels 409 Type
- Automotive mufflers

Features

- Good corrosion resistance
- Low spatter
- Non-slag type

Welding Position



Current

DC +

Shielding Gas

Ar + 2% O₂

Diameter / Packaging

Diameter mm (in)	Spool			Pac		
	5kg (11lbs)	12.5kg (27.6lbs)	15kg (33lbs)	250kg (551lbs)	300kg (661lbs)	350kg (771lbs)
0.9 (0.035)		✓	✓	✓	✓	✓
1.0 (0.040)		✓	✓	✓	✓	✓
1.2 (0.045)		✓	✓	✓	✓	✓
1.4 (0.052)		✓	✓	✓	✓	✓

Typical Chemical Composition of All-Weld Metal (%)

C	Si	Mn	P	S	Cr	Ti
0.03	0.50	0.55	0.012	0.010	12.5	0.8

Typical Mechanical Properties of All-Weld Metal

TS MPa(lbs/in ²)	EL (%)
500 (72,600)	20

Typical Welding Parameters

Diameter, Polarity Shielding Gas	CTWD mm (in)	Wire Feed Speed m/min (in/min)	Amp. (A)	Volt. (V)	Deposition Rate kg/hr (lb/hr)
1.2mm (0.045 in) DC+					
Ar + 2% O ₂	20 (0.78)	5.5 (216)	180	23~25	2.9 (6.3)
		6.6 (260)	210	25~27	3.5 (7.6)
		8.1 (320)	250	26~28	4.4 (9.5)

SF-430

Type : Metal-Cored

Conformances

AWS A5.9/ ASME SFA5.9 EC430

JIS Z3323 TS430-MA0

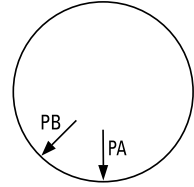
Applications

- Stainless steels 409 and 430 Type
- Automotive mufflers

Features

- Good corrosion resistance
- Low spatter
- Non-slag type

Welding Position



Current

DC +

Shielding Gas

Ar + 2% O₂

Diameter / Packaging

Diameter	Spool			Pac		
mm (in)	5kg (11lbs)	12.5kg (27.6lbs)	15kg (33lbs)	250kg (551lbs)	300kg (661lbs)	350kg (771lbs)
1.2 (0.045)		✓	✓	✓	✓	✓

Typical Chemical Composition of All-Weld Metal (%)

C	Si	Mn	P	S	Cr	Ti
0.03	0.30	0.50	0.005	0.010	16.5	0.45

Typical Mechanical Properties of All-Weld Metal

TS MPa(lbs/in ²)	EL (%)	Heat treatment
500 (72,600)	40	770°C x 2hr FC to 600°C AC to RT

Typical Welding Parameters

Diameter, Polarity Shielding Gas	CTWD mm (in)	Wire Feed Speed m/min (in/min)	Amp. (A)	Volt. (V)	Deposition Rate kg/hr (lb/hr)
1.2mm (0.045 in) DC+					
Ar + 2% O ₂	20 (0.78)	5.5 (216)	180	23~25	3.0 (6.6)
		6.6 (260)	210	25~27	3.4 (7.4)
		8.1 (320)	250	26~28	4.3 (9.4)

SF-430Nb

Type : Metal-Cored

Conformances

JIS Z3323 TS430Nb-MA0

EN 12072 G Z 17 L Nb

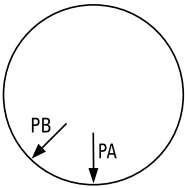
Applications

- Stainless steels 409 and 430 Type
- Automotive mufflers

Features

- Good corrosion resistance
- Low spatter
- Non-slag type

Welding Position



Current

DC +

Shielding Gas

Ar + 2% O₂

Diameter / Packaging

Diameter	Spool			Pac		
mm (in)	5kg (11lbs)	12.5kg (27.6lbs)	15kg (33lbs)	250kg (551lbs)	300kg (661lbs)	350kg (771lbs)
1.2 (0.045)		✓	✓	✓	✓	✓

Typical Chemical Composition of All-Weld Metal (%)

C	Si	Mn	P	S	Cr	Nb	Ti
0.03	0.40	0.17	0.010	0.010	16.5	0.50	0.40

Typical Mechanical Properties of All-Weld Metal

TS MPa(lbs/in ²)	EL (%)	Heat treatment
520 (75,400)	24	770°C x 2hr FC to 600°C AC to RT

Typical Welding Parameters

Diameter, Polarity Shielding Gas	CTWD mm (in)	Wire Feed Speed m/min (in/min)	Amp. (A)	Volt. (V)	Deposition Rate kg/hr (lb/hr)
1.2mm (0.045 in) DC+					
Ar + 2% O ₂	20 (0.78)	5.5 (216)	180	23~25	2.9 (6.3)
		6.6 (260)	210	25~27	3.4 (7.4)
		8.1 (320)	250	26~28	4.5 (9.9)

SF-436

Type : Metal-Cored

Conformances

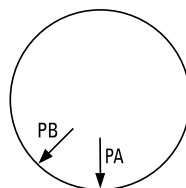
Applications

- Stainless steels 409, 430 and 436 Type
- Automotive mufflers

Features

- Good corrosion resistance
- Low spatter
- Non-slag type

Welding Position



Current

DC +

Shielding Gas

Ar + 2% O₂

Diameter / Packaging

Diameter	Spool			Pac		
mm (in)	5kg (11lbs)	12.5kg (27.6lbs)	15kg (33lbs)	250kg (551lbs)	300kg (661lbs)	350kg (771lbs)
1.2 (0.045)		✓	✓	✓	✓	✓

Typical Chemical Composition of All-Weld Metal (%)

C	Si	Mn	P	S	Cr	Mo	Ti
0.03	0.6	0.4	0.008	0.006	16.8	0.78	0.45

Typical Mechanical Properties of All-Weld Metal

TS MPa(lbs/in ²)	EL (%)	Heat treatment
500 (72,600)	35	770°C x 2hr FC to 600°C AC to RT

Typical Welding Parameters

Diameter, Polarity Shielding Gas	CTWD mm (in)	Wire Feed Speed m/min (in/min)	Amp. (A)	Volt. (V)	Deposition Rate kg/hr (lb/hr)
1.2mm (0.045 in) DC+					
Ar + 2% O ₂	20 (0.78)	5.5 (216)	180	23~25	2.8 (6.2)
		6.6 (260)	210	25~27	3.3 (7.3)
		8.1 (320)	250	26~28	4.5 (9.9)

SMW

SAW

GMW

GTAW

FCW

Non-FERROUS

APPENDIX

SC-439Ti Cored

Type : Metal-Cored

Conformances

AWS A5.22/ ASME SFA5.22 EC439

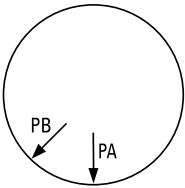
Applications

- Stainless steels 409, 430, 436, 439 Type
- Automotive mufflers

Features

- Good corrosion resistance
- Low spatter
- Non-slag type

Welding Position



Current

DC +

Shielding Gas

Ar + 2% O₂

Diameter / Packaging

Diameter	Spool			Pac		
mm (in)	5kg (11lbs)	12.5kg (27.6lbs)	15kg (33lbs)	250kg (551lbs)	300kg (661lbs)	350kg (771lbs)
1.2 (0.045)		✓	✓	✓	✓	✓

Typical Chemical Composition of All-Weld Metal (%)

C	Si	Mn	P	S	Cr	Ti
0.03	0.3	0.6	0.005	0.010	18.5	0.60

Typical Mechanical Properties of All-Weld Metal

TS MPa(lbs/in ²)	EL (%)	Heat treatment
500 (72,600)	40	770°C x 2hr FC to 600°C AC to RT

Typical Welding Parameters

Diameter, Polarity Shielding Gas	CTWD mm (in)	Wire Feed Speed m/min (in/min)	Amp. (A)	Volt. (V)	Deposition Rate kg/hr (lb/hr)
1.2mm (0.045 in) DC+					
Ar + 2% O ₂	20 (0.78)	5.5 (216)	180	23~25	2.8 (6.2)
		6.6 (260)	210	25~27	3.3 (7.3)
		8.1 (320)	250	26~28	4.3 (9.4)

Supershield CrC

Cr-Carbide Type

Conformances

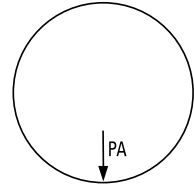
Applications

- Cement roll mill, bucket teeth and lips, crusher and coke hammers, wear plate

Features

- Open arc type hardfacing wire
- Cr-Carbide type

Welding Position



Current

DC +

Welding Process

Open Arc

Diameter / Packaging

Diameter mm (in)	Spool		Coil	Pac		
	12.5kg (27.6lbs)	15kg (33lbs)	25kg (55lbs)	150kg (330lbs)	250kg (551lbs)	350kg (771lbs)
1.2 (0.045)		✓				
1.6 (1/16)		✓				
2.4 (3/32)			✓	✓	✓	
2.8 (7/64)			✓	✓	✓	
3.2 (1/8)						

SMW

SAW

GMW

GTAW

FCW

Non-FERROUS

APPENDIX

Typical Chemical Composition of All-Weld Metal (%)

	C	Si	Mn	P	S	Cr
As welded with 1.2mm wires	4.1	0.4	1.1	0.011	0.004	22.0
As welded with 1.6mm wires	4.5	0.4	1.2	0.011	0.004	25.0
As welded with 2.4/2.8mm wires	5.2	0.6	1.4	0.013	0.005	28.0

Typical Mechanical Properties of All-Weld Metal

		Rockwell Hardness(HRc)		
		1 Layer	2 Layers	4 Layers
On Mild Steel	1.2/1.6mm	42~46	50~54	54~58
	2.4/2.8mm	50~52	54~57	58~62

Typical Welding Parameters

Diameter, Polarity Shielding Gas	CTWD mm (in)	Wire Feed Speed m/min (in/min)	Amp. (A)	Volt. (V)	Deposition Rate kg/hr (lb/hr)
1.6mm (1/16 in) DC+					
Open Arc	25 (1)	5.0 (196)	250	28	3.4 (7.4)
		7.5 (295)	300	29	5.3 (11.6)
		11.5 (452)	350	32	7.5 (16.6)
2.8mm (7/64in), DC+					
Open Arc	25 (1)	2.9 (117)	330	28	5.2 (11.4)
		3.7 (146)	380	29	6.4 (14.1)
		4.4 (174)	430	30	7.3 (16.0)

Supershield CrCW

Cr-Carbide Type

Conformances

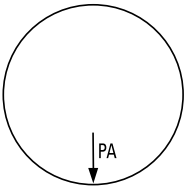
Applications

- Wear plate, conveyor screws, bucket teeth

Features

- Open arc type hardfacing wire
- Cr-Carbide type

Welding Position



Current

DC +

Welding Process

Open Arc

Diameter / Packaging

Diameter	Spool		Coil	Pac		
	12.5kg (27.6lbs)	15kg (33lbs)		150kg (330lbs)	250kg (551lbs)	350kg (771lbs)
mm (in)						
1.2 (0.045)		✓				
1.6 (1/16)		✓				
2.4 (3/32)			✓	✓	✓	
2.8 (7/64)			✓	✓	✓	
3.2 (1/8)						

SMW

SAW

GMW

GTAW

FCW

Non-FERROUS

APPENDIX

Typical Chemical Composition of All-Weld Metal (%)

	C	Si	Mn	P	S	Cr
As welded with 1.2mm wires	4.2	0.5	0.6	0.011	0.006	22.0
As welded with 1.6mm wires	4.5	0.5	0.7	0.011	0.006	25.0
As welded with 2.4/2.8mm wires	5.0	1.0	1.8	0.012	0.008	25.0

Typical Mechanical Properties of All-Weld Metal

		Rockwell Hardness(HRc)		
		1 Layer	2 Layers	4 Layers
On Mild Steel	1.2/1.6mm	40~44	46~49	53~56
	2.4/2.8mm	48~52	52~57	57~62

Typical Welding Parameters

Diameter, Polarity Shielding Gas	CTWD mm (in)	Wire Feed Speed m/min (in/min)	Amp. (A)	Volt. (V)	Deposition Rate kg/hr (lb/hr)
1.6mm (1/16 in) DC+					
Open Arc	25 (1)	5.0 (196)	250	28	3.4 (7.4)
		7.5 (295)	300	29	5.2 (11.4)
		11.5 (452)	350	32	7.4 (16.3)
2.8mm (7/64in), DC+					
Open Arc	25 (1)	2.9 (117)	330	28	5.2 (11.4)
		3.7 (146)	380	29	6.3 (13.9)
		4.4 (174)	430	30	7.2 (15.8)

Supershield CrCH

Cr-Carbide Type

Conformances

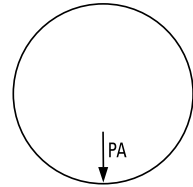
Applications

- Wear plate, conveyor screws, bucket teeth

Features

- Open arc type hardfacing wire
- Cr-Carbide type

Welding Position



Current

DC +

Welding Process

Open Arc

Diameter / Packaging

Diameter	Coil	Pac	
mm (in)	25kg (55lbs)	150kg (330lbs)	250kg (551lbs)
2.8 (7/64)	✓	✓	✓

Typical Chemical Composition of All-Weld Metal (%)

	C	Si	Mn	P	S	Cr
As welded with 2.8mm wires	5.0	0.9	0.2	0.010	0.007	28.0

Typical Mechanical Properties of All-Weld Metal

	Rockwell Hardness(HRC)		
	1 Layer	2 Layers	4 Layers
On Mild Steel (2.8mm)	53-56	56-59	59-63

Typical Welding Parameters

Diameter, Polarity Shielding Gas	CTWD mm (in)	Wire Feed Speed m/min (in/min)	Amp. (A)	Volt. (V)	Deposition Rate kg/hr (lb/hr)
2.8mm (7/64in), DC+					
Open Arc	25 (1)	2.9 (117)	330	28	5.2 (11.4)
		3.7 (146)	380	29	6.4 (14.1)
		4.4 (174)	430	30	7.2 (15.8)

SMW

SAW

GMW

GTAW

FCW

Non-FERROUS

APPENDIX

Supershield CrCNb5

Cr-Carbide+Nb-Carbide Type

Conformances

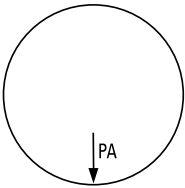
Applications

- Cement roll mill, bucket teeth and lips, crusher and coke hammers, wear plate

Features

- Open arc type hardfacing wire
- Cr-Carbide + Nb-Carbide type

Welding Position



Current

DC +

Welding Process

Open Arc

Diameter / Packaging

Diameter	Coil	Pac	
	25kg (55lbs)	150kg (330lbs)	250kg (551lbs)
mm (in)			
2.8 (7/64)	✓	✓	✓

Typical Chemical Composition of All-Weld Metal (%)

	C	Si	Mn	P	S	Cr	Nb
As welded with 2.4mm wires	5.0	1.0	0.5	0.010	0.006	22.0	4.8

Typical Mechanical Properties of All-Weld Metal

	Rockwell Hardness(HRc)		
	1 Layer	2 Layers	4 Layers
On Mild Steel (2.4mm)	-	-	60-64

Typical Welding Parameters

Diameter, Polarity Shielding Gas	CTWD mm (in)	Wire Feed Speed m/min (in/min)	Amp. (A)	Volt. (V)	Deposition Rate kg/hr (lb/hr)
2.4mm (3/32in), DC+					
Open Arc	25 (1)	2.2 (85)	300	28	3.8 (8.3)
		2.7 (105)	340	29	5.5 (12.1)
		3.1 (124)	380	30	7.1 (15.6)

Supershield CrCNb

Cr-Carbide+Nb-Carbide Type

Conformances

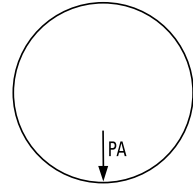
Applications

- Cement roll mill, bucket teeth and lips, crusher and coke hammers, wear plate

Features

- Open arc type hardfacing wire
- Cr-Carbide + Nb-Carbide type

Welding Position



Current

DC +

Welding Process

Open Arc

Diameter / Packaging

Diameter	Spool		Coil	Pac		
mm (in)	12.5kg (27.6lbs)	15kg (33lbs)	25kg (55lbs)	150kg (330lbs)	250kg (551lbs)	350kg (771lbs)
1.2 (0.045)						
1.6 (1/16)		✓				
2.4 (3/32)						
2.8 (7/64)			✓	✓	✓	
3.2 (1/8)						

SMW

SAW

GMW

GTAW

FCW

Non-FERROUS

APPENDIX

Typical Chemical Composition of All-Weld Metal (%)

	C	Si	Mn	P	S	Cr	Nb
As welded with 1.6mm wires	4.5	0.7	0.2	0.015	0.003	21.0	6.5
As welded with 2.8mm wires	5.0	0.8	0.2	0.011	0.004	22.0	6.8

Typical Mechanical Properties of All-Weld Metal

		Rockwell Hardness(HRc)		
		1 Layer	2 Layers	4 Layers
On Mild Steel	1.6mm	-	-	60-64
	2.8mm	-	-	62-65

Typical Welding Parameters

Diameter, Polarity Shielding Gas	CTWD mm (in)	Wire Feed Speed m/min (in/min)	Amp. (A)	Volt. (V)	Deposition Rate kg/hr (lb/hr)
1.6mm (1/16 in) DC+					
Open Arc	25 (1)	5.0 (196)	250	28	3.5 (7.7)
		7.5 (295)	300	29	6.0 (13.2)
		11.5 (452)	350	32	7.8 (17.2)
2.8mm (7/64in), DC+					
Open Arc	25 (1)	2.9 (117)	330	28	5.2 (11.4)
		3.7 (146)	380	29	6.4 (14.1)
		4.4 (174)	430	30	7.3 (16.0)

Supershield CrCMo

Cr-Carbide Type

Conformances

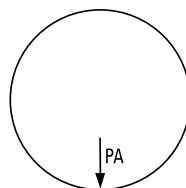
Applications

- Cement roll mill, bucket teeth and lips, crusher and coke hammers, wear plate

Features

- Open arc type hardfacing wire
- Cr-Carbide + Mo-Carbide type

Welding Position



Current

DC +

Welding Process

Open Arc

Diameter / Packaging

Diameter mm (in)	Coil	Pac	
	25kg (55lbs)	150kg (330lbs)	250kg (551lbs)
2.4 (3/32)	✓	✓	✓
2.8 (7/64)	✓	✓	✓

Typical Chemical Composition of All-Weld Metal (%)

	C	Si	Mn	P	S	Cr	Mo
As welded with 2.4/2.8mm wires	5.0	1.0	0.4	0.011	0.003	27.0	1.2

Typical Mechanical Properties of All-Weld Metal

		Rockwell Hardness(HRc)		
		1 Layer	2 Layers	4 Layers
On Mild Steel	2.4mm	-	-	59-63
	2.8mm	-	-	59-63

Typical Welding Parameters

Diameter, Polarity Shielding Gas	CTWD mm (in)	Wire Feed Speed m/min (in/min)	Amp. (A)	Volt. (V)	Deposition Rate kg/hr (lb/hr)
2.8mm (7/64in), DC+					
Open Arc	25 (1)	2.9 (117)	330	28	5.2 (11.4)
		3.7 (146)	380	29	6.4 (14.1)
		4.4 (174)	430	30	7.3 (16.0)

SMW

SAW

GMW

GTAW

FCAW

Non-FERROUS

APPENDIX

Supershield CrCV1

Cr-Carbide Type

Conformances

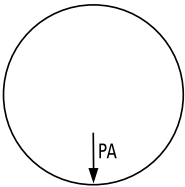
Applications

- Cement roll mill, bucket teeth and lips, crusher and coke hammers, wear plate

Features

- Open arc type hardfacing wire
- Cr-Carbide + V-Carbide type

Welding Position



Current

DC +

Welding Process

Open Arc

Diameter / Packaging

Diameter	Coil		Pac	
	25kg (55lbs)	150kg (330lbs)	250kg (551lbs)	
3.2 (1/8)	✓	✓	✓	

Typical Chemical Composition of All-Weld Metal (%)

	C	Si	Mn	P	S	Cr	V	Ti
As welded with 3.2mm wires	5.0	0.8	2.2	0.012	0.003	28.0	0.5	0.1

Typical Mechanical Properties of All-Weld Metal

	Rockwell Hardness(HRc)		
	1 Layer	2 Layers	4 Layers
On Mild Steel (3.2mm)	-	-	60-63

Typical Welding Parameters

Diameter, Polarity Shielding Gas	CTWD mm (in)	Wire Feed Speed m/min (in/min)	Amp. (A)	Volt. (V)	Deposition Rate kg/hr (lb/hr)
3.2mm (1/8in), DC+					
Open Arc	25 (1)	1.5 (60)	360	29	5.4 (11.9)
		1.8 (71)	400	30	6.7 (14.7)
		1.9 (75)	430	32	7.6 (16.7)

Supershield CrCB

Cr-Carbide Type

Conformances

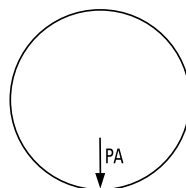
Applications

- Cement roll mill, bucket teeth and lips, crusher and coke hammers, wear plate

Features

- Open arc type hardfacing wire
- Cr-Carbide + B-Carbide type

Welding Position



Current

DC +

Welding Process

Open Arc

Diameter / Packaging

Diameter mm (in)	Coil	Pac	
	25kg (55lbs)	150kg (330lbs)	250kg (551lbs)
2.4 (3/32)	✓	✓	✓
3.2 (1/8)	✓	✓	✓

Typical Chemical Composition of All-Weld Metal (%)

	C	Si	Mn	P	S	Cr	Ti	B
As welded with 2.4/3.2mm wires	4.5	0.6	1.4	0.011	0.002	26.0	0.1	0.3

Typical Mechanical Properties of All-Weld Metal

		Rockwell Hardness(HRc)		
		1 Layer	2 Layers	4 Layers
On Mild Steel	2.4mm	-	-	60-63
	3.2mm	-	-	62-65

Typical Welding Parameters

Diameter, Polarity Shielding Gas	CTWD mm (in)	Wire Feed Speed m/min (in/min)	Amp. (A)	Volt. (V)	Deposition Rate kg/hr (lb/hr)
3.2mm (1/8in), DC+					
Open Arc	25 (1)	1.5 (60)	360	29	5.4 (11.9)
		1.8 (71)	400	30	6.6 (14.5)
		1.9 (75)	430	32	7.5 (16.5)

SMW

SAW

GMW

GTAW

FCW

Non-FERROUS

APPENDIX

Supershield AP-0

High Mn/Cr Type

Conformances

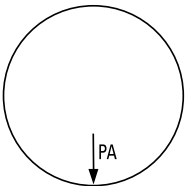
Applications

- Crusher rolls and hammers, cone mills

Features

- Open arc type hardfacing wire(buffer layer)
- High-Mn/Cr type

Welding Position



Current

DC +

Welding Process

Open Arc

Diameter / Packaging

Diameter	Spool		Coil	Pac		
mm (in)	12.5kg (27.6lbs)	15kg (33lbs)	25kg (55lbs)	150kg (330lbs)	250kg (551lbs)	350kg (771lbs)
1.2 (0.045)						
1.6 (1/16)			✓			
2.4 (3/32)			✓	✓	✓	
2.8 (7/64)			✓	✓	✓	
3.2 (1/8)						

Typical Chemical Composition of All-Weld Metal (%)

	C	Si	Mn	Cr
As welded with 1.6/2.4/2.8mm wire	0.4	0.4	16.0	13.0

Typical Mechanical Properties of All-Weld Metal

	Rockwell Hardness(HRC) (≥3layers)	
	As welded	Work hardened
On Mild Steel (1.6/2.4/2.8mm)	15~20	40~50

Typical Welding Parameters

Diameter, Polarity Shielding Gas	CTWD mm (in)	Wire Feed Speed m/min (in/min)	Amp. (A)	Volt. (V)	Deposition Rate kg/hr (lb/hr)
1.6mm (1/16 in) DC+					
Open Arc	25 (1)	4.9 (192)	240	26	3.4 (7.5)
		7.3 (287)	280	29	4.5 (9.9)
		11.2 (440)	330	30	5.4 (11.9)
2.8mm (7/64in), DC+					
Open Arc	25 (1)	2.9 (114)	330	27	5.0 (11.0)
		3.3 (130)	360	29	5.7 (12.5)
		3.8 (149)	400	30	6.5 (14.3)

SWAW

SAW

GMWAW

GTAW

FCAW

Non-FERROUS

APPENDIX

Supershield 16Mn-0

High Mn Type

Conformances

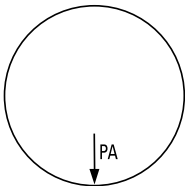
Applications

- Crusher rolls and hammers, cone mills

Features

- Open arc type hardfacing wire(buffer layer)
- High-Mn type

Welding Position



Current

DC +

Welding Process

Open Arc

Diameter / Packaging

Diameter	Spool		Coil	Pac		
mm (in)	12.5kg (27.6lbs)	15kg (33lbs)	25kg (55lbs)	150kg (330lbs)	250kg (551lbs)	350kg (771lbs)
1.2 (0.045)						
1.6 (1/16)						
2.4 (3/32)			✓	✓	✓	
2.8 (7/64)			✓	✓	✓	
3.2 (1/8)						

Typical Chemical Composition of All-Weld Metal (%)

	C	Si	Mn	Cr
As welded with 1.6/2.4/2.8mm wire	0.5	0.5	17.0	3.5

Typical Mechanical Properties of All-Weld Metal

	Rockwell Hardness(HRC) (≥3layers)	
	As welded	Work hardened
On Mild Steel (1.6/2.4/2.8mm)	15~20	40~50

Typical Welding Parameters

Diameter, Polarity Shielding Gas	CTWD mm (in)	Wire Feed Speed m/min (in/min)	Amp. (A)	Volt. (V)	Deposition Rate kg/hr (lb/hr)
2.4mm (3/32 in) DC+					
Open Arc	25 (1)	3.6 (144)	310	26	4.3 (9.4)
		4.7 (185)	360	28	6.1 (13.4)
		6.1 (242)	410	30	8.4 (18.5)
2.8mm (7/64in), DC+					
Open Arc	25 (1)	2.9 (114)	330	27	5.2 (11.4)
		3.3 (130)	360	29	5.8 (12.7)
		3.8 (149)	400	30	6.8 (14.9)

Supershield 309L-0

Conformances

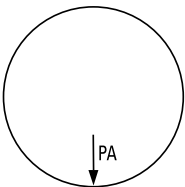
Applications

- Crusher rolls and hammers, cone mills

Features

- Open arc type hardfacing wire(buffer layer)
- High-Cr/Ni stainless steel type

Welding Position



Current

DC +

Welding Process

Open Arc

Diameter / Packaging

Diameter	Coil	Pac	
mm (in)	25kg (55lbs)	150kg (330lbs)	250kg (551lbs)
2.8 (7/64)	✓	✓	✓

Typical Chemical Composition of All-Weld Metal (%)

	C	Si	Mn	Cr	Ni	Mo
As welded with 2.8mm wire	0.02	0.35	1.4	22.5	12.5	0.05

Typical Mechanical Properties of All-Weld Metal

	Rockwell Hardness (HRc)	TS MPa(lbs/in ²)	EL (%)
All-Weld Metal	-	630 (91,400)	38

Typical Welding Parameters

Diameter, Polarity Shielding Gas	CTWD mm (in)	Wire Feed Speed m/min (in/min)	Amp. (A)	Volt. (V)	Deposition Rate kg/hr (lb/hr)
2.8mm (7/64in), DC+					
Open Arc	25 (1)	2.9 (114)	330	27	5.1 (11.2)
		3.3 (130)	360	29	5.8 (12.7)
		3.8 (149)	400	30	6.7 (14.7)

SC-BU Cored

Low Alloy Type

Conformances

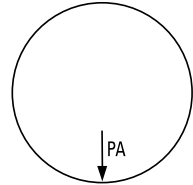
Applications

- Crain wheels, pulleys

Features

- Open arc type hardfacing wire(build-up)
- Low alloy type

Welding Position



Current

DC +

Welding Process

Open Arc

Diameter / Packaging

Diameter	Spool		Coil	Pac		
mm (in)	12.5kg (27.6lbs)	15kg (33lbs)	25kg (55lbs)	150kg (330lbs)	250kg (551lbs)	350kg (771lbs)
1.2 (0.045)						
1.6 (1/16)						
2.4 (3/32)			✓	✓	✓	
2.8 (7/64)			✓	✓	✓	
3.2 (1/8)						

SMW

SAW

GMW

GTAW

FCW

Non-FERROUS

APPENDIX

Typical Chemical Composition of All-Weld Metal (%)

	C	Si	Mn	Cr
As welded with 2.4/2.8mm wire	0.12	0.8	2.7	1.0

Typical Mechanical Properties of All-Weld Metal

	Rockwell Hardness(HRC) (≥3layers)
On Mild Steel (2.4/2.8mm)	25~35

Typical Welding Parameters

Diameter, Polarity Shielding Gas	CTWD mm (in)	Wire Feed Speed m/min (in/min)	Amp. (A)	Volt. (V)	Deposition Rate kg/hr (lb/hr)
2.4mm (3/32 in) DC+					
Open Arc	25 (1)	3.2 (127)	310	26	3.9 (8.6)
		4.0 (158)	360	28	4.6 (10.1)
		4.6 (181)	410	30	5.1 (11.2)
2.8mm (7/64in), DC+					
Open Arc	25 (1)	2.9 (114)	330	27	4.9 (10.8)
		3.3 (130)	360	29	5.5 (12.1)
		3.8 (149)	400	30	6.3 (13.8)

Supershield 430-0

Ferritic STS Type

Conformances

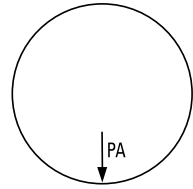
Applications

- Continuous casting rolls, steel mill rolls

Features

- Open arc type hardfacing wire(build-up)
- Ferritic stainless steel type

Welding Position



Current

DC +

Welding Process

Open Arc

Diameter / Packaging

Diameter mm (in)	Coil	Pac	
	25kg (55lbs)	150kg (330lbs)	250kg (551lbs)
2.4 (3/32)	✓	✓	✓
2.8 (7/64)	✓	✓	✓

Typical Chemical Composition of All-Weld Metal (%)

	C	Si	Mn	Cr
As welded with 2.4/2.8mm wire	0.05	0.7	0.9	17.0

Typical Mechanical Properties of All-Weld Metal

	Rockwell Hardness(HRC) (≥3layers)
On Mild Steel (2.4/2.8mm)	5~10

Typical Welding Parameters

Diameter, Polarity Shielding Gas	CTWD mm (in)	Wire Feed Speed m/min (in/min)	Amp. (A)	Volt. (V)	Deposition Rate kg/hr (lb/hr)
2.8mm (7/64in), DC+					
Open Arc	25 (1)	2.9 (114)	330	27	4.9 (10.8)
		3.3 (130)	360	29	5.6 (12.3)
		3.8 (149)	400	30	6.5 (14.2)

SMW

SAW

GMW

GTAW

FCAW

Non-FERROUS

APPENDIX

Supershield 410NiMo-0

Martentic STS Type

Conformances

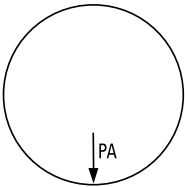
Applications

- Continuous casting rolls, steel mill rolls

Features

- Open arc type hardfacing wire
- Martensitic stainless steel type

Welding Position



Current

DC +

Welding Process

Open Arc

Diameter / Packaging

Diameter	Coil	Pac	
mm (in)	25kg (55lbs)	150kg (330lbs)	250kg (551lbs)
2.4 (3/32)	✓	✓	✓
2.8 (7/64)	✓	✓	✓

Typical Chemical Composition of All-Weld Metal (%)

	C	Si	Mn	Cr	Ni	Mo	Nb
As welded with 2.4/2.8mm wire	0.05	0.7	0.9	13.0	4.0	0.5	0.2

Typical Mechanical Properties of All-Weld Metal

	Rockwell Hardness(HRC) (≥3layers)
On Mild Steel (2.4/2.8mm)	36~40

Typical Welding Parameters

Diameter, Polarity Shielding Gas	CTWD mm (in)	Wire Feed Speed m/min (in/min)	Amp. (A)	Volt. (V)	Deposition Rate kg/hr (lb/hr)
2.8mm (7/64in), DC+					
Open Arc	25 (1)	2.9 (114)	330	27	4.9 (10.8)
		3.3 (130)	360	29	5.5 (12.1)
		3.8 (149)	400	30	6.6 (14.5)

SC-410NiMoS

Martentic STS Type

Conformances

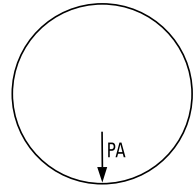
Applications

- Continuous casting rolls, steel mill rolls

Features

- Submerged arc type hardfacing wire
- Martensitic stainless steel type

Welding Position



Current

DC +

Welding Process

SAW(with S-717/S-401HF flux)

Diameter / Packaging

Diameter	Coil	Pac	
mm (in)	25kg (55lbs)	150kg (330lbs)	250kg (551lbs)
3.2 (1/8)	√	√	√

Typical Chemical Composition of All-Weld Metal (%)

	C	Si	Mn	Cr	Ni	Mo
As welded with 3.2mm wire	0.05	0.7	1.7	13.0	4.5	0.5

Typical Mechanical Properties of All-Weld Metal

	Rockwell Hardness(HRC) (≥3layers)
On Mild Steel (2.4/2.8mm)	36~40

Typical Welding Parameters

Diameter, Polarity Shielding Gas	CTWD mm (in)	Wire Feed Speed m/min (in/min)	Amp. (A)	Volt. (V)	Deposition Rate kg/hr (lb/hr)
3.2mm (1/8in), DC+					
Submerged Arc	25 (1)	1.4 (55)	350	28	3.7 (8.2)
		1.7 (66)	390	30	4.5 (9.9)
		1.8 (72)	430	31	5.3 (11.6)

SMW

SAW

GMW

GTAW

FCW

Non-FERROUS

APPENDIX

SC-414S

Martentic STS Type

Conformances

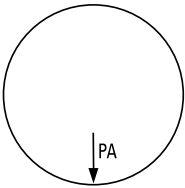
Applications

- Continuous casting rolls, steel mill rolls

Features

- Submerged arc type hardfacing wire
- Martensitic stainless steel type

Welding Position



Current

DC +

Welding Process

SAW(with S-717/S-401HF flux)

Diameter / Packaging

Diameter	Coil	Pac	
mm (in)	25kg (55lbs)	150kg (330lbs)	250kg (551lbs)
2.4 (3/32)	✓	✓	✓
3.2 (1/8)	✓	✓	✓

Typical Chemical Composition of All-Weld Metal (%)

	C	Si	Mn	Cr	Ni	Mo	Nb	V
As welded with 2.4/3.2mm wire	0.11	0.6	1.5	13.8	2.8	1.1	0.2	0.3

Typical Mechanical Properties of All-Weld Metal

	Rockwell Hardness(HRC) (≥3layers)
On Mild Steel (2.4/3.2mm)	42~46

Typical Welding Parameters

Diameter, Polarity Shielding Gas	CTWD mm (in)	Wire Feed Speed m/min (in/min)	Amp. (A)	Volt. (V)	Deposition Rate kg/hr (lb/hr)
3.2mm (1/8in), DC+					
Submerged Arc	25 (1)	1.4 (55)	350	28	3.8 (8.4)
		1.7 (66)	390	30	4.6 (10.1)
		1.8 (72)	430	31	5.2 (11.4)

SC-420S

Martentic STS Type

Conformances

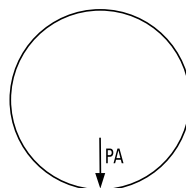
Applications

- Continuous casting rolls, steel mill rolls

Features

- Submerged arc type hardfacing wire
- Martensitic stainless steel type

Welding Position



Current

DC +

Welding Process

SAW(with S-717/S-401HF flux)

Diameter / Packaging

Diameter	Coil	Pac	
	25kg (55lbs)	150kg (330lbs)	250kg (551lbs)
2.8 (7/64)	✓	✓	✓
3.2 (1/8)	✓	✓	✓

Typical Chemical Composition of All-Weld Metal (%)

	C	Si	Mn	Cr	Ni	Mo	Nb	V	W
As welded with 2.8/3.2mm wire	0.3	0.6	1.7	11.5	0.5	1.5	0.15	0.3	1.3

Typical Mechanical Properties of All-Weld Metal

	Rockwell Hardness(HRC) (≥3layers)
On Mild Steel (2.8/3.2mm)	48-53

Typical Welding Parameters

Diameter, Polarity Shielding Gas	CTWD mm (in)	Wire Feed Speed m/min (in/min)	Amp. (A)	Volt. (V)	Deposition Rate kg/hr (lb/hr)
3.2mm (1/8in), DC+					
Submerged Arc	25 (1)	1.4 (55)	350	28	3.9 (8.6)
		1.7 (66)	390	30	4.6 (10.1)
		1.8 (72)	430	31	5.3 (11.6)

SMW

SAW

GMW

GTAW

FCAW

Non-FERROUS

APPENDIX

SC-420SG

Martentic STS Type

Conformances

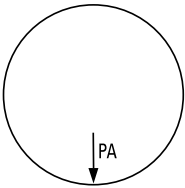
Applications

- Continuous casting rolls, steel mill rolls

Features

- Submerged arc type hardfacing wire
- Martensitic stainless steel type

Welding Position



Current

DC +

Welding Process

SAW(with S-717/S-401HF flux)

Diameter / Packaging

Diameter mm (in)	Coil	Pac	
	25kg (55lbs)	150kg (330lbs)	250kg (551lbs)
1.6 (1/16)	✓	✓	✓
2.4 (3/32)	✓		
3.2 (1/8)	✓	✓	✓

Typical Chemical Composition of All-Weld Metal (%)

	C	Si	Mn	Cr	Ni	Nb
As welded with 1.6/2.4/3.2mm wire	0.2	0.6	1.5	13.0	0.2	0.15

Typical Mechanical Properties of All-Weld Metal

	Rockwell Hardness(HRC) (≥3layers)
On Mild Steel (1.6/2.4/3.2mm)	48-53

Typical Welding Parameters

Diameter, Polarity Shielding Gas	CTWD mm (in)	Wire Feed Speed m/min (in/min)	Amp. (A)	Volt. (V)	Deposition Rate kg/hr (lb/hr)
1.6mm (1/16 in) DC+					
Submerged Arc	25 (1)	4.9 (192)	240	26	2.4 (5.3)
		7.3 (287)	280	29	3.5 (7.7)
		11.2 (440)	330	30	4.4 (9.7)
3.2mm (1/8in), DC+					
Submerged Arc	25 (1)	1.4 (55)	350	28	3.8 (8.4)
		1.7 (66)	390	30	4.5 (9.9)
		1.8 (72)	430	31	5.2 (11.4)

SC-423S

Ferritic STS Type

Conformances

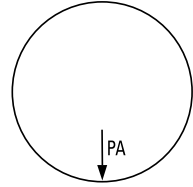
Applications

- Continuous casting rolls, steel mill rolls

Features

- Submerged arc type hardfacing wire(build-up)
- Ferritic stainless steel type

Welding Position



Current

DC +

Welding Process

SAW(with S-717/S-401HF flux)

Diameter / Packaging

Diameter	Coil	Pac	
	25kg (55lbs)	150kg (330lbs)	250kg (551lbs)
mm (in)			
3.2 (1/8)	√	√	√

Typical Chemical Composition of All-Weld Metal (%)

	C	Si	Mn	Cr	Ni	Mo	Nb	V
As welded with 3.2mm wire	0.06	0.4	1.4	17.0	2.4	1.1	0.2	0.3

Typical Mechanical Properties of All-Weld Metal

	Rockwell Hardness(HRC) (≥3layers)
On Mild Steel (3.2mm)	5~10

Typical Welding Parameters

Diameter, Polarity Shielding Gas	CTWD mm (in)	Wire Feed Speed m/min (in/min)	Amp. (A)	Volt. (V)	Deposition Rate kg/hr (lb/hr)
3.2mm (1/8in), DC+					
Submerged Arc	25 (1)	1.4 (55)	350	28	3.7 (8.1)
		1.7 (66)	390	30	4.4 (9.7)
		1.8 (72)	430	31	5.2 (11.4)

SMW

SAW

GMW

GTAW

FCAW

Non-FERROUS

APPENDIX

SC-430S

Ferritic STS Type

Conformances

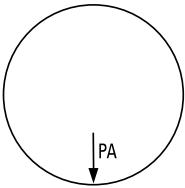
Applications

- Continuous casting rolls, steel mill rolls

Features

- Submerged arc type hardfacing wire(build-up)
- Ferritic stainless steel type

Welding Position



Current

DC +

Welding Process

SAW(with S-717/S-401HF flux)

Diameter / Packaging

Diameter	Coil	Pac	
mm (in)	25kg (55lbs)	150kg (330lbs)	250kg (551lbs)
3.2 (1/8)	✓	✓	✓

Typical Chemical Composition of All-Weld Metal (%)

	C	Si	Mn	Cr
As welded with 2.4/3.2mm wire	0.05	0.7	1.3	17.0

Typical Mechanical Properties of All-Weld Metal

	Rockwell Hardness(HRC) (≥3layers)
On Mild Steel (2.4/3.2mm)	5~10

Typical Welding Parameters

Diameter, Polarity Shielding Gas	CTWD mm (in)	Wire Feed Speed m/min (in/min)	Amp. (A)	Volt. (V)	Deposition Rate kg/hr (lb/hr)
3.2mm (1/8in), DC+					
Submerged Arc	25 (1)	1.4 (55)	350	28	3.8 (8.4)
		1.7 (66)	390	30	4.5 (9.9)
		1.8 (72)	430	31	5.3 (11.6)

SC-30S

Low / Middle Alloy Type

Conformances

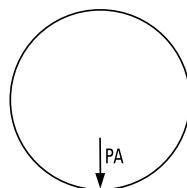
Applications

- Crane wheels, rod wheels, tractor roller

Features

- Submerged arc type hardfacing wire
- Low/Middle alloy type

Welding Position



Current

DC +

Welding Process

SAW(with S-717/S-401HF flux)

Diameter / Packaging

Diameter	Coil	Pac	
mm (in)	25kg (55lbs)	150kg (330lbs)	250kg (551lbs)
3.2 (1/8)	✓	✓	✓

Typical Chemical Composition of All-Weld Metal (%)

	C	Si	Mn	Cr	Mo
As welded with 3.2mm wire	0.15	0.5	1.9	2.0	0.3

Typical Mechanical Properties of All-Weld Metal

	Rockwell Hardness(HRC) (≥3layers)
On Mild Steel (3.2mm)	30-33

Typical Welding Parameters

Diameter, Polarity Shielding Gas	CTWD mm (in)	Wire Feed Speed m/min (in/min)	Amp. (A)	Volt. (V)	Deposition Rate kg/hr (lb/hr)
3.2mm (1/8in), DC+					
Submerged Arc	25 (1)	1.4 (58)	350	28	4.2 (9.2)
		1.7 (70)	390	30	5.1 (11.2)
		1.9 (76)	430	31	5.8 (12.7)

SMW

SAW

GMW

GTAW

FCAW

Non-FERROUS

APPENDIX

SC-45S

Low / Middle Alloy Type

Conformances

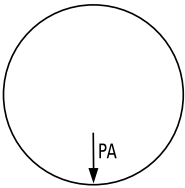
Applications

- Crane wheels, rod wheels, tractor roller

Features

- Submerged arc type hardfacing wire
- Low/Middle alloy type

Welding Position



Current

DC +

Welding Process

SAW(with S-717/S-401HF flux)

Diameter / Packaging

Diameter	Coil		Pac	
mm (in)	25kg (55lbs)	150kg (330lbs)	250kg (551lbs)	
3.2 (1/8)	✓	✓	✓	

Typical Chemical Composition of All-Weld Metal (%)

	C	Si	Mn	Cr	Mo
As welded with 3.2mm wire	0.2	0.5	2.3	3.4	0.5

Typical Mechanical Properties of All-Weld Metal

	Rockwell Hardness(HRC) (≥3layers)
On Mild Steel (3.2mm)	43~48

Typical Welding Parameters

Diameter, Polarity Shielding Gas	CTWD mm (in)	Wire Feed Speed m/min (in/min)	Amp. (A)	Volt. (V)	Deposition Rate kg/hr (lb/hr)
3.2mm (1/8in), DC+					
Submerged Arc	25 (1)	1.4 (58)	350	28	4.3 (9.4)
		1.7 (70)	390	30	5.2 (11.4)
		1.9 (76)	430	31	5.9 (12.9)

SC-55S

Middle Alloy Type

Conformances

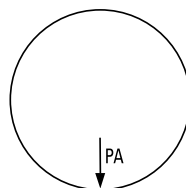
Applications

- Crane wheels, rod wheels, tractor roller

Features

- Submerged arc type hardfacing wire
- Low/Middle alloy type

Welding Position



Current

DC +

Welding Process

SAW(with S-717/S-401HF flux)

Diameter / Packaging

Diameter	Coil	Pac	
mm (in)	25kg (55lbs)	150kg (330lbs)	250kg (551lbs)
3.2 (1/8)	✓	✓	✓

Typical Chemical Composition of All-Weld Metal (%)

	C	Si	Mn	Cr	Mo	W
As welded with 3.2mm wire	0.3	0.6	2.0	6.5	1.5	1.5

Typical Mechanical Properties of All-Weld Metal

	Rockwell Hardness(HRC) (≥3layers)
On Mild Steel (3.2mm)	50-55

Typical Welding Parameters

Diameter, Polarity Shielding Gas	CTWD mm (in)	Wire Feed Speed m/min (in/min)	Amp. (A)	Volt. (V)	Deposition Rate kg/hr (lb/hr)
3.2mm (1/8in), DC+					
Submerged Arc	25 (1)	1.4 (58)	350	28	4.5 (9.9)
		1.7 (70)	390	30	5.3 (11.6)
		1.9 (76)	430	31	6.0 (13.1)

SMW

SAW

GMW

GTAW

FCAW

Non-FERROUS

APPENDIX

SC-A4S

Low Alloy Type

Conformances

AWS A5.23/ ASME SFA5.23 F8P2 ECA4-A4

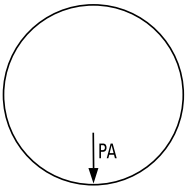
Applications

- High strength steel, creep resisting steel

Features

- Submerged arc type hardfacing wire
- Low alloy type

Welding Position



Current

DC +

Welding Process

SAW(with S-717/S-401HF flux)

Diameter / Packaging

Diameter	Coil	Pac	
	25kg (55lbs)	150kg (330lbs)	250kg (551lbs)
mm (in)			
2.4 (3/32)	✓	✓	✓

Typical Chemical Composition of All-Weld Metal (%)

	C	Si	Mn	Mo
As welded with 2.4mm wire	0.10	0.5	1.4	0.5

Typical Mechanical Properties of All-Weld Metal

	TS MPa(lbs/in ²)	EL (%)	Temp °C(°F)	CVN-Impact Value J (ft.-lbs)	Heat Treatment
As welded with 2.4mm wire	676 (97,000)	24.4	-29 (-20)	70 (52)	600°C (1,112°F) X 1hr FC

Typical Welding Parameters

Diameter, Polarity Shielding Gas	CTWD mm (in)	Wire Feed Speed m/min (in/min)	Amp. (A)	Volt. (V)	Deposition Rate kg/hr (lb/hr)
2.4mm (3/32in), DC+					
Submerged Arc	25 (1)	3.2 (127)	310	26	3.9 (8.6)
		4.0 (158)	360	28	4.6 (10.1)
		4.6 (181)	410	30	5.1 (11.2)

SC-250H

For Hard-facing

Conformances

JIS Z3326 YF2A-C-250

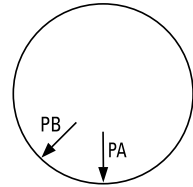
Applications

- Spindle, gear, shaft etc.

Features

- Flat and horizontal fillet position welding
- Suitable for metal to metal wear parts

Welding Position



Current

DC +

Shielding Gas

100% CO₂ / FCAW process

Diameter / Packaging

Diameter	Spool
mm (in)	15kg (33lbs)
1.2 (0.045)	✓
1.6 (1/16)	✓

Typical Chemical Composition of All-Weld Metal (%)

C	Si	Mn	P	S	Cr	Mo	Others
0.06	0.57	1.30	0.011	0.005	1.20	-	-

Typical Mechanical Properties of All-Weld Metal

Hardness (Hv)
260~300

Typical Welding Parameters

Diameter, Polarity Shielding Gas	CTWD mm (in)	Wire Feed Speed m/min (in/min)	Amp. (A)	Volt. (V)	Deposition Rate kg/hr (lb/hr)
1.2mm (0.045 in) DC+					
100% CO ₂	20 (4/5)	9.8 (385)	230	25~27	4.0 (8.8)
		12.5 (492)	260	27~29	5.1 (11.2)
		14.2 (559)	300	29~31	6.0 (13.2)
1.6mm (1/16 in) DC+					
100% CO ₂	20 (4/5)	5.8 (228)	260	27~29	4.6 (10.1)
		7.9 (311)	300	28~30	5.4 (11.9)
		9.7 (381)	330	29~31	6.9 (15.2)

SC-350H

For Hard-facing

Conformances

JIS Z3326 YF2A-C-350

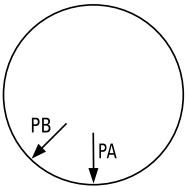
Applications

- Spindle, gear, shaft etc.

Features

- Flat and horizontal fillet position welding
- Suitable for metal to metal wear parts

Welding Position



Current

DC +

Shielding Gas

100% CO₂ / FCAW process

Diameter / Packaging

Diameter	Spool
mm (in)	15kg (33lbs)
1.2 (0.045)	✓
1.6 (1/16)	✓

Typical Chemical Composition of All-Weld Metal (%)

C	Si	Mn	P	S	Cr	Mo	Others
0.12	0.6	1.5	0.010	0.006	1.5	0.5	-

Typical Mechanical Properties of All-Weld Metal

Hardness (Hv)

350~400

Typical Welding Parameters

Diameter, Polarity Shielding Gas	CTWD mm (in)	Wire Feed Speed m/min (in/min)	Amp. (A)	Volt. (V)	Deposition Rate kg/hr (lb/hr)
1.2mm (0.045 in) DC+					
100% CO ₂	20 (4/5)	9.8 (385)	230	25~27	4.1 (9.0)
		12.5 (492)	260	27~29	5.2 (11.4)
		14.2 (559)	300	29~31	6.0 (13.2)
1.6mm (1/16 in) DC+					
100% CO ₂	20 (4/5)	5.8 (228)	260	27~29	4.7 (10.3)
		7.9 (311)	300	28~30	5.4 (11.9)
		9.7 (381)	330	29~31	7.0 (15.4)

SC-450H

For Hard-facing

Conformances

JIS Z3326 YF2A-C-450

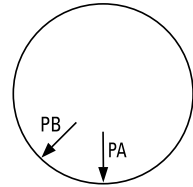
Applications

- Crain wheels, gear, shaft etc.

Features

- Flat and horizontal fillet position welding
- Suitable for metal to metal wear and abrasion parts

Welding Position



Current

DC +

Shielding Gas

100% CO₂ / FCAW process

Diameter / Packaging

Diameter	Spool
mm (in)	15kg (33lbs)
1.2 (0.045)	✓
1.4 (0.052)	✓
1.6 (1/16)	✓

Typical Chemical Composition of All-Weld Metal (%)

C	Si	Mn	P	S	Cr	Mo	Others
0.2	0.7	1.7	0.018	0.005	2.2	0.6	-

Typical Mechanical Properties of All-Weld Metal

Hardness (Hv)
450~500

Typical Welding Parameters

Diameter, Polarity Shielding Gas	CTWD mm (in)	Wire Feed Speed m/min (in/min)	Amp. (A)	Volt. (V)	Deposition Rate kg/hr (lb/hr)
1.2mm (0.045 in) DC+					
100% CO ₂	20 (4/5)	9.8 (385)	230	25~27	4.3 (9.4)
		12.5 (492)	260	27~29	5.2 (11.3)
		14.2 (559)	300	29~31	6.0 (13.2)
1.6mm (1/16 in) DC+					
100% CO ₂	20 (4/5)	5.8 (228)	260	27~29	4.8 (10.5)
		7.9 (311)	300	28~30	5.5 (12.1)
		9.7 (381)	330	29~31	7.2 (15.8)

SC-600H

For Hard-facing

Conformances

JIS Z3326 YF3B-C-600

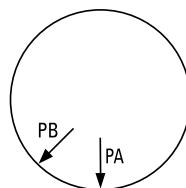
Applications

- Rollers, shear blades, screw conveyer etc.

Features

- Flat and horizontal fillet position welding
- Suitable for abrasion parts

Welding Position



Current

DC +

Shielding Gas

100% CO₂ / FCAW process

Diameter / Packaging

Diameter mm (in)	Spool 15kg (33lbs)
1.2 (0.045)	✓
1.4 (0.052)	✓
1.6 (1/16)	✓

Typical Chemical Composition of All-Weld Metal (%)

C	Si	Mn	Cr	Mo	V	W	Others
0.35	0.8	1.6	4.2	0.6	-	-	-

Typical Mechanical Properties of All-Weld Metal

Hardness (Hv)

620-680

Typical Welding Parameters

Diameter, Polarity Shielding Gas	CTWD mm (in)	Wire Feed Speed m/min (in/min)	Amp. (A)	Volt. (V)	Deposition Rate kg/hr (lb/hr)
1.2mm (0.045 in) DC+					
100% CO ₂	20 (4/5)	9.8 (385)	230	25–27	4.4 (9.7)
		12.5 (492)	260	27–29	5.3 (11.6)
		14.2 (559)	300	29–31	6.1 (13.4)
1.6mm (1/16 in) DC+					
100% CO ₂	20 (4/5)	5.8 (228)	260	27–29	4.9 (10.8)
		7.9 (311)	300	28–30	5.7 (12.5)
		9.7 (381)	330	29–31	7.3 (16.0)

SC-600HM

For Hard-facing

Conformances

DIN 8555 MSG 6-GF-60-P

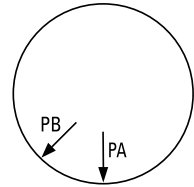
Applications

- Rollers, shear blades, screw conveyer etc.

Features

- Flat and horizontal fillet position welding
- Suitable for abrasion parts

Welding Position



Current

DC +

Shielding Gas

Ar + 20~25% CO₂
FCAW process

Diameter / Packaging

Diameter	Spool
mm (in)	15kg (33lbs)
1.2 (0.045)	✓
1.6 (1/16)	✓

Typical Chemical Composition of All-Weld Metal (%)

C	Si	Mn	P	S	Cr	Mo
0.5	0.3	1.5	0.012	0.009	6.2	0.35

Typical Mechanical Properties of All-Weld Metal

Hardness (HRC)
58~62

Typical Welding Parameters

Diameter, Polarity Shielding Gas	CTWD mm (in)	Wire Feed Speed m/min (in/min)	Amp. (A)	Volt. (V)	Deposition Rate kg/hr (lb/hr)
1.2mm (0.045 in) DC+					
80% Ar + 20% CO ₂	20 (4/5)	9.8 (385)	230	25~27	4.5 (9.9)
		12.5 (492)	260	27~29	5.5 (12.1)
		14.2 (559)	300	29~31	6.4 (14.1)
1.6mm (1/16 in) DC+					
80% Ar + 20% CO ₂	20 (4/5)	5.8 (228)	260	27~29	5.3 (11.6)
		7.9 (311)	300	28~30	6.2 (13.6)
		9.7 (381)	330	29~31	7.6 (16.7)

SC-700H

For Hard-facing

Conformances

JIS Z3326 YF3B-C-700

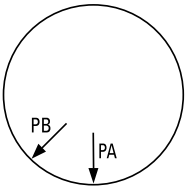
Applications

- Rollers, shear blades, screw conveyer etc.

Features

- Flat and horizontal fillet position welding
- Suitable for abrasion parts

Welding Position



Current

DC +

Shielding Gas

100% CO₂ / FCAW process

Diameter / Packaging

Diameter mm (in)	Spool 15kg (33lbs)
1.2 (0.045)	✓
1.4 (0.052)	✓
1.6 (1/16)	✓

Typical Chemical Composition of All-Weld Metal (%)

C	Si	Mn	Cr	Mo	V	W	Others
0.5	0.7	1.7	5.2	-	-	0.4	-

Typical Mechanical Properties of All-Weld Metal

Hardness (Hv)

660~720

Typical Welding Parameters

Diameter, Polarity Shielding Gas	CTWD mm (in)	Wire Feed Speed m/min (in/min)	Amp. (A)	Volt. (V)	Deposition Rate kg/hr (lb/hr)
1.2mm (0.045 in) DC+					
100% CO ₂	20 (4/5)	9.8 (385)	230	25~27	4.4 (9.7)
		12.5 (492)	260	27~29	5.4 (11.9)
		14.2 (559)	300	29~31	6.3 (13.8)
1.6mm (1/16 in) DC+					
100% CO ₂	20 (4/5)	5.8 (228)	260	27~29	5.1 (11.2)
		7.9 (311)	300	28~30	5.9 (13.0)
		9.7 (381)	330	29~31	7.4 (16.3)

Non-FERROUS

Non-Ferrous Metal Welding Consumables



Conformances

AWS A5.11/ ASME SFA5.11 ENiCrFe-2

JIS Z3224 DNiCrFe-2

EN ISO 14172 Ni 6092

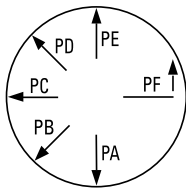
Applications

- Inconel 600, 601, Incoloy 800 and 800HT
- Dissimilar welding of stainless steels and low-alloy steels & Nickel-alloy steel(Inconel, Incoloy, Monel alloys)
- Overlay cladding on similar chemical composition steels

Features

- High impact toughness at low temperature
- Good Arc & slag stability and hot cracking resistance
- Good productivity

Welding Position



Current

DC +

Diameter / Packaging

Diameter	Length mm(in)
mm (in)	350 (14)
2.6 (3/32)	
3.2 (1/8)	✓
4.0 (5/32)	✓
5.0 (3/16)	✓

Typical Chemical Composition of All-Weld Metal (%)

C	Si	Mn	P	S	Cr	Ni	Mo	Cu	Nb+Ta	Fe
0.05	0.15	3.1	0.005	0.003	15.0	71.5	1.0	0.01	1.25	7.5

Typical Mechanical Properties of All-Weld Metal

YS MPa(lbs/in ²)	TS MPa(lbs/in ²)	EL (%)	Temp °C(°F)	CVN-Impact Value J (ft.lbs)
395 (57,000)	610 (88,000)	37.0	-196 (-321)	91 (67)

Typical Welding Parameters

Approx. Current (Amps)			
Diameter	3.2mm (1/8) DC +	4.0mm (5/32) DC +	5.0mm (3/16) DC +
F	70~90	110~140	120~150
V-up	70~90	100~130	110~140

Conformances

AWS A5.11/ ASME SFA5.11 ENiCrFe-3
JIS Z3224 DNiCrFe-3
EN ISO 14172 Ni 6182
CE

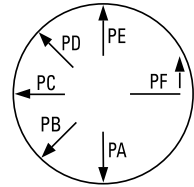
Applications

- Inconel 600, 601 and stainless steels & low-alloy steel & nickel-alloy steel.
- Ni-Cr-Fe alloy clad steels

Features

- Good crack resistance
- Good arc stability and good slag removal
- Good bead appearance

Welding Position



Current

DC +

Diameter / Packaging

Diameter mm (in)	Length mm(in)	
	300 (12)	350 (14)
2.6 (3/32)	✓	
3.2 (1/8)		✓
4.0 (5/32)		✓
5.0 (3/16)		✓

Typical Chemical Composition of All-Weld Metal (%)

C	Si	Mn	P	S	Cr	Ti	Nb+Ta	Fe	Ni
0.06	0.46	6.5	0.011	0.010	16.3	0.07	1.8	5.2	72.0

Typical Mechanical Properties of All-Weld Metal

YS MPa(lbs/in ²)	TS MPa(lbs/in ²)	EL (%)	Temp °C(°F)	CVN-Impact Value J (ft·lbs)
-	650 (94,000)	40.0	-196 (-321)	76 (56)

Typical Welding Parameters

Approx. Current (Amps)				
Diameter	2.6mm (3/32) DC +	3.2mm (1/8) DC +	4.0mm (5/32) DC +	5.0mm (3/16) DC +
F&HF	60~90	70~115	100~140	120~160
V-up	60~90	65~110	100~130	110~140

Conformances

AWS A5.11/ ASME SFA5.11 ENiCrFe-4
JIS Z3225 D9Ni-1
KOGAS
DNV-GL VL9Ni H5

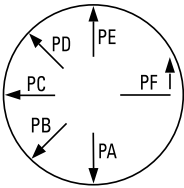
Applications

- 9%Ni steel for cryogenic storage tanks for LNG
- Liquified nitrogen tanks

Features

- Good strength and toughness at cryogenic temperatures
- Meets specifications of API and NV for the welding of 9%Ni steel With AC

Welding Position



Current

AC

Diameter / Packaging

Diameter	Length mm(in)
mm (in)	350 (14)
2.6 (3/32)	
3.2 (1/8)	✓
4.0 (5/32)	✓
5.0 (3/16)	✓

Typical Chemical Composition of All-Weld Metal (%)

C	Si	Mn	P	S	Cr	Ni	Mo	Nb	Fe
0.07	0.4	2.8	0.01	0.02	15.5	70.7	2.2	2.2	5.3

Typical Mechanical Properties of All-Weld Metal

YS MPa(lbs/in ²)	TS MPa(lbs/in ²)	EL (%)	Temp °C(°F)	CVN-Impact Value J (ft.lbs)
-	705 (102,000)	40.5	-196 (-321)	58 (43)

Typical Welding Parameters

Approx. Current (Amps)			
Diameter	3.2mm (1/8) AC	4.0mm (5/32) AC	5.0mm (3/16) AC
F	70~90	110~140	120~150
V-up	70~90	100~130	110~140

Conformances

AWS A5.11/ ASME SFA5.11 ENiMo-8

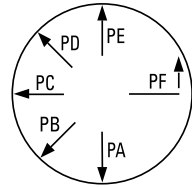
Applications

- Repair welding and tack welding of 9%Ni steel
- LNG Storage tanks

Features

- Good impact toughness at extra low temperature

Welding Position



Current

AC

Diameter / Packaging

Diameter	Length mm(in)
mm (in)	350 (14)
2.6 (3/32)	
3.2 (1/8)	✓
4.0 (5/32)	✓
5.0 (3/16)	

Typical Chemical Composition of All-Weld Metal (%)

C	Si	Mn	P	S	Cr	Ni	Mo	W	Fe
0.03	0.25	0.3	0.002	0.001	2.6	67.0	18.5	3.1	6.0

Typical Mechanical Properties of All-Weld Metal

YS MPa(lbs/in ²)	TS MPa(lbs/in ²)	EL (%)	Temp °C(°F)	CVN-Impact Value J (ft.lbs)
-	730 (106,000)	41.0	-196 (-321)	70 (52)

Typical Welding Parameters

Approx. Current (Amps)		
Diameter	3.2mm (1/8) AC	4.0mm (5/32) AC
F	70~90	110~140
V-up	70~90	100~130

Conformances

AWS A5.11/ ASME SFA5.11 ENiCrMo-3
JIS Z3224 DNiCrMo-3
EN ISO 14172 Ni 6625 (NiCr22Mo9Nb)
ABS AWS A5.11 ERNiCrMo-3

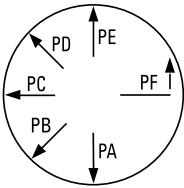
Applications

- Inconel 601 + 625, steel and Nickel alloys Hardfacing of steel
- 9% Nickel steel
- LNG storage tank manufactures and desulfurizations
- Heat exchanger Building of chemical carrier

Features

- Good corrosion resistance to Crevice and Pitting, SCC
- Good Tensile Strength at High Temperature
- Good Impact value at Cryogenic temperature

Welding Position



Current

DC +, AC

Diameter / Packaging

Diameter mm (in)	Length mm(in)	
	300 (12)	350 (14)
2.6 (3/32)	✓	
3.2 (1/8)		✓
4.0 (5/32)		✓
5.0 (3/16)		✓

Typical Chemical Composition of All-Weld Metal (%)

C	Si	Mn	P	S	Cr	Ni	Mo	Nb+Ta	Fe
0.06	0.4	0.1	0.001	0.004	21.7	63.4	9.3	3.32	1.52

Typical Mechanical Properties of All-Weld Metal

YS MPa(lbs/in ²)	TS MPa(lbs/in ²)	EL (%)	Temp °C(°F)	CVN-Impact Value J (ft.-lbs)
-	780 (113,000)	36.0	-196 (-321)	45 (33)

Typical Welding Parameters

Approx. Current (Amps)				
Diameter	2.6mm (3/32) DC +	3.2mm (1/8) DC +	4.0mm (5/32) DC +	5.0mm (3/16) DC +
F	60~90	70~110	110~140	120~150
V-up/OH	60~90	70~110	100~130	110~140

Superflux300 X SA-625

Conformances

Applications

- Furnace equipments
- Petrochemical plants
- Power generation plants

Features

- Bonded type flux, High basicity flux
- Good arc stability and slag removal
- Good bead apperance and weldability

Welding Position

Current

DC +

Diameter / Packaging

Diameter	Spool
mm (in)	25kg (55lbs)
2.0 (5/64)	✓
2.4 (3/32)	✓
3.2 (1/8)	✓
4.0 (5/32)	✓

Typical Chemical Composition of All-Weld Metal (%)

C	Si	Mn	P	S	Cr	Ni	Mo	Nb+Ta
0.02	0.58	0.27	0.011	0.005	20.8	65.5	8.6	3.3

Typical Mechanical Properties of All-Weld Metal

YS MPa(lbs/in ²)	TS MPa(lbs/in ²)	EL (%)	Temp °C(°F)	CVN-Impact Value J (ft.lbs)
-	715 (104,000)	37.7	-196 (-321)	60 (44)

Typical Welding Parameters

Wire Feed Speed m/min (in/min)	Amp. (A)	Volt. (V)
2.4mm (3/32 in) DC+		
30-60	350-400	28-31

SMW

SAW

GMW

GTAW

FCAW

Non-FERROUS

APPENDIX

SMT-625

Conformances

AWS	A5.14/ ASME SFA5.14 ERNiCrMo-3	LR	9Ni H15
JIS	Z3334 SNi6625 (NiCr22Mo9Nb)	BV	AWS A5.14 ERNiCrMo3
EN	ISO 18274 Ni 6625 (NiCr22Mo9Nb)	DNV-GL	-MS
KR	L92S		NV 1.5Ni, 9Ni
ABS	AWS A5.14 ERNiCrMo-3 (-196°C ≥34 J)	NK	KSWL92

Applications

- LNG Storage Tank, Equipments for gas desulfurization,
- Petrochemical plants
- Heat exchangers
- 9% nickel steel

Features

- Good impact toughness at extra low temperature
- Dissimilar steels(B24Inconel 601, Incoloy800/800H or combination of these with other alloys)

Welding Position

Current

GMAW: DC+(Pulse)
GTAW: DC-

Shielding Gas

Ar
Ar + He

Diameter / Packaging

Diameter	MIG	TIG
mm (in)	12.5kg (27.6lbs)	5kg (11lbs)
0.9 (0.035)	✓	
1.0 (0.040)	✓	
1.2 (0.045)	✓	
1.4 (0.052)	✓	
1.6 (1/16)	✓	
2.0 (5/64)		✓
2.4 (3/32)		✓
3.2 (1/8)		✓

Typical Chemical Composition of the Wire (%)

C	Si	Mn	P	S	Cr	Ni	Mo	Nb+Ta
0.02	0.05	0.03	0.012	0.001	22.0	64.6	8.7	3.6

Typical Mechanical Properties of All-Weld Metal

YS MPa(lbs/in ²)	TS MPa(lbs/in ²)	EL (%)	Temp °C(°F)	CVN-Impact Value J (ft-lbs)
-	770 (117,000)	40.0	-196 (-321)	100 (74)

Typical Welding Parameters

Diameter, Polarity Shielding Gas	Amp. (A)	Volt. (V)
1.2mm (0.045 in) DC+		
Ar, Ar + He	140	28
2.4mm (3/32 in) DC-		
Ar	110	12

SMW

SAW

GMW

GTAW

FCW

Non-FERROUS

APPENDIX

SMT-686

Type : MIG/TIG

Conformances

AWS A5.14/ ASME SFA5.14 ERNiCrMo-14

Applications

- Mainly used for welding Super-Duplex, Super-austenitic stainless steels, as well as Nickel alloys(UNS N06059, N06022, C-276, 22, 625, 686)

Features

- This is capable of being used to deposit overlays of outstanding corrosion-resistance onto a range of steels.
- SMT-686 is suitable for use at requiring general corrosion resistance in HCl or sulfuric acid.

Welding Position

Current

GMAW: DC+(Pulse)

GTAW: DC-

Shielding Gas

Ar, Ar+He

Diameter / Packaging

Diameter	MIG	TIG
mm (in)	12.5kg (27.6lbs)	5kg (11lbs)
1.0 (0.039)	✓	
1.2 (0.045)	✓	
1.6 (1/16)	✓	✓
2.0 (5/64)		✓
2.4 (3/32)		✓
3.2 (1/8)		✓

Typical Chemical Composition of the Wire (%)

C	Si	Mn	P	S	Ni	Cr	Mo	Fe	W
0.008	0.07	0.31	0.001	0.001	58.2	22.13	15.17	0.28	3.17

Typical Mechanical Properties of All-Weld Metal

YS Mpa(lbs/in ²)	TS Mpa(lbs/in ²)	EL (%)	Temp °C(°F)	CVN-Impact Value J (ft-lbs)
-	816 (118,000)	40.2	-196 (-321)	91 (67)

SMT-617

Type : MIG/TIG

Conformances

AWS A5.14/ ASME SFA5.14 ERNiCrCoMo-1
JIS Z3334 SNI6617 (NiCr22Co12Mo19)
EN ISO 18274 SNI 6617 (NiCr22Co12Mo9)

Applications

- Incoloy 800HT, 803, cast alloys such as HK-40, HP, HP-45 modified

Features

- Used for joining various dissimilar high temperature alloys the weld metal's high temperture strength,oxidation resistance and metallurgical stability from 815°C up to 1150°C

Welding Position

Current

GMAW: DC+(Pulse)
GTAW: DC-

Shielding Gas

Ar, Ar+He

Diameter / Packaging

Diameter	MIG	TIG
mm (in)	12.5kg (27.6lbs)	5kg (11lbs)
1.0 (0.039)	✓	
1.2 (0.045)	✓	
1.6 (1/16)	✓	✓
2.0 (5/64)		✓
2.4 (3/32)		✓
3.2 (1/8)		✓

Typical Chemical Composition of the Wire (%)

C	Si	Mn	P	S	Ni	Cr	Mo	Al	Co
0.07	0.30	0.30	0.003	0.010	54.6	22.3	8.8	1.2	11.2

Typical Mechanical Properties of All-Weld Metal

YS Mpa(lbs/in ²)	TS Mpa(lbs/in ²)	EL (%)	Temp °C(°F)	CVN-Impact Value J (ft.-lbs)
-	765 (111,000)	20	-196 (-321)	92 (66)

SMW

SAW

GMAW

GTAW

FCAW

Non-FERROUS

APPENDIX

SW-625

Conformances

AWS A5.34/ ASME SFA5.34 ENiCrMo3T1-4

EN ISO 12153 T Ni 6625 P M 2

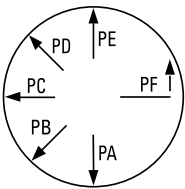
Applications

- Joining nickel-chromium-molybdenum alloys cladding steel with nickel- chromium-molybdenum weld metal LNG storage
- LNG storage tank manufactures
- Desulfurizations
- Heat exchangers

Features

- Good corrosion resistance to crevice and pitting, SCC
- Good Tensile strength at high temperature
- Good impact value at cryogenic temperature

Welding Position



Current

DC +

Shielding Gas

Ar + 20% CO₂

Diameter / Packaging

Diameter	Spool
mm (in)	12.5kg (27.6lbs)
1.2 (0.045)	✓

Typical Chemical Composition of All-Weld Metal (%)

	C	Si	Mn	P	S	Cr	Ni	Mo	Fe	Nb+Ta
Ar + 20% CO ₂	0.07	0.35	0.29	0.003	0.002	20.7	61.8	9.1	3.5	3.4

Typical Mechanical Properties of All-Weld Metal

	YS MPa(lbs/in ²)	TS MPa(lbs/in ²)	EL (%)	Temp °C(°F)	CVN-Impact Value J (ft.lbs)
As-weld	-	810 (117,000)	36.0	-196 (-321)	60 (44)
PWHT(620°C*8Hr)	-	825 (120,000)	36.4	-196 (-321)	55 (41)

Typical Welding Parameters

Approx. Current (Amps)	
Diameter	1.2mm (0.045) DC +
F&HF	180~220
V-up/OH	120~170

SW-82 Cored

Conformances

AWS A5.34/ ASME SFA5.34 ENiCr3T1-1/-4

EN ISO 12153 T Ni 6082 P M/C 2

Applications

- Dissimilar welding (stainless steel, heat resisting steel)

Features

- Designed for welding with 100% CO₂ or Ar+15~25% CO₂ shielding gas
- Excellent all position weldability
- Smooth and stable arc with a fast freezing slag

Welding Position

Current

DC +

Shielding Gas

100% CO₂ / Ar+20~25% CO₂

Diameter / Packaging

Diameter mm (in)	Length mm(in)	
	12.5kg (28lbs)	15kg (33lbs)
1.2 (0.045)	✓	✓
1.4 (0.052)		
1.6 (1/16)		

Typical Chemical Composition of All-Weld Metal(%)

C	Si	Mn	P	S	Cr	Ni	Nb	Fe
0.044	0.21	3.1	0.001	0.004	20.6	71.3	2.42	2.26

Typical Mechanical Properties of All-Weld Metal

YS MPa(lbs/in ²)	TS MPa(lbs/in ²)	EL (%)	Temp °C(°F)	CVN-Impact Value J (ft.-lbs)
-	665	42.8	-196 (-321)	100 (74)

Typical Welding Parameters

Diameter, Polarity Shielding Gas	CTWD mm (in)	Wire Feed Speed m/min (in/min)	Amp. (A)	Volt. (V)	Deposition Rate kg/hr (lb/hr)
1.2mm (0.045 in) DC+					
100% CO ₂	20 (4/5)	6.0 (236)	140	23~26	2.5 (5.5)
		9.2 (362)	180	27~30	3.4 (7.5)
		12.0 (472)	210	28~31	4.5 (9.9)
80% Ar+20% CO ₂	20 (4/5)	6.1 (240)	140	23~26	2.6 (5.7)
		9.0 (354)	180	27~30	3.6 (7.9)
		11.5 (453)	210	27~30	4.6 (10.1)

SW-182 Cored

Conformances

AWS A5.34/ ASME SFA5.34 ENiCrFe3T1-1/-4
EN ISO 12153 T Ni 6182 P M/C 2

Applications

- Dissimilar welding(stainless steel, heat resisting steel)

Features

- Designed for welding with 100% CO₂ or Ar+15~25% CO₂ shielding gas
- Excellent all position weldability
- Smooth and stable arc with a fast freezing slag

Welding Position

Current

DC +

Shielding Gas

100% CO₂ / Ar+20~25% CO₂

Diameter / Packaging

Diameter mm (in)	Length mm(in)	
	12.5kg (28lbs)	15kg (33lbs)
1.2 (0.045)	✓	✓
1.4 (0.052)		
1.6 (1/16)		

Typical Chemical Composition of All-Weld Metal(%)

C	Si	Mn	P	S	Cr	Ni	Nb	Fe
0.05	0.31	6.22	0.001	0.007	16.0	66.0	1.9	8.6

Typical Mechanical Properties of All-Weld Metal

YS MPa(lbs/in ²)	TS MPa(lbs/in ²)	EL (%)	Temp °C(°F)	CVN-Impact Value J (ft-lbs)
-	640	37	-196 (-321)	100 (74)

Typical Welding Parameters

Diameter, Polarity Shielding Gas	CTWD mm (in)	Wire Feed Speed m/min (in/min)	Amp. (A)	Volt. (V)	Deposition Rate kg/hr (lb/hr)
1.2mm (0.045 in) DC+					
100% CO ₂	20 (4/5)	6.0 (236)	140	23~26	2.5 (5.5)
		9.2 (362)	180	27~30	3.4 (7.5)
		12.0 (472)	210	28~31	4.5 (9.9)
80% Ar+20% CO ₂	20 (4/5)	6.1 (240)	140	23~26	2.6 (5.7)
		9.0 (354)	180	27~30	3.6 (7.9)
		11.5 (453)	210	27~30	4.6 (10.1)

Conformances

AWS A5.14/ ASME SFA5.14 ERNiMo-8

JIS Z3334 SNi1008 (NiMo19WCr)

KOGAS

ABS AWS A5.14 ERNiMo-8

DNV-GL VL1.5Ni up to VL9Ni

RS Manufacturer's Spec. (-196°C)

Applications

- LNG storage tanks
- Oxygen, nitrogen and LNG carriers

Features

- For the automatic welding processes for a LNG storage tank with a methode of GTAW for vertical joints of side plates(ASTM A333,A334,A353,A553)
- Impact toughness at extra low temperature

Welding Position

Current

GTAW: DC-(Auto TIG)

Shielding Gas

Ar

Diameter / Packaging

Diameter	MIG	TIG
mm (in)	12.5kg (27.6lbs)	5kg (11lbs)
1.2 (0.045)	✓	
2.0 (5/64)		✓
2.4 (3/32)		✓
3.2 (1/8)		✓

Typical Chemical Composition of the Wire (%)

C	Si	Mn	P	S	Cr	Ni	Mo	Fe	W
0.015	0.012	0.01	0.002	0.001	2.1	69.8	19.2	5.6	2.6

Typical Mechanical Properties of All-Weld Metal

YS MPa(lbs/in ²)	TS MPa(lbs/in ²)	EL (%)	Temp °C(°F)	CVN-Impact Value J (ft-lbs)
-	725 (105,000)	38.0	-196 (-321)	150 (111)

Typical Welding Parameters

Diameter, Polarity Shielding Gas	Amp. (A)	Volt. (V)
1.2mm (0.045 in) DC-(Auto-TIG)		
Ar	160	28
2.4mm (3/32 in) DC-		
Ar	110	12

SMT-825

Conformances

AWS A5.14/ ASME SFA5.14 ERNiFeCr-1
JIS Z3334 S Ni8065 (NiFe30Cr21Mo3)
EN ISO 18274 S Ni 8065

Applications

- Ni-Cr-Mo-Co alloys
- Overlay cladding on similar chemical composition steels

Features

- Good resistance of corrosion in sulfuric acid and phosphoric acid environment

Welding Position

Current

GMAW: DC+(Pulse)
GTAW: DC-

Shielding Gas

Ar, Ar + He

Diameter / Packaging

Diameter	MIG	TIG
mm (in)	12.5kg (27.6lbs)	5kg (11lbs)
1.0 (0.040)	✓	
1.2 (0.045)	✓	
1.6 (1/16)	✓	
2.0 (5/64)		✓
2.4 (3/32)		✓
3.2 (1/8)		✓

Typical Chemical Composition of the Wire (%)

C	Si	Mn	P	S	Cr	Ni	Mo	Fe	Cu	Ti
0.01	0.25	0.45	0.02	0.001	21.5	42.6	3.1	29.0	2.0	1.0

Typical Mechanical Properties of All-Weld Metal

YS MPa(lbs/in ²)	TS MPa(lbs/in ²)	EL (%)	Temp °C(°F)	CVN-Impact Value J (ft-lbs)
420 (61,000)	610 (88,000)	34.0		

Typical Welding Parameters

Diameter, Polarity Shielding Gas	Amp. (A)	Volt. (V)
	1.2mm (0.045 in) DC+	
Ar, Ar + He	160	28
	2.4mm (3/32 in) DC-	
Ar	110	12

SM-455 / ST-455

Conformances

AWS A5.14/ ASME SFA5.14 ERNiCrMo-7

JIS Z3334 SNI6455 (NiCr16Mo16Ti)

Applications

- Vessel engines
- Heat exchangers
- Offshore oil equipments
- Petrochemical plants
- Suitable for Hastelloy C4,C276

Features

- Ni based solid filler wire.
- Highly corrosive resistance in reductive, especially in oxidation cinditions

Welding Position

Current

GMAW: DC+(Pulse)

GTAW: DC-

Shielding Gas

Ar, Ar + He

Diameter / Packaging

Diameter	MIG	TIG
mm (in)	12.5kg (27.6lbs)	5kg (11lbs)
1.0 (0.040)	✓	
1.2 (0.045)	✓	
1.4 (0.052)	✓	
1.6 (1/16)	✓	
2.0 (5/64)		✓
2.4 (3/32)		✓
3.2 (1/8)		✓

Typical Chemical Composition of the Wire (%)

C	Si	Mn	P	S	Cr	Ni	Mo	Fe
0.013	0.05	0.01	0.004	0.003	17.5	65.0	15.0	2.5

Typical Mechanical Properties of All-Weld Metal

YS MPa(lbs/in ²)	TS MPa(lbs/in ²)	EL (%)	Temp °C(°F)	CVN-Impact Value J (ft.-lbs)
-	700 (102,000)	40.0		

Typical Welding Parameters

Diameter, Polarity Shielding Gas	Amp. (A)	Volt. (V)
	1.2mm (0.045 in) DC+	
Ar, Ar + He	150	29
	2.4mm (3/32 in) DC-	
Ar	110	12

SMW

SAW

GMAW

GTAW

FCAW

Non-FERROUS

APPENDIX

Conformances

AWS A5.14/ ASME SFA5.14 ERNiCrMo-10
JIS Z 3324 S Ni6022 (NiCr21Mo13Fe4W3)
EN ISO 18274 S Ni 6022

Applications

- FGD, Petrochemical plants Offshore applications
- Inconel 625+601, Hastalloy C-22, Ni alloy steel

Features

- Good resistance to pitting and crevice corrosion

Welding Position

Current

GMAW: DC+(Pulse)
GTAW: DC-

Shielding Gas

Ar, Ar + He

Diameter / Packaging

Diameter	MIG	TIG
mm (in)	12.5kg (27.6lbs)	5kg (11lbs)
1.0 (0.040)	✓	
1.2 (0.045)	✓	
2.0 (5/64)		✓
2.4 (3/32)		✓
3.2 (1/8)		✓

Typical Chemical Composition of the Wire (%)

C	Si	Mn	P	S	Cr	Ni	Mo	W	Fe
0.01	0.06	0.38	0.001	0.001	22.4	55.5	14.2	2.8	4.1

Typical Mechanical Properties of All-Weld Metal

YS MPa(lbs/in ²)	TS MPa(lbs/in ²)	EL (%)	Temp °C(°F)	CVN-Impact Value J (ft-lbs)
-	720 (104,000)	41.0	-196 (-321)	110 (81)

Typical Welding Parameters

Diameter, Polarity Shielding Gas	Amp. (A)	Volt. (V)
	1.2mm (0.045 in) DC+	
Ar, Ar + He	160	28
	2.4mm (3/32 in) DC-	
Ar	110	12

SM-82 / ST-82

Conformances

AWS A5.14/ ASME SFA5.14 ERNiCr-3
JIS Z3334 SNi6082 (NiCr20Mn3Nb)
EN ISO 18274 S Ni 6082

Applications

- LNG and LPG storage plant, Boilers of the thermal power stations
- Ni-based alloys and high temperature alloys

Features

- Good corrosion-resistant and heat-resistant
- Excellnet strength and toughness
- No preheat is required

Welding Position

Current

GMAW: DC+(Pulse)
GTAW: DC-

Shielding Gas

Ar, Ar + He

Diameter / Packaging

Diameter	MIG	TIG
mm (in)	12.5kg (27.6lbs)	5kg (11lbs)
1.0 (0.040)	✓	
1.2 (0.045)	✓	
1.4 (0.052)	✓	
1.6 (1/16)	✓	
2.0 (5/64)		✓
2.4 (3/32)		✓
3.2 (1/8)		✓

Typical Chemical Composition of the Wire (%)

C	Si	Mn	P	S	Cr	Ni	Nb+Ta
0.04	0.1	3.2	0.006	0.001	20.0	73.0	2.5

Typical Mechanical Properties of All-Weld Metal

YS MPa(lbs/in ²)	TS MPa(lbs/in ²)	EL (%)	Temp °C(°F)	CVN-Impact Value J (ft-lbs)
-	660 (96,000)	35.0	-196 (-321)	80 (59)

Typical Welding Parameters

Diameter, Polarity Shielding Gas	Amp. (A)	Volt. (V)
	1.2mm (0.045 in) DC+	
Ar, Ar + He	180	28
	2.4mm (3/32 in) DC-	
Ar	110	12

SMW

SAW

GMAW

GTAW

FCAW

Non-FERROUS

APPENDIX

SMT-276

Conformances

AWS A5.14/ ASME SFA5.14 ERNiCrMo-4
JIS Z3334 SNi6276 (NiCr15Mo16Fe6W4)
EN ISO 18274 S Ni 6276
ABS AWS A5.14 ERNiCrMo-4

Applications

- LNG and LPG storage plant, Boilers of the thermal power station
- Aggressive environmetns in chemical process plants

Features

- Good corrosion-resistant
- No preheat is required
- Interpass temperature should preferably be kept below 100°C and input restriected to 1.5KJ/Min

Welding Position

Current

GMAW: DC+(Pulse)
GTAW: DC-

Shielding Gas

Ar, Ar + He

Diameter / Packaging

Diameter	MIG	TIG
mm (in)	12.5kg (27.6lbs)	5kg (11lbs)
1.0 (0.040)	✓	
1.2 (0.045)	✓	
1.4 (0.052)	✓	
1.6 (1/16)	✓	
2.0 (5/64)		✓
2.4 (3/32)		✓
3.2 (1/8)		✓

Typical Chemical Composition of the Wire (%)

C	Si	Mn	P	S	Cr	Ni	Mo	W
0.01	0.05	0.5	0.003	0.01	15.0	57.0	16.0	4.0

Typical Mechanical Properties of All-Weld Metal

YS MPa(lbs/in ²)	TS MPa(lbs/in ²)	EL (%)	Temp °C(°F)	CVN-Impact Value J (ft-lbs)
-	750 (109,000)	33.0		

Typical Welding Parameters

Diameter, Polarity Shielding Gas	Amp. (A)	Volt. (V)
	1.2mm (0.045 in) DC+	
Ar, Ar + He	160	28
	2.4mm (3/32 in) DC-	
Ar	110	12

SM-400 / ST-400

Conformances

AWS A5.14/ ASME SFA5.14 ERNiCu-7

JIS Z3334 SNi4060 (NiCu30Mn3Ti)

EN ISO 18274 S Ni 4060

Applications

- Heat exchanger
- Piping and Vessels
- Salt purification

Features

- No Preheat required, maximum interpass temperature 150°C and no PWHT required

Welding Position

Current

GMAW: DC+(Pulse)

GTAW: DC-

Shielding Gas

Ar, Ar + He

Diameter / Packaging

Diameter	MIG	TIG
mm (in)	12.5kg (27.6lbs)	5kg (11lbs)
1.0 (0.040)	✓	
1.2 (0.045)	✓	
1.4 (0.052)	✓	
1.6 (1/16)	✓	
2.0 (5/64)		✓
2.4 (3/32)		✓
3.2 (1/8)		✓

Typical Chemical Composition of the Wire (%)

C	Si	Mn	P	S	Ni	Cu	Ti	Fe
0.04	0.20	3.5	0.005	0.001	64.0	28.5	2.2	0.9

Typical Mechanical Properties of All-Weld Metal

YS MPa(lbs/in ²)	TS MPa(lbs/in ²)	EL (%)	Temp °C(°F)	CVN-Impact Value J (ft-lbs)
-	530 (77,000)	45.0	-	-

Typical Welding Parameters

Diameter, Polarity Shielding Gas	Amp. (A)	Volt. (V)
	1.2mm (0.045 in) DC+	
Ar, Ar + He	150	29
	2.4mm (3/32 in) DC-	
Ar	110	12

SMW

SAW

GMAW

GTAW

FCAW

Non-FERROUS

APPENDIX

SM-718 / ST-718

Conformances

AWS A5.14/ ASME SFA5.14 ERNiFeCr-2
JIS Z3334 SNi7718 (NiCr19Fe19Nb5Mo3)
EN ISO 18274 S Ni 7718

Applications

- High-strength aircraft components
- Spindles of ship-building, engines
- Jet engine parts
- Nuclear power plants involving cryogenic temperatures

Features

- Precautions should be taken with high input processes to avoid microfissuring

Welding Position

Current

GMAW: DC+(Pulse)
GTAW: DC-

Shielding Gas

Ar, Ar + He

Diameter / Packaging

Diameter	MIG	TIG
mm (in)	12.5kg (27.6lbs)	5kg (11lbs)
1.0 (0.040)	✓	
1.2 (0.045)	✓	
1.4 (0.052)	✓	
1.6 (1/16)	✓	
2.0 (5/64)		✓
2.4 (3/32)		✓
3.2 (1/8)		✓

Typical Chemical Composition of the Wire (%)

C	Si	Mn	P	S	Cr	Ni	Mo	Fe	Nb	Ti
0.06	0.10	0.15	0.004	0.001	19.0	53.0	3.10	17.5	5.05	1.0

Typical Mechanical Properties of All-Weld Metal

YS MPa(lbs/in ²)	TS MPa(lbs/in ²)	EL (%)	Temp °C(°F)	CVN-Impact Value J (ft-lbs)
630 (91,000)	860 (125,000)	27.0	-	-

Typical Welding Parameters

Diameter, Polarity Shielding Gas	Amp. (A)	Volt. (V)
	1.2mm (0.045 in) DC+	
Ar, Ar + He	180	28
	2.4mm (3/32 in) DC-	
Ar	110	12

SM-60 / ST-60

Conformances

AWS A5.14/ ASME SFA5.14 ERNi-1

JIS Z3334 SNi2061 (NiTi3)

EN ISO 18274 S Ni 2061

Applications

- Salt Production line
- Cast irons to give soft low strength deposit
- Dissimilar welding and buffer layers

Features

- Heavy multipass deposits or highly restrained joints may require preheatup to 150°C

Welding Position

Current

GMAW: DC+(Pulse)

GTAW: DC-

Shielding Gas

Ar, Ar + He

Diameter / Packaging

Diameter	MIG	TIG
mm (in)	12.5kg (27.6lbs)	5kg (11lbs)
1.0 (0.040)	✓	
1.2 (0.045)	✓	
1.4 (0.052)	✓	
1.6 (1/16)	✓	
2.0 (5/64)		✓
2.4 (3/32)		✓
3.2 (1/8)		✓

Typical Chemical Composition of the Wire (%)

C	Si	Mn	P	S	Ni	Ti
0.02	0.40	0.4	0.005	0.001	96.0	3.0

Typical Mechanical Properties of All-Weld Metal

YS MPa(lbs/in ²)	TS MPa(lbs/in ²)	EL (%)	Temp °C(°F)	CVN-Impact Value J (ft-lbs)
	480 (70,000)	30.0	-	-

Typical Welding Parameters

Diameter, Polarity Shielding Gas	Amp. (A)	Volt. (V)
	1.2mm (0.045 in) DC+	
Ar, Ar + He	150	29
	2.4mm (3/32 in) DC-	
Ar	110	12

SMW

SAW

GMAW

GTAW

FCAW

Non-FERROUS

APPENDIX

SMT-7030

Conformances

AWS A5.7/ ASME SFA5.7 ERcUNi
JIS Z3341 YcUNi-3
ABS AWS A5.7 ERcUNi

Applications

- Desalination plant
- Evaporators and etc in salt and sea water processing system

Features

- No preheat & PWHT required, maximum interpass temperature 150°C
- Contamination of the weld zone with foreign material, particularly any source of lead, tin or zinc must be scrupulously avoided to prevent weld metal cracking

Welding Position

Current

GMAW: DC+(Pulse)
GTAW: DC-

Shielding Gas

Ar, Ar + He

Diameter / Packaging

Diameter	MIG	TIG
mm (in)	12.5kg (27.6lbs)	5kg (11lbs)
1.0 (0.040)	✓	
1.2 (0.045)	✓	
1.4 (0.052)	✓	
1.6 (1/16)	✓	
2.0 (5/64)		✓
2.4 (3/32)		✓
3.2 (1/8)		✓

Typical Chemical Composition of the Wire (%)

C	Si	Mn	P	S	Ni	Ti	Cu	Fe
0.02	0.10	0.8	0.001	0.001	31.0	0.4	67.0	0.6

Typical Mechanical Properties of All-Weld Metal

YS MPa(lbs/in ²)	TS MPa(lbs/in ²)	EL (%)	Temp °C(°F)	CVN-Impact Value J (ft-lbs)
-	500 (73,000)	30.0		

Typical Welding Parameters

Diameter, Polarity Shielding Gas	Amp. (A)	Volt. (V)
	1.2mm (0.045 in) DC+	
Ar, Ar + He	160	28
	2.4mm (3/32 in) DC-	
Ar	110	12

ST-80B6

Conformances

AWS A5.28/ ASME SFA5.28 ER80S-B6

EN ISO 21952-A W CrMo5Si

Applications

- It will find applications in chemical or petro-chemical industry and in the ammonia synthesis process
- It is also used for heat exchangers, boilers, piping and pressure vessels for temperature service up to 600°C

Features

- Low alloy copper-coated tig rod with 5% Cr and 0.5% Mo content to be used for the welding of creep resistant steel

Welding Position

Current

GTAW: DC-

Shielding Gas

Ar

Diameter / Packaging

Diameter	Length mm(in)
mm (in)	5kg (11lbs)
2.0 (5/64)	✓
4.0 (5/32)	✓
5.0 (3/16)	✓

Typical Chemical Composition of the Wire (%)

C	Si	Mn	S	P	Cu	Ni	Cr
0.085	0.386	0.537	0.005	0.006	0.138	0.052	5.610
Mo	V	Nb	Sb	Sn	As	X-Factor	
0.558	0.010	0.003	0.002	0.004	0.002	8.81 ppm	

Typical Mechanical Properties of All-Weld Metal

YS Mpa(lbs/in ²)	TS Mpa(lbs/in ²)	EL (%)	Temp °C(°F)	CVN-Impact Value J (ft-lbs)	PWHT
594 (86,000)	676 (98,000)	23.9	-20 (-4)	257 (198)	745°C × 1hr

SMW

SAW

GMW

GTAW

FCW

Non-FERROUS

APPENDIX

ST-80B8

Type : TIG

Conformances

AWS A5.28/ ASME SFA5.28 ER80S-B8

EN ISO 21952-A W CrMo9

Applications

- It will find applications in power plants, chemical or petrochemical industry and in the ammonia synthesis process
- It is also used for heat exchangers, boilers, piping and pressure vessels for temperature service up to 600°C

Features

- Low alloy copper-coated tig rod with 9% Cr and 1% Mo content to be used for the welding of creep resistant steel

Welding Position

Current

GTAW: DC-

Shielding Gas

Ar

Diameter / Packaging

Diameter mm (in)	Length mm(in) 5kg (11lbs)
2.0 (5/64)	✓
2.4 (3/32)	✓
3.2 (1/8)	✓

Typical Chemical Composition of the Wire (%)

C	Si	Mn	S	P	Cu	Ni	Cr
0.06	0.33	0.49	0.005	0.006	0.150	0.230	8.740
Mo	V	Nb	Sb	Sn	As	Al	X-Factor
0.970	0.021	0.002	0.001	0.005	0.003	0.005	8.8 ppm

Typical Mechanical Properties of All-Weld Metal

YS Mpa(lbs/in ²)	TS Mpa(lbs/in ²)	EL (%)	Temp °C(°F)	CVN-Impact Value J (ft-lbs)	PWHT
660 (96,000)	740 (107,000)	21	-20 (-4)	132 (97)	745°C × 1hr

ST-80B2R

Type : TIG

Conformances

AWS A5.28/ ASME SFA5.28 ER80S-B2

Applications

- High pressure pipe & Pressure vessels

Features

- Careful control of preheat, interpass temperatures, postheat is essential to avoid cracking.
- For welding 0.5~1.25Cr-0.5Mo steels for elevated temperatures and corrosive service
- X-factor value of wire is 10ppm or less

Welding Position

Current

GTAW: DC-

Shielding Gas

Ar

Diameter / Packaging

Diameter	Length mm(in)
mm (in)	5kg (11lbs)
2.0 (5/64)	✓
2.4 (3/32)	✓
3.2 (1/8)	✓

Typical Chemical Composition of the Wire (%)

C	Si	Mn	S	P	Cu	Ni	Cr
0.095	0.49	0.645	0.011	0.008	0.12	0.021	1.320
Mo	V	Al	Nb	Sb	Sn	As	X-Factor
0.48	0.002	0.002	0.002	0.001	0.002	0.003	9.6 ppm

Typical Mechanical Properties of All-Weld Metal

YS Mpa(lbs/in ²)	TS Mpa(lbs/in ²)	EL (%)	Temp °C(°F)	CVN-Impact Value J (ft-lbs)	PWHT
490 (71,000)	580 (84,100)	22	20 (68)	120 (88.5)	620°C × 1hr

SMW

SAW

GMW

GTAW

FCW

Non-FERROUS

APPENDIX

ST-90B3R

Type : TIG

Conformances

AWS A5.28/ ASME SFA5.28 ER90S-B3

Applications

- High pressure pipe & Pressure vessels

Features

- Careful control of preheat, interpass temperatures, postheat is essential to avoid cracking.
- For welding 2.25Cr-1.0Mo steels for elevated temperatures and corrosive service
- X-factor value of wire is 10ppm or less

Welding Position

Current

GTAW: DC-

Shielding Gas

Ar

Diameter / Packaging

Diameter	Length mm(in)
mm (in)	5kg (11lbs)
2.0 (5/64)	✓
2.4 (3/32)	✓
3.2 (1/8)	✓

Typical Chemical Composition of the Wire (%)

C	Si	Mn	S	P	Cu	Ni	Cr
0.09	0.51	0.61	0.006	0.008	0.13	0.035	2.390
Mo	V	Al	Nb	Sb	Sn	As	X-Factor
0.94	0.003	0.002	0.004	0.001	0.002	0.003	9.6 ppm

Typical Mechanical Properties of All-Weld Metal

YS Mpa(lbs/in ²)	TS Mpa(lbs/in ²)	EL (%)	Temp °C(°F)	CVN-Impact Value J (ft-lbs)	PWHT
549 (78,600)	641 (92,900)	21.5	20 (68)	197 (145)	690°C × 1hr

ST-70A1

Type : TIG

Conformances

AWS A5.28/ ASME SFA5.28 ER70S-A1

Applications

- Structural steels resistant to heat and to hot work creep

Features

- Good impact strength at low temperatures

Welding Position

Current

GTAW: DC-

Shielding Gas

Ar

Diameter / Packaging

Diameter	Length mm(in)
mm (in)	5kg (11lbs)
2.0 (5/64)	✓
2.4 (3/32)	✓
3.2 (1/8)	✓

Typical Chemical Composition of the Wire (%)

C	Si	Mn	S	P	Cu	Ni
0.09	0.51	0.61	0.006	0.008	0.13	0.035
Cr	Mo	V	Ti	Al	Zr	Sn
2.390	0.94	0.003	0.002	0.004	0.003	0.001

Typical Mechanical Properties of All-Weld Metal

YS Mpa(lbs/in ²)	TS Mpa(lbs/in ²)	EL (%)	Temp °C(°F)	CVN-Impact Value J (ft-lbs)	PWHT
-	652 (94,500)	35.2	-25 (-13)	224 (165)	620°C × 1hr

SMW

SAW

GMW

GTAW

FCW

Non-FERROUS

APPENDIX

ST-80D2

Type : TIG

Conformances

AWS A5.28/ ASME SFA5.28 R80S-D2

Applications

- Low-alloy copper-coated solid wire with 0.5% Mo content designed for welding low-alloy steels with high tensile strength and creep-resistant steels
- Suitable for pipelines and pressure vessels with operating temperatures of about 500°C

Features

- Good impact strength at low temperatures

Welding Position

Current

GTAW: DC-

Shielding Gas

Ar

Diameter / Packaging

Diameter mm (in)	Length mm(in) 5kg (11lbs)
2.0 (5/64)	✓
2.4 (3/32)	✓
3.2 (1/8)	✓

Typical Chemical Composition of the Wire (%)

C	Si	Mn	S	P	Cu	Ni
0.09	0.72	1.84	0.009	0.010	0.15	0.05
Cr	Mo	V	Ti	Al	Zr	Sn
0.11	0.43	0.004	0.001	0.006	0.002	0.008

Typical Mechanical Properties of All-Weld Metal

YS Mpa(lbs/in²)	TS Mpa(lbs/in²)	EL (%)	Temp °C(°F)	CVN-Impact Value J (ft-lbs)	PWHT
-	718 (104,000)	22.8	-30 (-22)	94 (69)	620°C × 1hr

SM-9010 / ST-9010

Conformances

JIS Z3341 YCuNi-1

KR KS D7044 YCuNi-1

Applications

- Desalination plant
- Offshore applications for ship building in the chemical industry

Features

- No preheat & PWHT required, maximum interpass temperature 150°C
- Contamination of the weld zone with foreign material, particularly any source of lead, tin or zinc must be scrupulously avoided to prevent weld metal cracking

Welding Position

Current

GMAW: DC+(Pulse)

GTAW: DC-

Shielding Gas

Ar, Ar + He

Diameter / Packaging

Diameter	MIG	TIG
mm (in)	12.5kg (27.6lbs)	5kg (11lbs)
1.0 (0.040)	✓	
1.2 (0.045)	✓	
1.4 (0.052)	✓	
1.6 (1/16)	✓	
2.0 (5/64)		✓
2.4 (3/32)		✓
3.2 (1/8)		✓

Typical Chemical Composition of the Wire (%)

C	Si	Mn	P	S	Ni	Ti	Cu	Fe
0.01	0.01	0.85	0.006	0.001	10.6	0.27	Rem	1.0

Typical Mechanical Properties of All-Weld Metal

YS MPa(lbs/in ²)	TS MPa(lbs/in ²)	EL (%)	Temp °C(°F)	CVN-Impact Value J (ft-lbs)
-	380 (55,000)	36.0		

Typical Welding Parameters

Diameter, Polarity Shielding Gas	Amp. (A)	Volt. (V)
	1.2mm (0.045 in) DC+	
Ar, Ar + He	160	28
	2.4mm (3/32 in) DC-	
Ar	110	12

SMW

SAW

GMAW

GTAW

FCAW

Non-FERROUS

APPENDIX

Superflux300 X SA-82

Conformances

Applications

- Structures in extremely low temperature environment
- Boilers of steam power plants

Features

- Dry the flux at 250~300°C for 60 minutes before use.
- Keep the welding current and heat input as low as possible to prevent HAZ from falling corrosion resistance.
- No preheat required and maximum interpass of 250°C.
- When welding superaustenitic alloys, the interpass temperature should be controlled to a maximum of 100°C

Welding Position

Current

DC +

Diameter / Packaging

Diameter	Spool
mm (in)	25kg (55lbs)
2.0 (5/64)	✓
2.4 (3/32)	✓
3.2 (1/8)	✓

Typical Chemical Composition of All-Weld Metal (%)

C	Si	Mn	P	S	Cr	Ni
0.067	0.22	3.33	0.001	0.014	19.6	69.8

Typical Mechanical Properties of All-Weld Metal

YS MPa(lbs/in ²)	TS MPa(lbs/in ²)	EL (%)	Temp °C(°F)	CVN-Impact Value J (ft.-lbs)
-	619 (90,000)	46.4	-196 (-321)	117 (86)

Typical Welding Parameters

Wire Feed Speed m/min (in/min)	Amp. (A)	Volt. (V)
3.2mm (1/8 in) DC+		
36	380	30

S-Ni2 X SA-08

Conformances

ABS Manufacturer's Spec. (-196°C)
LR 9NiM
BV AN90M
DNV-GL VL1.5Ni up to VL9Ni
RS Manufacturer's Spec. (-196°C)

Applications

- LNG storage tanks
- Liquid nitrogen storage tanks

Features

- Dry the flux at 300~350°C for 60 minutes before use

Welding Position

Current

DC +

Diameter / Packaging

Diameter	Spool
mm (in)	25kg (55lbs)
2.0 (5/64)	
2.4 (3/32)	✓
3.2 (1/8)	

Typical Chemical Composition of All-Weld Metal (%)

C	Si	Mn	P	S	Cr	Ni	Mo	W	Al
0.04	0.2	0.5	0.001	0.001	2.0	66.0	19.0	2.5	0.2

Typical Mechanical Properties of All-Weld Metal

YS MPa(lbs/in ²)	TS MPa(lbs/in ²)	EL (%)	Temp °C(°F)	CVN-Impact Value J (ft.lbs)
420 (61,000)	680 (99,000)	43.0	-196 (-321)	100 (74)

- Base Metal: 9% Ni

Typical Welding Parameters

Wire Feed Speed m/min (in/min)	Amp. (A)	Volt. (V)	
2.4mm (3/32 in) DC+			
30~70	300~380	24~28	Horizontal Butt

SMW

SAW

GMAW

GTAW

FCAW

Non-FERROUS

APPENDIX

SW-625 Cored

Conformances

AWS A5.34/ ASME SFA5.34 ENiCrMo3T1-1/-4
EN ISO 12153 T Ni 6625 P M/C 2

Applications

- Joining nickel-chromium-molybdenum alloys
- Cladding steel with nickel-chromium-molybdenum weld metal
- LNG storage tank manufacture, desulfurization

Features

- Designed for welding with 100% CO₂ or Ar+15~25% CO₂ shielding gas
- Excellent all position weldability
- Smooth and stable arc with a fast freezing slag

Welding Position

Current

DC +

Shielding Gas

100% CO₂ / Ar+20~25% CO₂

Diameter / Packaging

Diameter mm (in)	Length mm(in)	
	12.5kg (28lbs)	15kg (33lbs)
1.2 (0.045)	✓	✓
1.4 (0.052)		
1.6 (1/16)		

Typical Chemical Composition of All-Weld Metal(%)

C	Si	Mn	P	S	Cr	Ni	Mo	Nb	Fe
0.024	0.42	0.34	0.004	0.002	20.9	65.0	8.9	3.4	0.5

Typical Mechanical Properties of All-Weld Metal

YS MPa(lbs/in ²)	TS MPa(lbs/in ²)	EL (%)	Temp °C(°F)	CVN-Impact Value J (ft.-lbs)
-	759	40.4	-196 (-321)	65 (48)

Typical Welding Parameters

Diameter, Polarity Shielding Gas	CTWD mm (in)	Wire Feed Speed m/min (in/min)	Amp. (A)	Volt. (V)	Deposition Rate kg/hr (lb/hr)
1.2mm (0.045 in) DC+					
100% CO ₂	20 (4/5)	6.0 (236)	140	23~26	2.5 (5.5)
		9.2 (362)	180	27~30	3.4 (7.5)
		12.0 (472)	210	28~31	4.5 (9.9)
80% Ar+20% CO ₂	20 (4/5)	6.1 (240)	140	23~26	2.6 (5.7)
		9.0 (354)	180	27~30	3.6 (7.9)
		11.5 (453)	210	27~30	4.6 (10.1)

SM-CuSi A

Type : MIG

Conformances

AWS A5.7/ ASME SFA5.7 ERCuSi-A

Applications

- Use for welding of Silicon Bronze Copper

Features

- It is used primarily for oxyacetylene welding of copper copper-silicon and copper-zinc metals to themselves and to steel.
- HWC Silicon Bronze is excellent for plain or galvanized steel sheet metal as well as other coated steels.
- Preheat is NOT recommended

Welding Position

Current

GMAW: DC+(Pulse)

Shielding Gas

Ar, Ar+He

Diameter / Packaging

Diameter	MIG
mm (in)	12.5kg(27.6lbs), 15kg(30lbs)
0.8 (0.032)	✓
0.9 (0.036)	✓
1.0 (0.039)	✓
1.2 (0.045)	✓

Typical Chemical Composition of the Wire (%)

Cu	Al	Fe	Mn	Pb	Si	Sn	Zn
Bal	0.002	0.02	0.89	0.004	2.91	0.005	0.003

Typical Mechanical Properties of All-Weld Metal

YS Mpa(lbs/in ²)	TS Mpa(lbs/in ²)	EL (%)	Temp °C(°F)	CVN-Impact Value J (ft.-lbs)
-	345 (50,000)	45		

SMW

SAW

GMAW

GTAW

FCAW

Non-FERROUS

APPENDIX

Titanium Gr2

Type : MIG

Conformances

AWS A5.16/ ASME SFA5.16 ERTi-2

Applications

- Aerospace, marine, chemical plants
- Power generation, oil and gas extraction

Features

- Titanium alloys offer excellent corrosion resistance to acids, chlorides and salt; a wide continuous service temperature range.

Welding Position

Current

GMAW: DC-

Shielding Gas

Ar

Diameter / Packaging

Diameter	TIG
mm (in)	2.5kg (5.5lbs)
2.0 (5/64)	✓
2.4 (3/32)	✓
3.2 (1/8)	✓

Typical Chemical Composition of the Wire (%)

	Ti	Fe	C	N	O	H	Pb
Titanium Gr2	Bal	<0.12	<0.03	<0.015	0.08-0.16	<0.008	-

Typical Mechanical Properties of All-Weld Metal

YS Mpa(lbs/in ²)	TS Mpa(lbs/in ²)	EL (%)	Temp °C(°F)	CVN-Impact Value J (ft-lbs)
-				

SMT-5356(H)

Type : MIG/TIG

Conformances

AWS A5.10/ ASME SFA5.10 ER5356
EN ISO 18273 S Al 5356 (AlMg5Cr(A))
DNV-GL 5356

Applications

- Used for welding casting Al-Mg alloys with maximum 5% Magnesium and parts of wrought alloy of 5000 series, 6000 and 7000 series.

Features

- ER5356 is a about 5% Magnesium Aluminum filler metal which has high strength, high corrosion resistance, and matches the color well with the parent metal after anodizing
- SMT-5356H is used for shipbuilding, automobile, railway parts industry, etc. because it has excellent feedability by controlling impurities

Welding Position

Current

GMAW: DC+(Pulse)
GTAW: DC-

Shielding Gas

Ar, Ar+He

Diameter / Packaging

Diameter	MIG	TIG
mm (in)	12.5kg (27.6lbs)	5kg (11lbs)
1.0 (0.039)	✓	
1.2 (0.045)	✓	
1.6 (1/16)	✓	✓
2.0 (5/64)		✓
2.4 (3/32)		✓
3.2 (1/8)		✓

Typical Chemical Composition of the Wire (%)

	Si	Fe	C	Mn	Mg	Cr	Zn	Ti	Al
SMT-5356(H)	0.07	0.14	0.005	0.11	4.7	0.11	0.01	0.08	Rem

Typical Mechanical Properties of All-Weld Metal

YS Mpa(lbs/in ²)	TS Mpa(lbs/in ²)	EL (%)	Temp °C(°F)	CVN-Impact Value J (ft-lbs)
-	≥275 (≥39,700)	≥17		

SMW

SAW

GMAW

GTAW

FCAW

Non-FERROUS

APPENDIX

SMT-5183(H)

Type : MIG/TIG

Conformances

AWS A5.10/ ASME SFA5.10 ER5183
EN ISO 18273 S Al 5183 (AlMg4.5Mn0.7(A))
LR WC/I-1S
BV WC
DNV-GL 5183

Applications

- Railroad cars and transportation equipment, pressure vessels

Features

- ER5183 is a about 5% Magnesium and 0.6% Manganese Aluminum filler metal which has high strength, high corrosion resistance, and matches the color well with the parent metal after anodizing.
- SMT-5183H is used for shipbuilding, automobile, railway parts industry, etc. because it has excellent feedability by controlling impurities

Welding Position

Current

GMAW: DC+(Pulse)
GTAW: DC-

Shielding Gas

Ar, Ar+He

Diameter / Packaging

Diameter	MIG	TIG
mm (in)	12.5kg (27.6lbs)	5kg (11lbs)
1.0 (0.039)	✓	
1.2 (0.045)	✓	
1.6 (1/16)	✓	✓
2.0 (5/64)		✓
2.4 (3/32)		✓
3.2 (1/8)		✓

Typical Chemical Composition of the Wire (%)

	Si	Fe	Cu	Mn	Mg	Cr	Zn	Ti	Al
SMT-5183(H)	0.06	0.09	0.02	0.65	4.96	0.08	0.03	0.02	Rem

Typical Mechanical Properties of All-Weld Metal

YS Mpa(lbs/in ²)	TS Mpa(lbs/in ²)	EL (%)	Temp °C(°F)	CVN-Impact Value J (ft.-lbs)
-	≥275 (≥39,700)	≥17		

SMT-4043(H)

Type : MIG/TIG

Conformances

AWS A5.10/ ASME SFA5.10 ER4043

EN ISO 18273 S Al 4043 (AlSi5)

Applications

- All the industrial manufacturing sectors, such as the automotive industry, the production of mobile equipments, the shipbuilding sector, etc.

Features

- This silicon-aluminum filler material is one of the oldest and most widely used welding alloys. It can be classified as a general purpose type filler alloy the color well with the parent metal after anodizing.
- SMT-4043H is used for shipbuilding, automobile, railway parts industry, etc. because it has excellent feedability by controlling impurities

Welding Position

Current

GMAW: DC+(Pulse)

GTAW: DC-

Shielding Gas

Ar, Ar+He

Diameter / Packaging

Diameter	MIG	TIG
mm (in)	12.5kg (27.6lbs)	5kg (11lbs)
1.0 (0.039)	✓	
1.2 (0.045)	✓	
1.6 (1/16)	✓	✓
2.0 (5/64)		✓
2.4 (3/32)		✓
3.2 (1/8)		✓

Typical Chemical Composition of the Wire (%)

	Si	Fe	Cu	Mn	Mg	Cr	Zn	Ti	Al
SMT-4043(H)	5.07	0.12	0.03	0.02	0.01	-	0.03	0.02	Rem

Typical Mechanical Properties of All-Weld Metal

YS Mpa(lbs/in ²)	TS Mpa(lbs/in ²)	EL (%)	Temp °C(°F)	CVN-Impact Value J (ft.-lbs)
-	≥120 (≥17,400)	≥8		

SMAW

SAW

GMAW

GTAW

FCAW

Non-FERROUS

APPENDIX

APPENDIX

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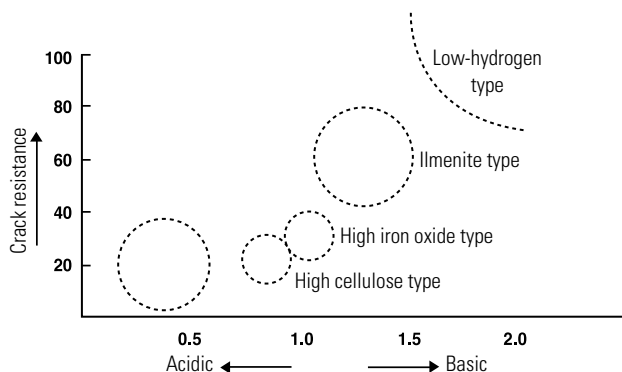
Basics of Welding

Welding electrodes for mild steel

1 Welding electrodes for mild steel									
Section	Standard	KS	E4301	E4303	E4311	E4313	E4316	E4324	E4327
		AWS	-	-	E6011	E6013	E7016	E7024	E6027
Weldability	Arc state		Spray type	A little stable	Rough spray type	Stable	Short maintain	Spray type	Spray type
	Weld penetration		Deep	Normal	Deep	Normal	A little deep	Normal	A little deep
	Slag state		A lot, totally covered	Totally covered	A little, partially covered	Totally covered	A lot, easily desquamate	Naturally desquamate	A lot, totally covered
	Bead appearance		Beautiful	Beautiful	Normal	Beautiful	Normal	Beautiful	Beautiful
	Fillet state		A little concave	A little concave	Flat	A little convex	A little concave	A little concave	A little concave
	Internal organization		Superb	Good	Good	Normal	Superb	Normal	Good
	Spatter		A lot	Normal	A lot	A little	Normal	A little	Normal
the main purpose of use		Use in mild steel and generally use in every welding including construction, shipbuilding, etc	Suitable for every position including flat position, especially appropriate to fillet welding which has short vertical leg	Suitable for every position, especially appropriate to vertical and overhead position which needs x-ray examination. Moreover it could be use for pipe, galvanized steel sheet and low alloy steel	Appropriate to thin plate welding with every position	Having good mechanical property among the mild steel electrodes. Not only appropriate to alloy steel, hard carbon steel and high sulfur but also to malleable cast iron, spring steel, plating welding and enameling. Please take notice of its drying	High efficiency, contains a lot of iron among the coating material. Easily arcing and few or no short circuit during the welding. E4327 has good deposited metallic nature. In the case of flat fillet, nonexpert could also manage to weld uniformly and completely		

2 Comparison of crack resistance of welding electrodes

The crack resistance of weld metal is a critical factor in the selection of a welding electrode. The following figure compares the crack resistance for the basicity of the coating material.



(Figure) Comparison of crack resistance of welding electrodes

As shown in the above figure, the low-hydrogen type has the highest crack resistance, followed by ilmenite type, high iron oxide type, high cellulose type, and high titanium oxide type. In other words, as the coating material becomes more acidic, the workability improves, but the crack resistance decreases. Furthermore, even if the welding electrodes have the same coating material type, some have excellent crack resistance and some have poor crack resistance.

* Crack susceptibility = $230C + 190S + 75P + 45Nb - 12.3Si - 5.4Mn - 1$

≤ 10: Crack resistance is high.

20: Beginning of crack

≥ 30: Crack resistance is low.

Basics of Welding

Welding electrodes for high tensile strength steel and weathering steel

1 Drying welding electrode

Welding electrodes with a higher strength are more prone to cracks due to hydrogen and more prone to pit and blow holes due to the moisture absorption of the coating. Special care should be taken to prevent moisture by drying welding electrodes to a certain temperature before using them, and after drying, they should be stored in a storage of 100~150°C and used in small quantities. If 2-4 hours has passed after taking welding electrodes out of the storage, they should be dried again before using them.

2 Preheating and interpass temperature

Preheating delays the cooling speed of the weld, lowers the hardening of the heat-affected zone and the weld metal, improves ductility, and promotes the discharge of diffusible hydrogen of the new weld, thus preventing cracks in the weld.

The following table lists the preheating temperatures used in arc rod welding with ordinary coating. However, the interpass temperature must be adjusted because if it exceeds 200°C, the strength and impact values may decrease as shown in the following heat input.

The same preheating and interpass temperatures as those of the main welding must be kept for tack welding, tack welding of assembly molds, repair welding and gouging.

Examples of preheating temperatures (°C)

Plate thickness (mm)		6~12	13~25	26~38	39~50
Steel grade					
	HT-50	Unnecessary	Unnecessary	70 or lower	40~100
	HT-55	Unnecessary	70 or lower	40~100	70~120
	HT-60	70 or lower	40~100	70~120	100~150
	HT-70	40~100	70~120	100~150	120~180
	HT-80	40~120	100~150	120~180	150~200
	HT-100	40~150	120~180	150~200	150~200

(Note) Preheating is performed at 10°C or lower. The interpass temperature is 200°C or lower.

3 Welding heat input

The welding heat input is calculated by the following equation:

$$\text{Welding heat input (J/cm)} = \frac{\text{Welding current(A)} \times \text{Arc voltage(V)} \times 60}{\text{Welding speed(cm/min)}}$$

The size of the welding heat input has an impact on the weld cooling speed and the welding pass count. The larger the welding heat input, the lower the weld cooling speed, the thicker the bead and the coarser the microstructure become. Therefore, care should be taken to prevent excessive heat input to prevent the degradation of the weld metal strength, especially the decrease in yield point, and the decrease in the impact values of the bond part and weld metal. Furthermore, the lower the welding heat input, the higher the cooling speed, and welding cracks are caused by hardening of the base metal heat-affected zone and weld metal.

Therefore, you must select an appropriate range of the welding heat input to prevent welding crack and achieve good weld joint.

Examples of welding heat input (KJ/cm)

Steel Grade \ Plate Thickness (mm)	6~12	13~25	26~50
HT-50, HT-55	30 or lower	10~50	15~60
HT-60	30 or lower	10~45	15~55
HT-70, HT-80	25 or lower	10~40	15~45
HT-100	25 or lower	10~35	15~40

(Note) The smaller the plate thickness, the smaller the upper limit of the welding heat input must be than the indicated value.

Basics of Welding

Welding electrodes for high tensile strength steel and weathering steel

4 General precautions

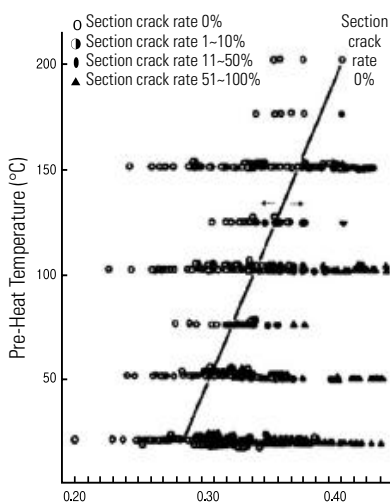
- 1) For the groove morphology, select a shape where the welding distortion is small and the improved part should be kept as clean as possible.
- 2) The tack welding must be at least 50mm, and the tack welding beads must be removed during the main welding.
- 3) You must use the backstep method to prevent the occurrence of blowholes during arc start.
- 4) For welding, you must choose a welding method and sequence that can minimize residual stress. In other words, you must perform wide weaving or avoid using excessive current or undercurrent.
- 5) Absolutely avoid arc strike of the base metal. If arc strike of the base metal occurred inevitably, you must carry out repair welding to prevent welding crack at that part.
- 6) When the humidity is high in summer, care should be taken because the amount of hydrogen in the weld metal increases due to hydrogen partial pressure in the arc atmosphere, causing welding cracks.
- 7) If stress removal annealing is performed, the heating temperature must not exceed the annealing temperature of the base metal.

5 Carbon equivalent and preheating temperature

Steel type	Carbon equivalent (%)	Preheating temperature	Remarks
Carbon steel Low alloy steel	≤0.3	≤100	Preheating temperature (°C)
	≤0.4	≥100	
	≤0.5	≥150	
	≤0.6	≥200	
	≤0.7	≥250	
	≤0.8	≥300	
	≥0.8	≥350	
High Mn steel		-	
Austenitic stainless steel		-	
High alloy steel		≥400	

Carbon equivalent (Ceq, %) = $C + \frac{Mn}{6} + \frac{Si}{24} + \frac{Ni}{40} + \frac{Cr}{5} + \frac{Mo}{4} + \frac{V}{14}$

6 The relationship between preheat temperature and weld crack index of steel



Chemical Component of Steel

C	: 0.007 ~ 0.22
Si	: 0 ~ 0.60
Mn	: 0.40 ~ 1.40
Cu	: 0 ~ 0.50
Ni	: 0 ~ 1.20
Cr	: 0 ~ 1.20
Mo	: 0 ~ 0.70
V	: 0 ~ 0.12
Ti	: 0 ~ 0.05
Nb	: 0 ~ 0.04
B	: 0 ~ 0.005

Diffusion hydrogen amount H :
1.0 ~ 5.0cc/100g

Plate thickness t : 19 ~ 50mm

Intensity of restraint K :
500 ~ 3300Kg/mm-mm

Heat input : 17 ~ 33KJ/cm

Weld crack rate(Pc):

$$P_c = C + \frac{Si}{30} + \frac{Mn}{20} + \frac{Cu}{20} + \frac{Ni}{60} + \frac{Cr}{20} + \frac{Mo}{15} + \frac{V}{10} + 5B + \frac{t}{600} + \frac{H}{60} + (\%)$$

The relationship between the Pc and the preheat temperature(t=16~50mm)

Weld crack sensitivity(Pcm):

$$P_{cm}(\%) = C + \frac{Si}{30} + \frac{Mn}{20} + \frac{Cu}{20} + \frac{Ni}{60} + \frac{Cr}{20} + \frac{Mo}{15} + \frac{V}{10} + 5B$$

Crack sensitivity quotient(Pw):

$$P_w = P_{cm} + \frac{H}{60} + \frac{t}{600} = P_{cm} + \frac{H}{60} + \frac{K}{40,000}$$

H : Diffusion hydrogen amount ml/100g

t : Plate thickness mm

K : Intensity of restraint Kg/mm-mm

Basics of Welding

Welding electrodes for low temperature steel and low alloy heat resistant steel

1 Welding of welding electrode for low temperature steel

You must select an appropriate input heat to obtain a good impact value in welding.

Plate thickness (mm)	Heat input (KJ/cm)
6~12	25 or less
13 ~ 25	10 ~3 5
26 ~ 50	15 ~ 30

(Note) The smaller the plate thickness, the smaller the input heat range must be. For the drying of the welding electrode, preheating and interpass temperatures, and general precautions, follow the instructions for the welding electrodes for high tensile strength steel.

2 Welding of welding electrodes for low alloy low heat-resistant steels

The welding of heat-resistant steel is essentially identical to the welding of high tensile strength steel. However, because it is easy to be hardened if the contents of Cr and Mo are high, the preheating temperature must be higher than that of the high tensile strength steel and post-weld heat treatment must be performed after welding is completed.

For other general precautions and detailed descriptions, refer to the construction precautions for welding electrodes for high tensile strength steel. The drying and welding heat input of welding electrodes should be done according to the procedures for welding electrodes for high tensile strength steel of 60kg grade.

1) Welding preheating process

The typical welding preheating temperatures are as follows.

These preheating temperatures must be maintained during welding and until post-weld heat treatment after welding is completed. If the weld zone needs to be cooled before post-weld heat treatment, hydrogens should be removed before cooling the weld zone.

Steel type	Preheating temperature (°C)
Mn-Mo-(Ni) 0.5% Mo 0.5% Cr-0.5% Mo	100 ~ 200
1% Cr-0.3% Mo 1% Cr-0.5% Mo 1.2% Cr-0.5% Mo	150 ~ 300
2.25% Cr-1% Mo 3% Cr-1% Mo 5% Cr-0.5% Mo	200 ~ 350

(Note) For hydrogen removal process, the following conditions must be met (plate thickness 20mm or greater).

Heating temperature (°C)	Heating time (hr)
250	1 ~ 24
300	1 ~ 20
350	1 ~ 16

2) Post-weld heat treatment (PWHT)

The heat-resistant steel has a large self-hardening property, so the change of the heat-resistant steel by preheating is insufficient, the weld metal is not ductile and the microstructures are unstable. Therefore, post-weld heat treatment (PWHT) should be carried out to improve the properties of the weld zone, remove the residual stress, and prevent welding cracks by hydrogen. The typical PWHT conditions are listed in the following table.

Care should be taken because extended heating at a high temperature with a very thick material can grow the ferrite particles, which may decrease strength.

The temperature for intermediate post-weld heat treatment should be lower by 30~60 than that of the final post-weld heat treatment. Furthermore, a steel grade that is prone to stress removal annealing crack should be smoothened with a grinder before the PWHT.

PWHT Conditions

Steel grade	Plate thickness (mm) for which the PWHT can be omitted	Maintained temperature (°C)	Retention time (hr)	Heating and cooling speeds (°C X hr)
Mn-Mo(Ni)	38 or lower	590~650	t/25 1 hour at the minimum	400°C or higher (1) Heating 220×25/t or lower 220°C/hr must not be exceeded. (2) Cooling 270×25/t or lower 275°C/hr must not be exceeded.
0.5% Mo 0.5% Cr-0.5% Mo	16 or lower	600~650		
1% Cr-0.3% Mo 1% Cr-0.5% Mo 1.25% Cr-0.5% Mo	13 or lower	620~720		
2.25% Cr-1% Mo 3% Cr-1% Mo	-	680~730		
5% Cr-0.5% Mo	-	680~730		

(Note) t: plate thickness

Basics of Welding

Hardfacing Welding

Hardfacing welding process refers to welding with a special-purpose alloy appropriate for using the surface of a base metal damaged by abrasion, corrosion and thermal resistance. The hardfacing welding process must meet the following conditions.

- 1) Investigate in detail the wear state of the base metal to be welded.
- 2) Select an appropriate welding electrode in the wear part.
- 3) Select an appropriate work method.

1 Classification of metal wear types

Wear refers to the chip-off or cracking of part of an object by contact between different objects. The actual wear is not simple, but complex. The actual wear phenomena can be classified as follows.

1) Abrasive wear

- (1) A wear caused by scratching of the metal surface under a stress by nonmetal particles or by fine soil
- (2) A wear caused by cutting of metal surface under a stress by nonmetal particles and hard soil or hard bumps
- (3) A wear caused by a deep dented metal surface under an impact and high stress
- (4) A wear caused by fine particles in a fluid moving at a high speed
- (5) A wear caused by friction between metal and nonmetal

2) Adhesive wear

A wear caused by rupture of a soft metal by a hard metal due to adhesion on a micro-contact surface by friction between two metals.

3) Impact wear

A wear caused by cracks on a metal surface due to a high impact

2 Crack prevention measures in hardfacing welding process

Most wear-resistant hardfacing welding electrodes contain alloy elements, and high alloy steel containing alloy elements are often used as base metal, which is prone to cracking. Therefore, preheating and post-weld heat treatment is emphasized as a countermeasure to cracking. For determination of preheating and post-weld temperatures, the relationship between carbon equivalent (Ceq) and theoretical maximum hardness is widely used.

$$\text{Carbon equivalent (Ceq, \%)} = \text{C} + \frac{1}{24}\text{Si} + \frac{1}{6}\text{Mn} + \frac{1}{15}\text{Ni} + \frac{1}{5}\text{Cr} + \frac{1}{4}\text{Mo} + \frac{1}{5}\text{V}$$

$$\text{Maximum hardness (Hv max.)} = 1200 \times \text{Ceq} - 200$$

HV max	Crack Prevention Measures
Under 200	Unnecessary
200–250	Preheat and PWHT needed (about 100°C) Preheat needed for thick plate, wide area welding and in winter season
250–325	Preheat for over 150°C, 650°C × 1hr, stress relief
Over 325	Preheat for over 250°C, right after welding 650°C × 1hr, stress relief

3 Base Metal and Carbon Equivalent

Component	Steel Type	JIC symbol	Carbon Equivalent (%)
Truck roller	0.50–0.55C Carbon Steel	S50C	0.65–0.75
Truck link	0.50–0.55C Carbon Steel	S 45 C S Cr 4 SCM 3	0.50–0.70 0.65–0.75 0.70–0.80
Tipper teeth	High Mn Steel Medium Ni-Cr-Mo Carbon Steel	SCMnH S Cr 4	- 0.65–0.75
Dredger cutter knife	Cast Carbon Steel Low Mn Cast Steel Medium Carbon Steel Medium Ni-Cr-Mo Carbon Steel	SC 49 SCA 2 S 45 C SNCM 9	0.35–0.40 0.50–0.55 0.55–0.65 0.80–0.90
Dredger pump casing	Cast Carbon Steel Low Mn Cast Steel Medium Carbon Steel Medium Carbon Ni-Cr-Mo Steel	SC 46 SCA 51 - -	0.35–0.40 0.65–0.75 0.65~ -
Jaw crusher	High Mn Steel	SCMnH	-
Gear	Medium Carbon Steel Medium Carbon Ni-Cr-Mo Steel Cr-Mo Steel Cast Steel	S40C SN CM1 SCM4 -	0.40–0.65 0.70–0.80 0.50–1.00 -
Roller	Medium Carbon Steel High Carbon Steel High Carbon Cr-Mo Steel Cast Iron	- - - -	0.50–0.90 0.80–1.50 1.40–2.50 -
Punch for cold forging	Carbon Tool Steel Dies Steel High-speed Steel Superhard Alloy	SK 3 SK D 6 SKD -	1.0–1.2 - - -
Valve	Cast Carbon Steel Stainless Steel Copper Alloy	SC 46 SCS 14 -	0.35–0.40 - -

(Note) The following equation is the calculation of the carbon equivalent

$$\text{Carbon equivalent (Ceq, \%)} = C + \frac{1}{24}Si + \frac{1}{6}Mn + \frac{1}{5}Cr + \frac{1}{4}Mo + \frac{1}{15}Ni$$

Basics of Welding

4 Application of Hardfacing welding electrode

1) Engineering construction part

Component Name and Shape	Materials	Electrode				Note
		Under Laying		Over Laying		
		Name	Standard(JIC)	Name	Standard(JIC)	
Bulldozer Idler 	Medium carbon steel Low alloy steel	S-7016-M S-7016-H	D4316 D5016	S-260A-B S-350B-B	DF2A-300-B DF2A-400-B	Preheat: ≥200°C
Bulldozer Sprocket 	"	"	"	"	"	"
Bulldozer Shoe 	Medium carbon steel	S-7016-M S-7016-H	D4316 D5016	S-600A-B S-700B-B	DF2B-600-B DF2C-600-B	Preheat, PWHT: ≥200°C
	Manganese steel High manganese steel	-	-	S-700B-B S-13MN-B	DF3C-600-B DFMA-250-B	-
Bulldozer Link 	High carbon steel Cast steel	S-7016-M	D4316	S-700B-B S-13MN-B	DF3C-600-B DFMA-250-B	Preheat, PWHT: ≥200°C
	Medium carbon steel	S-7016-H	D5016	(final layer) S-700B-B	DF3C-600-B	

Component Name and Shape	Materials	Electrode				Note
		Under Laying		Over Laying		
		Name	Standard(JIC)	Name	Standard(JIC)	
Bulldozer Cutting Edge 	Carbon tool steel	S-7016-M S-7016-H	D4316 D5016	S-600B-B S-700B-B	DF2B-600-B DF3C-600-B	Preheat: ≥200°C
				S-13MN-B (When an object contains many rocks)	DFMA-250-B	
Bulldozer End-Bit 	Carbon tool steel	S-7016-M S-7016-H	D4316 D5016	S-600B-B S-700B-B	DF2B-600-B DF3C-600-B	Preheat: ≥200°C
				S-13MN-B (When an object contains many rocks)	DFMA-250-B	
Bulldozer Trunnion 	Silicon steel	S-7016-M S-7016-H S-8016-G S-9016-G	D4316 D5016 D5316 D5816	S-260A-B S-240A-R	DF2A-300-B DF2A-250-R	Preheat: ≥150°C
Bulldozer Shank Tip 	High carbon steel	S-7016-M S-7016-H	D4316 D5016	S-13MN-B (When an object contains many rocks)	DFMA-250-B	Preheat, PWHT: ≥200°C

Basics of Welding

Hardfacing Welding

Component Name and Shape	Materials	Electrode				Note
		Under Laying		Over Laying		
		Name	Standard(JIC)	Name	Standard(JIC)	
Bulldozer Roller 	Medium carbon steel	S-7016-M S-7016-H S-8016-G S-9016-G	D4316 D5016 D5316 D5816	S-260A-B S-600B-B S-700B-B	DF2A-300-B DF2B-600-B DF3C-600-B	Preheat: 70~150°C
Shovel Shoe 	High manganese steel	S-316-16N	D316-16	S-13MN-B	DFMA-250-B	-
				(final layer) S-700B-B	DF3C-600-B	
Shovel Roller 	Medium carbon steel Low alloy steel	S-7016-M S-7016-H S-8016-G S-9016-G	D4316 D5016 D5316 D5816	S-260A-B S-600B-B S-700B-B	DF2A-300-B DF2B-600-B DF3C-600-B	Preheat: 70~150°C
Shovel Sprocket 	Medium carbon steel Low alloy steel	“	“	“	“	Preheat: 100~150°C
Shovel Idler 	Medium carbon steel Low alloy steel	“	“	“	“	Preheat: 100~150°C

Component Name and Shape	Materials	Electrode				Note
		Under Laying		Over Laying		
		Name	Standard(JIC)	Name	Standard(JIC)	
Pinion Gear 	Medium carbon steel	"	"	"	"	Preheat: 70~150°C
Bucket 	Cast carbon steel	-	-	S-600B-B S-700B-B	DF2B-600-B DF3C-600-B	"
				S-13MN-B (When an object contains many rocks)	DFMA-250-B	
Bucket Tooth 	High manganese steel	S-316-16N S-13MN-B	D316 DFHE-200B	S-13MN-B S-350B-B	DFMA-250-B DF2A-400-B	"
				(fore-end) S-700B-B	DF3C-600-B	
Pin 	Silicon steel	-	-	S-600B-B S-700B-B	DF2B-600-B DF3C-600-B	Preheat: 70~150°C

Basics of Welding

Hardfacing Welding

2) Dredge part

Component Name and Shape	Materials	Electrode				Note
		Under Laying		Over Laying		
		Name	Standard(JIC)	Name	Standard(JIC)	
Pump Casing 	Cast carbon steel Low manganese Cast steel	S-7016-M S-7016-H	D4316 D5016	S-600B-B S-700B-B	DF2B-600-B DF3C-600-B	Preheat: 100~150°C
Pump Impeller 	Cast carbon steel Low manganese Cast steel	S-7016-M S-7016-H	D4316 D5016	S-600B-B S-700B-B	DF2B-600-B DF3C-600-B	
Cutter Knife 	Cast carbon steel Low manganese Cast steel	S-7016-M S-7016-H	D4316 D5016	S-600B-B S-700B-B	DF2B-600-B DF3C-600-B	Preheat: 100~150°C
Bucket 	Mild steel Cast carbon steel	S-7016-M S-7016-H	D4316 D5016	S-600B-B S-700B-B	DF2B-600-B DF3C-600-B	

3) Mining machinery part

Component Name and Shape	Materials	Electrode				Note
		Under Laying		Over Laying		
		Name	Standard(JIC)	Name	Standard(JIC)	
Jaw Crusher Liner 	High manganese steel	S-7016-M	D4316	S-13MN-B	DFMA-250-B	-
		S-7016-H	D5016	(final layer)		
		S-8016-G	D5316	S-600B-B	DF2B-600-B	
		S-9016-G	D5816	S-700B-B	DF3C-600-B	
Cone Crusher Liner 	High manganese steel	S-7016-M	D4316	S-13MN-B	DFMA-250-B	-
		S-7016-H	D5016	(final layer)		
		S-8016-G	D5316	S-600B-B	DF2B-600-B	
		S-9016-G	D5816	S-700B-B	DF3C-600-B	
Roller Crusher Roll 	"	"	"		"	-
Cone Crusher Mantle 	"	"	"		"	-

SMW

SAW

GMAW

GTAW

FCAW

Non-FERROUS

APPENDIX

Basics of Welding

Hardfacing Welding

Component Name and Shape	Materials	Electrode				Note
		Under Laying		Over Laying		
		Name	Standard(JIC)	Name	Standard(JIC)	
Crusher Hammer 	High manganese steel	S-316-16N	D316	S-13MN-B	DFMA-250-B	Water cooling welding
		S-13MN-B	DFHE-200B			
Screw Conveyer 	Mild steel Low alloy steel	-	-	S-600B-B	DF2B-600-B	Preheat: 100~150°C
				S-700B-B	DF3C-600-B	
Rock Drill Knife 	Medium carbon steel Low alloy medium carbon steel	-	-	S-700B-B	DF3C-600-B	Preheat: ≥250°C
Ladle Pin 	Cast carbon steel	-	-	S-600B-B	DF2B-600-B	Preheat: 70~150°C
				S-700B-B	DF3C-600-B	

Component Name and Shape	Materials	Electrode				Note
		Under Laying		Over Laying		
		Name	Standard(JIC)	Name	Standard(JIC)	
Crank Shaft 	Low alloy steel	-	-	S-260A-B	DF2A-300-B	Preheat: 100~150°C
Coupling 	Cast carbon steel	S-7016-M	D4316	S-260A-B	DF2A-300-B	Preheat: 70~150°C
		S-7016-H	D5016	S-240A-R	DF2A-250-R	
Roller 	"	"	"	"	"	"
Mn-Rail Crossing 	High manganese steel	S-308-16N	D308-16	S-13MN-B	DFMA-250-B	-
				(when connecting) S-308-16N S-240A-R	D308 DF2A-250-R	

Basics of Welding

Stainless Steel Welding

1 Precautions for using

1) Redraying of welding electrode

If the welding electrode coating material contains a large amount of moisture, it may cause a blowhole. Furthermore, if the redry temperature is too high, covering cracks are generated during coagulation because the core wire has a high thermal expansion coefficient.

2) Welding current

If welding current is excessive, honeycomb phenomenon occurs in the latter part of welding, and may cause various weld defects (undercut, intergranular corrosion).

Furthermore, the current for DC welding must be lowered by 10~15% compared to AC welding.

3) Cracks during welding

The cracks in Cr-Ni steel are high-temperature cracks that appear around 900°C. This phenomenon is mainly caused because low-melting point compounds are gathered at the austenite grain boundary, and the external or weld metal cannot endure the stress that occurs during coagulation and contraction. To relieve the crack susceptibility, a small amount of ferrite structures should be added to the austenite structures, and the interlayer temperature should be limited to 150°C or lower.

4) Thorough removal of foreign substances on weld zone

5) Arc distance and ultra-arc welding

The arc distance during welding must be kept short to prevent the oxidation loss of heavy metals and suppress the intrusion of harmful elements from the atmosphere. Furthermore, for ultra-arc welding, use step-back method or end-tab method because ultra-arc blow hole may be generated due to lack of deoxidation and protective gas.

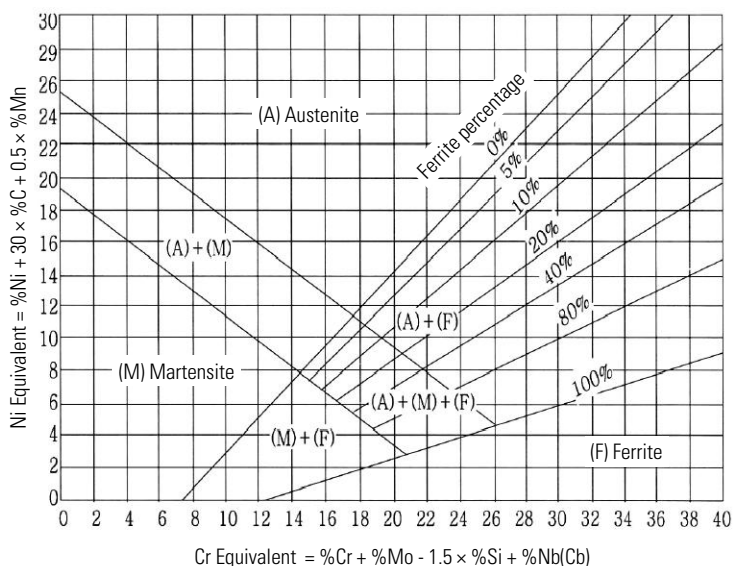
6) Vertical upward welding

The bead shape can become u-shape because the weld metal flows down easily. Thus, low-current intermittent welding is advisable.

2 Composition and microstructure of stainless steel weld metal

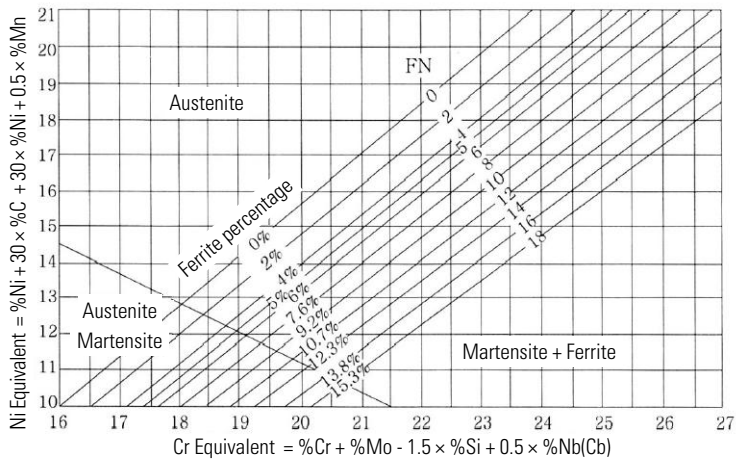
The microstructure chart is used to determine the ferrite amount of the austenitic stainless steel weld metal and to estimate the microstructure in the chemical composition from carbon steel to high alloy steel weld metal besides the stainless steel weld metal. For example, it is used to estimate the microstructure of weld metal if the different-material bonding part is welded by austenitic stainless steel, or if carbon steel is overlaid with stainless steel.

Schaeffler microstructure chart



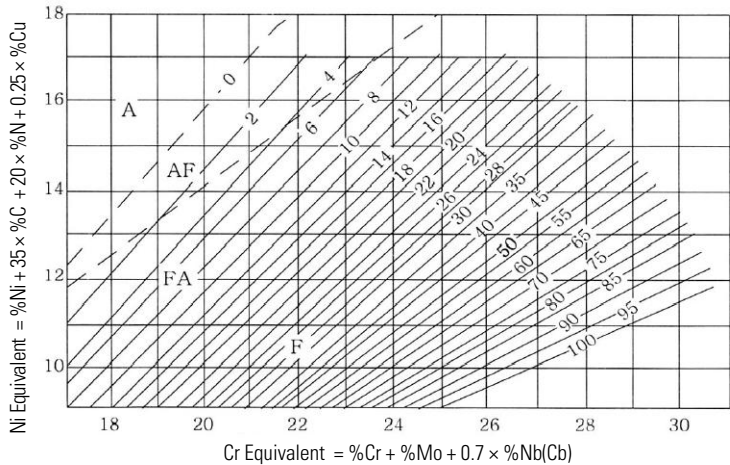
Basics of Welding

Delong microstructure chart



(Note) When this microstructure chart is used, it is advisable to determine the amount of applied nitrogen by an analysis test. If there is no analysis value, use 0.03% for a rough amount of nitrogen.

WRC microstructure chart

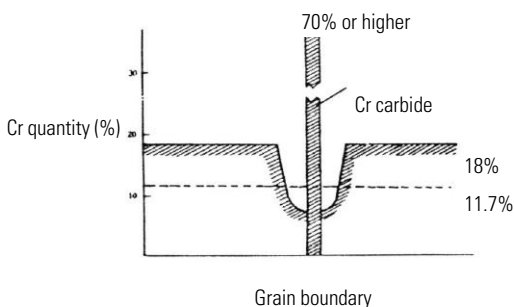


(Note) In this chart, A, AF FA, and F indicate the solidification mode. A denotes the austenite (γ) single phase, AF denotes the γ crystal+eutectic ferrite (δ), FA denotes the δ primary crystal+ peritectic/eutectic γ , and F denotes δ single phase solidification.

3 Intergranular corrosion

For 18%Cr-8%Ni, chromium carbide precipitates at the austenite grain boundary during welding (precipitation temperature zone 550~750°C), and the Cr in the base metal near the grain boundary is diluted. As a result, the Cr content becomes lower than 11.7% which is required to ensure corrosion resistance, and priority corrosion occurs. As a measure to prevent this:

- 1) If the carbon content is lower than the solubility limit, use a low-carbon stainless welding electrode (308L, 316L...) because it is difficult to precipitate chromium carbide.
- 2) Titanium and niobium have greater affinity to carbon at 850~930 °C, so they prevent loss of Cr by forming TiC and NbC. Use a stainless welding electrode (309Cb, 347) that contains these stabilized elements (Ti, Nb).
- 3) To avoid the temperature range of 550~750 °C (precipitation of chromium carbide), it is advisable to perform low-current welding and quenching after welding



4 Roles of ferrite in weld metal

To prevent the solidification cracks of weld metal, it is advisable to select a weld metal that contains 5~8% ferrite because:

- 1) Ferrite has a high solubility for harmful elements and impurity elements (P, S, Si, Nb, and O) than austenite. Thus, the existence of ferrite decreases liquid films of low melting point, which narrows the solidification range and makes it difficult to generate cracks.
- 2) The existence ferrite lowers the thermal expansion coefficient and the shrinkage stress, which makes it difficult to generate cracks.

Basics of Welding

Stainless Steel Welding

5 Selection of Welding Electrodes

Base Metal		Welding Electrode		HYUNDAI WELDING Products
ANSI	JIS	ANSI	JIS	
301	SUS 301	E 308	D 308	S-308.16N
302	SUS 302	E 308	D 308	S-308.16N
304	SUS 304	E 308	D 308	S-308.16N
		E 308L	D 308L	S-308L.16N
304L	SUS304L	E 308L	D 308L	S-308L.16N
309		E 309	D 309	S-309.16N
		E 309L	D 309L	S-309L.16N
309S	SUS 309S	E 309	D 309	S-309.16N
		E 309L	D 309L	S-309L.16N
310		E 310	D 310	S-310.15
310S	SUS 310S	E 310	D 310	S-310.15
316	SUS 316	E 316	D 316	S-316.16N
		E 316L	D 316L	S-316L.16N
316L	SUS 316L	E 316L	D 316L	S-316.16N
321	SUS 321	E 347	D 347	S-347.16
347	SUS 347	E 347	D 347	S-347.16

6 Heterogeneous Welding of Stainless Steel

Base metal	430	410	405	403	347	321	317L	317	316L	316	310S	309S	304L	304
304	309	309	309	309	347	347	317L	317L	316L	316	309	309	308L	308
304L	309L	309L	309L	309L	347	347	317L	317L	316L	316L	309L	309L	308L	
309S	309	309	309	309	309	309	309Mo	309Mo	309Mo	309Mo	309	309		
310S	NiCrFe-3	NiCrFe-3	NiCrFe-3	NiCrFe-3	NiCrFe-3	NiCrFe-3	309Mo	309Mo	309Mo	309Mo	310			
316	309Mo	309Mo	309Mo	309Mo	316L	316L	317L	317L	316L	316				
316L	309MoL	309MoL	309MoL	309MoL	316L	316L	317L	317L	316L					
317	309Mo	309Mo	309Mo	309Mo	317L	317L	317L	317L						
317L	309MoL	309MoL	309MoL	309MoL	317L	317L	317L							
321	309	309	309L	309L	347	347								
347	309	309	309L	309L	347									
403	430	410	430	410										
405	430	430	430											
410	430	410												
430	430													

Basics of Welding

Cast Iron Arc Welding

Cast iron arc welding methods include hot welding method which heats the base metal to a high temperature of 500~600 °C and cold welding method that welds with no preheating or by local low-temperature preheating.

1 Hot welding method

This method uses a welding electrode made of pure iron core wire.

- 1) Preheat the entire base metal or locally to 500~600 °C.
- 2) It is preferable to perform continuous welding by weaving.
- 3) After welding, slowly cool down after maintaining 600 °C for one hour.

2 Cold welding method

This method uses a welding electrode made of alloy core wire of pure Ni-Fe, Ni-Cu, etc.

- 1) Completely remove pollutants on the base metal surface such as rust, paint, and sand.
- 2) If possible, perform welding without using weaving at low current using a small-diameter welding electrode.
- 3) Avoid continuous welding, produce short beads, and relieve stress by symmetry method and skip welding method.
- 4) Attempt to reduce stress and residual stress in the weld zone by performing peening for each bead.
- 5) Preheating to 100~200 °C can achieve a better result.

Basics of Welding

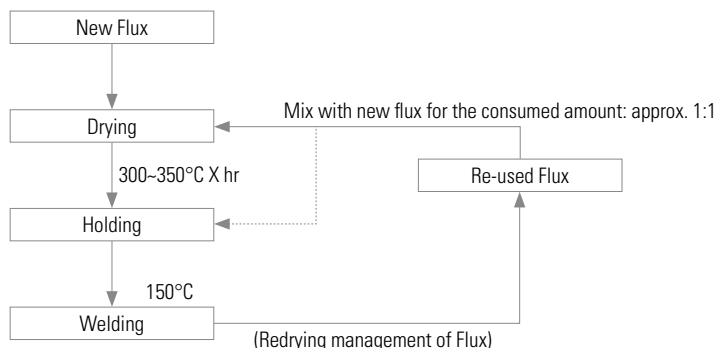
Submerged Arc Welding

1 Management of submerged arc welding material

Special care should be taken for proper management of welding materials because it has a decisive effect on the welding quality of important structures for which X-ray characteristics and impact toughness are highly regarded.

- 1) They must be kept on a pallet (temperature: $20 \pm 10^{\circ}\text{C}$, relative humidity: max. 70%)
- 2) The materials must not be stacked for more than two levels because the packing material may be damaged by weight and it is dangerous.
- 3) Care should be taken during transportation because the packing materials can be damaged due to improper handling. Furthermore, transportation is prohibited in snow or rain, but if it is unavoidable, they must be placed on and covered with waterproof sheets, and moisture-proofing must be verified before being transported
- 4) The wires are copper-plated to prevent rust and improve current flow with the contact tip of the welder. Thus, they must be kept isolated from harmful gases (sulfur dioxide gas, sea wind, etc.) that degrade the surface. When wires remaining after use are kept, their product names and dimensions must be recorded, and care should be taken not to mix them. The wires should be kept from rusting because it deteriorates current flow with the contact tip of the welder, destabilizes arc, damages the bead appearance and causes weld defects such as pits and blow holes.
- 5) In general, HYUNDAI fluxes are produced with low moisture content as much as possible to achieve good welding characteristics (for high temperature sintering type, max. 0.1% of crystal water at 1000°C) and supplied in tin cans or paper bags that can prevent moisture absorption. If the flux contacts snow or rain, or absorbs moisture, they must be dried by a redrying system before using.

Redrying management of flux



* Precautions

- 1) After opening the packing, it is ideal to evenly pour the flux in the drawer at approximately 50 mm height and re-dry it. Review the appropriateness of the redrying method in advance because the maintenance time can vary by the weight of the flux to be re-dried.
- 2) It is advisable to keep the re-dried flux that is not used immediately at 150 ± 25 °C.
- 3) When redrying the flux, you should separate it into dry condition and hold condition to minimize the moisture content of flux.

2 Appropriate current range by wire diameter

Appropriate current (A)		400 or less	300-350	350-800	500-1,100	700-1,600	1,000 or higher
Wire diameter	mm	2.4	3.2	4.0	4.8	6.4	7.9
	inch	3/32	1/8	5/32	3/16	1/4	5/16

<Example chemical composition of wire for submerged arc welding>

Type	Identification tag	AWS standard	Chemical composition (%)			
			C	Si	Mn	Mo
L-8	Brown	A5.17 EL8	0.07	0.01	0.5	-
L-12	Blue	A5.17 EL12	0.09	0.02	0.5	-
M-12K	Red	A5.17 EM12K	0.10	0.20	1.0	-
H-14	Orange	A5.17 EH14	0.12	0.03	2.01	-
H-14L	Purple	A5.23 EG	0.05	0.02	1.98	-
A-3	Green	A5.23 EA3	0.08	0.01	1.82	0.47
A-G	Black	A5.23 EG	0.12	0.03	1.90	-

3 Precautions for submerged arc welding of carbon steel

- 1) Keep the flux in a dry place with no moisture if possible. Re-dry it before using to get good welding quality. Repeated recovery can cause scales, slags, and foreign substances, and the change of grain size distribution can damage the bead appearance. Therefore, refill new flux.
- 2) Remove rust, oil, rubbish, water, and slags from groove because they can cause defects such as pit and blowhole.
- 3) If the groove angle, root interval, etc. are inaccurate, melt-through, poor penetration, and insufficient reinforcement can occur. Hence, the precision of improvement should be higher than other welding methods. Groove angle: $\pm 5^\circ$, root interval: max 0.8mm, root surface: ± 1 mm.

Basics of Welding

Submerged Arc Welding

- 4) Take special care about the following for multilayer welding.
 - (1) If humidity is high or temperature is low, perform appropriate preheating before welding a thick weld zone.
 - (2) Use relatively small diameter wires.
 - (3) Apply low current and low speed for first layer welding conditions in the groove.
 - (4) The initial layer weld zone is prone to root cracks due to large binding force. Thus, choose a groove shape that can endure the binding force. (see item 4 (2))
 - (5) To improve the slag peeling property, special care should be taken for the welding voltage selection (around 28 volt), and low-current intermediate speed welding should be carried out.
- 5) Especially for welding of high tensile strength steel, carefully select the wire to obtain weld metal with excellent collision toughness comparable to the base metal
- 6) The heat-affected zone may be hardened or become brittle depending on the high tensile strength steel, causing cracks of the weld metal. Thus, special care should be taken to the construction method.
- 7) When performing multilayer welding to a high tensile strength steel with a large binding force at low temperature, maintain a preheating and interlayer temperature of 50~100 °C for 50 and 60 kg grades to prevent cracks. However, they may vary by the steel type and thickness, construction method, and welding material characteristics. Therefore, calculate and select the appropriate preheating temperature in advance.

4 Main Causes and Countermeasures for Solidification Cracking

1) Formation of weld metal

* Unit of crack susceptibility: UCS factor

$$= 230C + 190S + 75P + 45Nb - 12.3Si - 5.4Mn - 1$$

UCS ≤ 10: high crack resistance, UCS=20: beginning of cracking, UCS ≥ 30: low crack resistance

2) Solidification type of weld metal

* Select welding conditions so that the bead width/penetration depth (b/p) ratio would to 1.0 to 1.25 times the weld zone.

b/p < 1.0: internal cracking danger, b/p > 1.25: surface cracking danger

3) Preheating

- (1) Preheating is performed to reduce the shrinkage stress of the weld zone for structures with a large binding force.

- (2) Preheating is performed to delay the cooling speed in the critical temperature range to prevent excessive hardenability and insufficient ductility of the weld metal and heat-affected zone.
- (3) Preheating is performed to delay the cooling speed for hydrogen to be discharged from around the weld metal and base metal to prevent low-temperature cracks such as underbead crack. However, there is a secondary purpose such as removal of oil, moisture, and organic matters from the weld zone and the prevention of blowholes by increasing the hydrogen diffusion speed.

* Precautions

- 1) The preheating temperature must be kept constant before welding to prevent aggregation, avoid partial preheating and preheat the entire groove.
- 2) Avoid direct preheating of the groove face. Preheat a width that is 5 times or more as large as the thickness of the base metal to both sides of the groove face to prevent aggregation of moisture in the groove face.
- 3) Excessive preheating can cause distortion of the weld joint and cause solidification cracks by increasing the dilution of impurity elements (C, P, S, etc.) in the base metal. Therefore, an appropriate temperature must be selected depending on the thickness of base metal and the carbon equivalent.

5 Countermeasures against defects of weld zone

Defect	Cause	Countermeasures
Pock mark	1. Moisture absorption of flux 2. Use of contaminated flux 3. Existence of foreign substances in the weld joint (rust, paint, scale, etc.) 4. Excessive application height of flux 5. Too small welding voltage 6. Too large welding speed	1. Re-dry the flux at 300~350°C for 1 hour. 2. Remove foreign substances and use a new flux. 3. Existence of foreign substances in the weld joint (brushing, grinding, flame, etc.) 4. Maintain an application height that does not expose arc. 5. Increase the welding voltage. 6. Lower the welding speed.
Blow hole, Pin hole	1. Moisture absorption of flux 2. Existence of foreign substances and moisture in the weld joint 3. Use of contaminated flux 4. Low application height of flux (arc exposure) 5. Defect of tack 6. Too large welding speed	1. Re-dry the flux at 300~350°C for 1 hour. 2. Perform clear water grind and preheat the weld joint. 3. Remove foreign substances and use a new flux. 4. Maintain an application height that does not expose arc. 5. Process the tack part and remove slag. 6. Lower the welding speed.

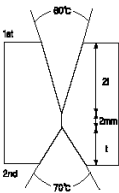
Basics of Welding

Submerged Arc Welding

Cracks (horizontal and vertical cracks)	1. Inappropriate selection of flux and wire 2. High C and S in the steel 3. Excessive binding of the weld joint 4. Low atmosphere temperature in the welding site 5. Excessive penetration for the bead width 6. Moisture absorption of flux 7. Inappropriate groove morphology of the weld joint	1. Select a flux and wire that is appropriate for the steel. 2. Lower the welding current and speed. 3. Apply appropriate welding conditions that endure the shrinkage stress. 4. Preheating and post-weld heating of the weld zone 5. Apply a low-speed welding at a low current. 6. Re-dry the flux at 300~350 °C for 1 hour. 7. Enlarge the groove angle of the weld joint.
Slag inclusion	1. Slag leading by poor selection of welding direction 2. Slag leading by too small welding speed 3. Inappropriate aiming position of wire 4. Poor bead morphology of the previous layer 5. Insufficient slag removal of the previous layer in multi-layer welding 6. Poor penetration	1. Weld from a low place to the high place in an inclined member. 2. Increase the welding speed. 3. Set the wire apart from the groove side by the wire diameter or more. 4. Modify the bead shape with a grinder before welding. 5. Completely remove the slags of the previous layer. 6. Deepen penetration by increasing the welding current.
Overlap	1. Too large welding current 2. Too small welding voltage 3. Too small welding speed 4. Inappropriate wire diameter 5. Inappropriate aiming position of wire	1. Lower the welding current. 2. Increase the welding voltage 3. Increase the welding speed. 4. Select an appropriate wire diameter. 5. Adjust the aiming position of wire.
Undercut	1. Too large welding current 2. Too small welding voltage 3. Too large welding speed 4. Inappropriate wire diameter 5. Inappropriate aiming position of wire (filletwelding)	1. Lower the welding current. 2. Increase the welding voltage 3. Lower the welding speed. 4. Select an appropriate wire diameter. 5. Adjust the aiming position of wire.
Lack of penetration	1. Poor precision of groove morphology of the weld joint 2. Too small welding current 3. Inappropriate welding polarity 4. Too large welding voltage 5. Too large welding speed 6. Inappropriate aiming position of wire 7. Inappropriate wire diameter 8. Poor selection of welding direction	1. Check the precision of the groove morphology (groove face, root face, root interval) 2. Increase the welding current. 3. Apply the welding polarity of DC+. 4. Lower the welding voltage. 5. Lower the welding speed. 6. Adjust the aiming position of wire 7. Apply a small-diameter wire. 8. Weld from a low place to the high place in an inclined member.

6 Tips for

1) S-717, S-787TB, S-707TP, S-777MX, Superflux 787, S-777MXH (multilayer welding)

Improvement shape	Thickness (mm)	Wire diameter (mm)	Stacking sequence		Electrode	Polarity	Current (A)	Voltage (V)	Speed (cm/min)		
	≥20	4.0	1st	Root	1 electrode	DC+	450~500	26~28	30~40		
				Foster		DC+	500~600	28~30	30~50		
			-			Back gouging					
			2nd	Root		DC+	450~500	26~28	30~40		
				Foster		DC+	500~600	28~30	30~50		
			-			Back gouging					
		4.0 4.0	1st	Root	2 electrode	L(DC+)	450~500	26~28	30~40		
				Foster		L(DC+)	600~700	30~32	60~80		
			-			Back gouging					
			2nd	Root		L(DC+)	450~500	26~28	30~40		
				Foster		L(DC+)	600~700	30~32	60~80		
			-			Back gouging					
			4.0 4.0 4.0	1st		Root	3 electrode	L(DC+)	450~500	26~28	30~40
						Foster		L(DC+)	600~700	30~32	70~90
				-		Back gouging					
				-		T1(AC)		500~600	32~36	70~90	
		-		T2(AC)	400~500	34~36		70~90			
		-		Back gouging							
		2nd		Root	L(DC+)	450~500		26~28	30~40		
				Foster	L(DC+)	600~700		30~32	70~90		
		-		Back gouging							
		-		T1(AC)	500~600	32~36	70~90				
-		T2(AC)	400~500	34~36	70~90						

(Note) Shield bead welding for melt prevention : GMAW, SM-70 1~2 layer welding

SMW

SAW

GMAW

GTAW

FCAW

Non-FERROUS

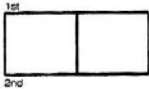
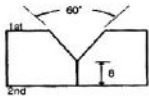
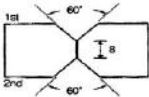
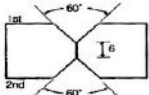
APPENDIX

Basics of Welding

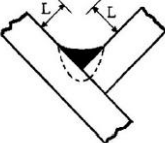
Submerged Arc Welding

2) S-707, S-717, S-727, S-787TB, S-707TP, S-777MX, S-777MXH, S-777MXT

(Both-sided single layer welding)

Thickness (min)	Wire Diameter (min)	Improvement	1st			2nd		
			Current (A)	Voltage (V)	Speed (cm/min)	Current (A)	Voltage (V)	Speed (cm/min)
6	4.0		500	34	60	600	36	60
8			550	34	55	650	36	55
10			650	34	50	750	36	50
12			700	34	50	800	36	50
14	4.8		700	34	35	800	36	55
16			750	34	35	825	36	55
18			800	34	30	850	36	50
20			850	34	30	875	36	45
22	4.8		800	34	30	900	35	40
25			825	34	35	825	36	40
28			850	34	30	950	36	35
30	4.8		875	34	30	950	36	30

3) S-727, S-777MX, S-777MXH, S-777MXT (Flat welding)

Improvement	Angle of Groove (L, mm)	Wire Diameter (mm)	Current (A)	Voltage (V)	Speed (cm/min)
	6	4.0	500	30	60~70
	7		600	32	60~70
	8		700	32	60~70
	9	4.8	650	34	50~60
	10		700	34	50~60
	12		750	34	40~50
	14		800	34	30~40

Basics of Welding

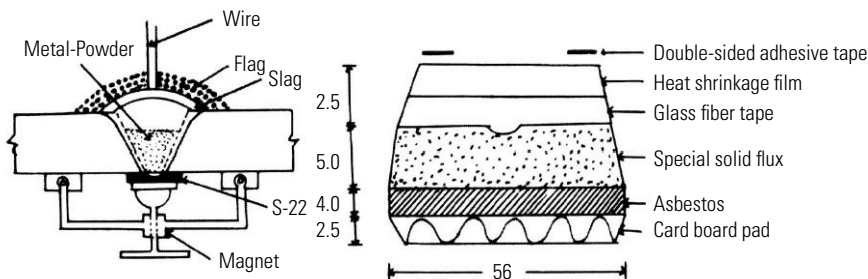
Single-sided Welding

1 SSB Process

1) Overview

Single-sided automatic welding method attaches S-22, which is a backing material with a special structure that is simply attached and detached because the surface is a double-sided adhesive tape, to the back side of the groove, and forms a back-side bead simultaneously with the formation of back-side beads when the surface is welded. This method omits back-gouging and back-side welding.

As shown in the following figures, S-22 is a material with glass fiber tape of the back-side bead formation layer, special solid flux as a height adjustment layer and asbestos of the fireproof layer, etc. embedded in a heat-shrinkable film to avoid absorption. It is easily applicable to automatic welding sites where the turn-over of members is constrained.



2) Characteristics

- (1) S-22 does not need re-dry because moisture is not absorbed.
- (2) Easy to handle because it is lightweight.
- (3) Simply attachable and detachable because the mounting to the back-side of the groove is possible with double-sided adhesive tape.
- (4) Due to high flexibility, it is highly adaptable to a groove back side that does not fit well or distorted, or to difference in plate thickness, and generates fewer defects by poor adhesion of the backing material.
- (5) It is applicable to curved members as well because it can be bent to a curvature of 300mm.

Basics of Welding

Single-sided Welding

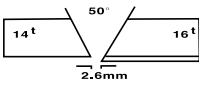
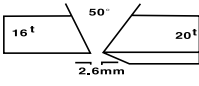
3) Applications

- (1) The S-22 backing material is applicable to members for automatic welding and to places where double-sided automatic welding is difficult or single-sided automatic welding is efficient.
- (2) Appropriate for ground and dock welding places for ship building, especially the upper deck and the members of ship’s bottom and side.
- (3) The welding cost can be saved and efficiency can be improved by applying this single-sided automatic welding to relatively thick steel structures.

4) Welding materials

Applied steels	Flux	Wire	Iron	Backing material
Mild steel and 50kg/mm ² -class high tensile strength steel	S-707	L-8	IRN	S-22 (std. - type) S-22 (M - type) S-22 (S - type) CBM - 600F
	S-705EF	H-14		

5) Example welding conditions

Plate thickness (mm)	Wire diameter (mm)	Iron height (mm)	Backing material	Groove morphology	No. of layers	Current (Amp)	Voltage (Volt)	Speed (Cpm)
20 x 20	4.8	13	Standard		1	860	34	38
					2	830	33	35
					3	720	34	35
14 x 16	4.8	14	M		1	960	34	23
16 x 20	4.8	14	S		1	960	34	23

Basics of Welding

Carbon Dioxide Arc Welding

1 Welding conditions

The appropriate welding conditions vary by the welder type or the plate thickness and groove morphology. Furthermore, the bead shape and performance of the carbon dioxide arc welding change greatly by the welding conditions. Therefore, the welding conditions must be selected carefully. The effects of the welding conditions are illustrated in Fig. 2.

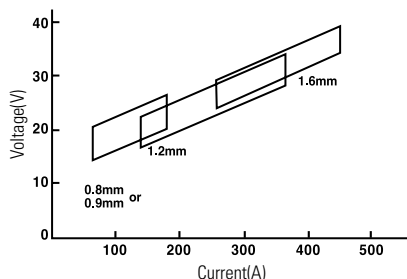


Figure 1. Appropriate welding conditions of wire

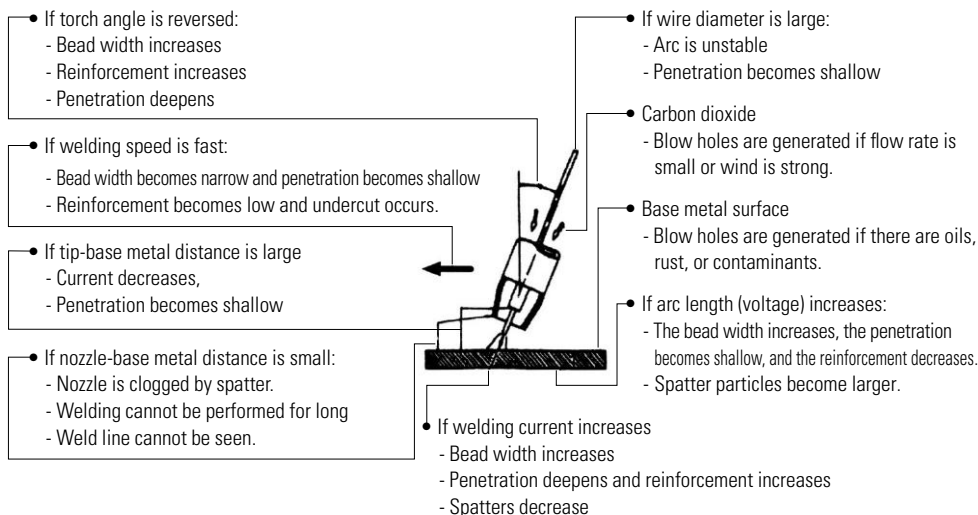


Figure 2. Welding conditions and their effects

Basics of Welding

Carbon Dioxide Arc Welding

1) Tip-base metal distance

Keep the tip-base metal distance according to the current as shown in Table 1 because it is related to bead shape and efficiency.

Table 1. Appropriate tip-base metal distance

Used current (A)	Tip-base metal distance (mm)	Remarks
< 250	6 ~ 15	The higher the current, the larger the tip-base metal distance.
≥ 250	15 ~ 25	

2) Torch angle

The torch angle and manipulation are shown in Figure 3.

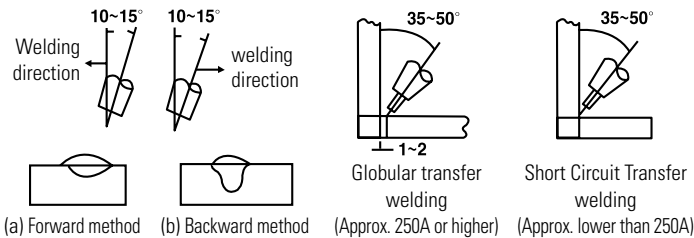


Figure 3. Torch angle

3) Slope of base metal

Downward welding can obtain good results for thin plate welding. The bead shape differences by the slope of base metal are shown in Figure 4

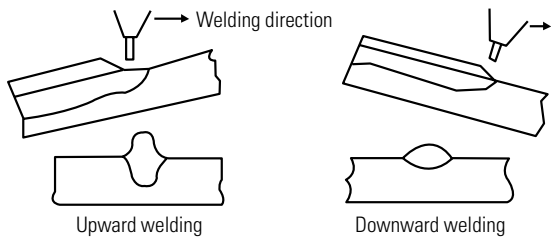


Figure 4. Bead shape by the slope of base metal

4) Carbon dioxide flow rate

For the carbon dioxide used for carbon dioxide arc welding, the carbon dioxide gas for welding or JIS type 3 is used. The flow rate should be 200/min in principle.

2 Welding preparation

1) Groove processing

The groove preparation determines the welding result for semi-automatic welding. Therefore, a highly precise and clean groove should be processed.

2) Tack

The dimensions of the tack should be as shown in Figure 5. The number of beads should be as small as possible. Furthermore, to prevent defects of the welding start and ending parts, attach and weld the plates of the same steel grade and same thickness.

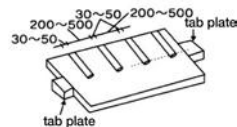


Fig. 5 Tack dimensions

3) Contaminants in groove

Remove oils, paints, moisture, and excess rust from the groove face.

3 Wire storage

The wires wound to the plastic spool cannot be re-dried. The wire surface is treated with copper plating or special rust-proofing. Thus, rusting or moisture absorption is difficult, but rust can occur if they are left in a damp place for a long time. Therefore, repack them and store in a less-damp place if they are not used for a long time.

4 Adjustment of welder

Sufficiently adjust the carbon dioxide adjuster, welding power supply, and feeder because defects in these parts can have adverse effect on the welding result.

5 General precautions

1) Types of protective gas

The purity and especially moisture content of protective gas can cause blow holes in the weld zone and hydrogen brittleness. Therefore, it should be selected by paying attention to the following conditions:

- (1) CO₂ of JIS type 3 (JIS K 1106) or CO₂ for welding
- (2) Ar gas for welding (JIS K 1105)
- (3) O₂ of JIS K 1101

Basics of Welding

Carbon Dioxide Arc Welding

2) Flow rate of protective gas

Pay special attention to the following when using CO₂ because insufficient flow rate can cause blow holes or pit.

- (1) If low-current (Wind velocity = 0): 15~20ℓ/min
- (2) For high current or wind 2m/sec about 25~30ℓ/min.

3) The arc voltage (arc length)

Penetrate when arc voltage change, bead shape and workability might be unstable, so please remain the arc voltage constant as possible.

4) Nozzle altitude

High or Low if the altitude of the nozzle is not constant the spatter might attached and the supply of the CO₂ could be unstable producing the cause of a Blow hole or a Pit. Therefore remain constant the altitude of the nozzle.

5) Distance between tip- base material

Keep it 20mm.

6 Cause and measures for CO₂ welding defects

Type of defects	Cause	Measures
Blow hole, Pit	1. Incomplete gas protection 2. Excessive moisture content in the CO₂ gas 3. Steel rust, filth 4. Improper welding conditions	1. Gas flow adjustment, perfect protective gas effects 2. Use CO₂ gas of JIS 3 class of high purity 3. Rust, filth removal 4. Maintain proper conditions
Spatter	1. When the arc voltage is over low 2. When the welding current is high	1. Proper voltage at working 2. Proper current at working
Undercut	1. When the arc voltage is over high 2. When the welding speed is faster 3. When the welding current is over high	1. Maintain proper voltage 2. Maintain proper welding speed 3. Maintain proper current
Bead Exterior defects	1. When there is high voltage 2. When the manipulation speed is faster 3. When the base material is overheated 4. When the manipulation speed is instable	1. Maintain proper voltage 2. Maintain proper manipulation speed 3. Lower the interlayer temperature 4. Maintain constant manipulation speed

Basics of Welding

Flux Cored Wire

1 Storage

- 1) Welding materials should be stored in a dried and well-ventilated place
 - humidity: under 60%
 - temperature under 30°C
- 2) The floor has to be flat, and when storing on pallets it must be under 2 stages
- 3) Welding materials should be stored on pallets which at least 10cm away from the wall and floor
- 4) Keep it out of external risk factors such as sea breeze or SO₂ gas.

2 Transportation

Cover it with humid proof of snow, rain or high humidity days. Also, the packaging might suffer damage, so handle it with precaution.

3 Precautions on Usage

- 1) Before using maintain it in its original package
- 2) After use, the remaining should be packed in plastic bags to protect from any humidity and storage in a dry place as mentioned in section (1).

SMW

SAW

GMAW

GTAW

FCAW

Non-FERROUS

APPENDIX

Basics of Welding

Stainless Wire

1) Welding power

Applying the characteristics of the DC voltage, use DC(+) when welding.

2) Shielding gas

The shielding gas usually uses the CO₂ or for better workability uses Ar + 20% CO₂ gas mixture.

3) The distance between the tip and the base material (Stick-out)

0.9mm wire 15mm before and after and remain for 1.2~1.5mm wire 15~20mm.

4) Windproof

When the wind speed around the arc exceeds the 1m/sec, a blowhole can be easily produced. The inhalation of atmospheric nitrogen, the amount of ferrite in the weld metal helps decrease the risk of hot cracking occurs, please make the appropriate windproof.

5) Welding fume

Because the amount of welding fume is more than the solid wire, please make sure that the ventilation is enough.

Basics of Welding

Inert Gas Arc (MIG, TIG) Welding

1 Overview

Inert gasses for inert gas welding include Ar, Ar+O₂, and Ar+CO₂. The methods for their use can be broadly classified into TIG and MIG welding methods. The TIG welding method generates an arc between a tungsten electrode and the base metal and uses Ar as the protective gas. This method is used for thin plate (3 mm or less) welding of stainless steel, initial layer welding of single-sided welding of pipes, and maraging steel welding.

The welding work is easy because no flux and slag remain, and beautiful bead appearance can be obtained. Furthermore, clean weld metal can be obtained because welding is performed in an inert gas.

The MIG welding generates arc between the core wire and the base metal, and uses Ar, Ar+2~5%O₂, Ar+5~70%CO₂ gas as protected gas depending on the use. This welding method has wide-ranging applications and is mainly used for mild steel, high tensile strength steel, low alloy steel, and stainless steel.

This is a highly efficient welding method with a very fast welding speed because the current density is six times as high as that of mild steel and twice as large as that of TIG welding.

It is divided into short-circuiting transfer, globular transfer, and spray transfer depending on melting state of the core wire. When 100%Ar is used as the protective gas, the volume becomes large and spray transfer is difficult. In this case, adding 2~5% oxygen can stabilize arc and facilitates spray transfer.

2 Characteristics of MIG welding

The MIG welding uses a DC welder with reverse polarity. The arc has a slender, long conical part at the center in the argon gas, a bell-shaped faint light is seen around it, and argon gas surrounds the outside again. The faint light surrounding the conical part is mainly caused by the light emission of argon gas. The gas ions collide with the base metal surface at the electrode (+) and cleans the surface oxide film. The welding rod melting rate of shielded metal arc welding is determined by the arc current. It is unrelated to arc voltage, but in the MIG welding, it is affected by arc voltage. When the current is identical, if the arc voltage increases, the melting speed decreases. If the arc length increases due to any reason, the arc voltage increases, and the melting speed decreases. If the wire feed rate is constant, the arc length becomes smaller and returns to the original length.

Basics of Welding

Inert Gas Arc (MIG, TIG) Welding

This is called the self-control characteristic of MIG arc. Unlike the shielded arc welding, the MIG welding has an arc voltage characteristic, which is a rising characteristic. Therefore, it fits well only with a welder with a static voltage characteristic or rising characteristic.

3 Characteristics of TIG welding

TIG welding (tungsten inert gas arc welding) can use both AC and DC power supplies. For the DC power, the welding work varies greatly by the polarity. In South Korea, Ar gas is used almost always in TIG welding.

1) DC welding

In straight polarity welding, electrons collide with the base metal at a high speed and heat the base metal more. The opposite phenomenon occurs in reverse polarity welding, and the electrode is heated to a high temperature and the tip melts easily. Therefore, a thicker electrode is used in reverse polarity welding. For example a tungsten electrode with a 1.6 mm diameter can flow 125 A welding current in straight polarity welding, but a tungsten electrode with a 6.4 mm diameter is required to flow the same current in the reverse polarity welding. These opposite heating effects also have large effects on the penetration depth and shape as well.

Therefore, the straight polarity welding can obtain a weld zone with a narrow width and a deep penetration, but the reverse polarity welding obtains a wide and shallow weld zone because it uses a low current with a thick electrode. In the AC welding, the penetration is in the middle between these two cases.

2) Cleaning action

Another characteristic of the reverse polarity welding is the cleaning action (plate cleaning action, surface cleaning action). It is generally known that accelerated gas ions collide with the base metal, and the cleaning action removes the oxide film of the base metal cleanly as if it has been wiped out by sandblast. Therefore, it can perform welding with no solvent even for metals with a strong oxide film such as aluminum or magnesium, or an oxide film with a high melting point. This cleaning action has almost no effect when He is used as the inert gas because He ions are too light compared to the Ar ions. Furthermore, the reverse polarity can heat the electrode and the melted electrode can be mixed with the weld metal; in addition, welding manipulation is difficult due to unstable arc. Therefore, AC welding which is described below is mainly used instead for welding of aluminum, magnesium, and their alloys

3) AC welding

AC welding has the characteristics of both DC straight polarity and reverse polarity, and can evenly use their characteristics. In other words, the diameter of the electrode may be relatively small, and when Ar gas is used, it has oxide film cleaning action for light alloys, and the penetration becomes slightly wide and deep.

4 Shielding gas type and Applicable base material and welding position

Arc Characteristics	Protection Gas	Apply Steel	Welding positions
Spray Arc	Argon	Aluminum, Aluminum alloy, Titanium, Titanium alloy, Nickel, Nickel alloy, Copper, Copper alloy	Lower 90° degree Horizontal fillet
	Argon + 2~5% Oxygen	Mild steel, High strength steel, Low alloy steel and stainless steel	Lower 90° degree Horizontal fillet
	Argon + 5~20% Carbon dioxide	Mild steel, High strength steel, and Low alloy steel	Lower 90° degree Horizontal fillet
Short Arc	Argon + 30~70% Carbon dioxide	Mild steel, Low alloy high strength steel and stainless steel	All positions
	Helium + Argon + Carbon dioxide (ex. 60%-35%-5%)	High strength steel, stainless steel, Nickel alloy steel	Lower 90° degree Horizontal fillet
	Helium + Argon + Carbon dioxide (ex. 60%-35%-5%)	High strength steel, stainless steel, Nickel alloy steel	Lower 90° degree Horizontal fillet
Pulse Arc	Argon + 2% Oxygen Argon + 5% Carbon dioxide	Mild steel, High strength steel, Stainless steel	All positions
	Argon	Nickel alloy(Inconel), Stainless steel	Lower 90° degree Horizontal fillet

Welding Positions

Welding Positions

GROOVE WELD

FILLET WELD

FLAT



HORIZONTAL



VERTICAL



OVERHEAD



Welding Positions

for Pipes

GROOVE WELD



www.hyundaiwelding.com

HYUNDAI
WELDING

SWAW

SAW

GMW

GTAW

FCW

Non-FERROUS

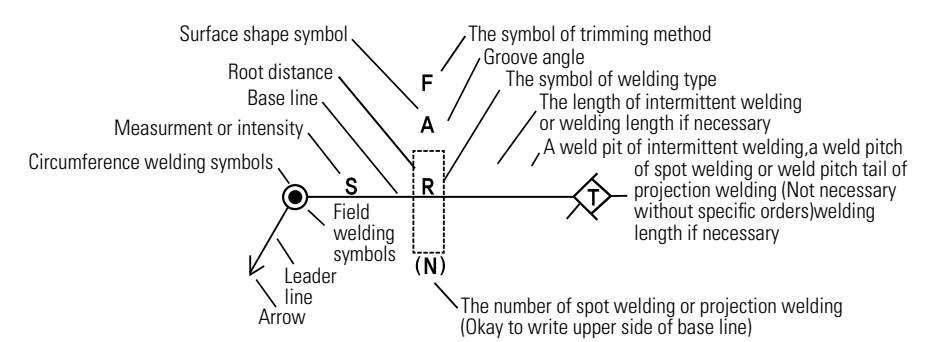
APPENDIX

Welding Symbols

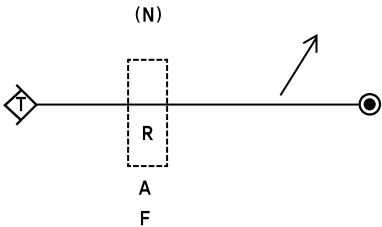
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Indicated position

- When the weld zone is the opposite direction of the arrow



- When the weld zone is the same direction as the arrow



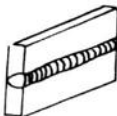
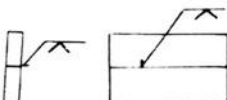
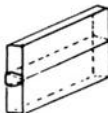
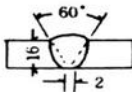
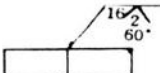
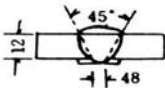
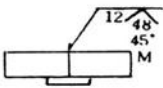
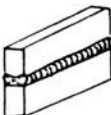
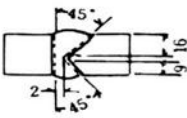
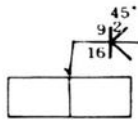
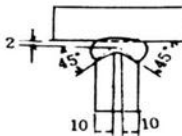
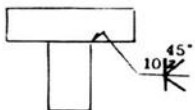
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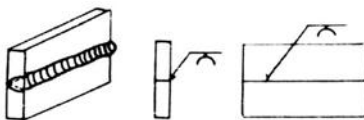
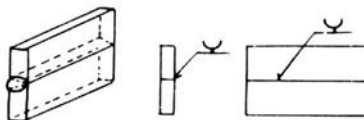
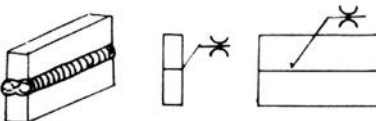
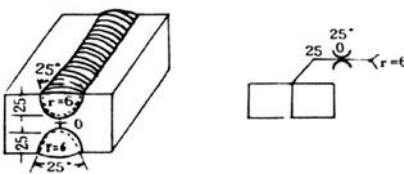
Welding symbol

	Welding Type	Symbol	Welding Type	Symbol	Classification	Sub Symbol
Groove Weld	I type		V type	∨	Surface Shape	Flat —
	X type	×	U type	∪		Convexity —
	H type	⋈	✓ type	✓		Concavity —
	J type	└	K type	└	Finishing Method	Grinder G
	Both side J type	└	Flare ✓ type	└		Machinery M
Fillet	Consecutiveness	⋈	Non-consecutiveness	⋈		Chipping C
	Cross	⋈				Finishing F

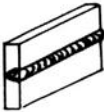
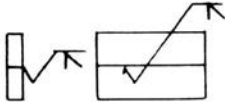
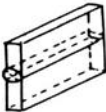
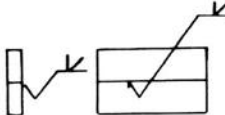
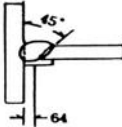
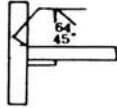
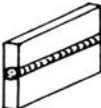
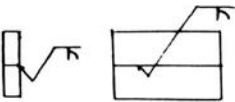
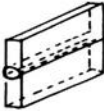
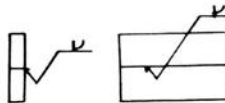
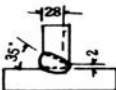
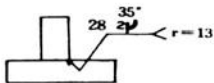
I Type Groove Welding	Symbol	II	
Weld zone	Real shape		
	The mark of floor plan		
Arrow side			
The opposite side of arrow			
Both side			
Root gap 2mm			
Root gap 2mm			
Root gap 0mm			
X Type Groove Welding	Symbol	X	angle 90°, 4side symmetry
Both side			
Groove depth Arrow side 6mm The opposite side of arrow 9mm Groove angle Arrow side 60° The opposite side of arrow 90° Root gap 3mm			

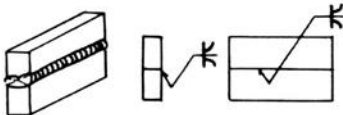
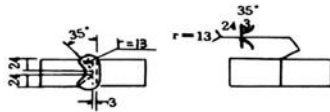
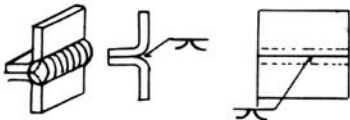
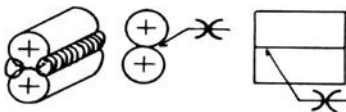
Welding Symbols

V Type Groove Welding	Symbol		angle 90°, 4side symmetry
Weld zone	Real shape		The mark of floor plan
Arrow side			
The opposite side of arrow			
Groove depth 16mm Groove angle 60° Root gap 2mm			
The thickness of the board which uses a base plate Groove angle 45° Root gap 4.8 mm Finishing method cutting			
K Type Groove Welding	Symbol	K	
Both side			
Arrow side Groove depth 16mm Groove angle 60° Opposite side of arrow Groove depth 9mm Groove angle 45° Root gap 2mm			
T-connection root gap 2mm Groove depth 10mm Groove angle 45° Root gap 2mm			

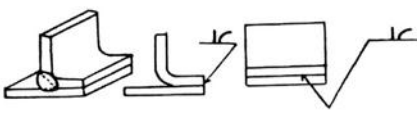
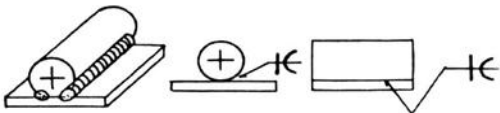
U Type Groove Welding	Symbol		Half circle and straight line (1/2 length of half circle)
Weld zone	Real shape		
	The mark of floor plan		
Arrow side			
The opposite side of arrow			
Groove depth 27mm			
Groove angle 60° Root radius 6mm Root gap 2mm			
H Type Groove Welding	Symbol		
Both side			
Groove depth 25mm Groove angle 25° Root radius 6mm Root gap 0mm			

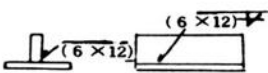
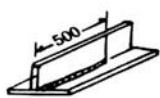
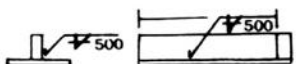
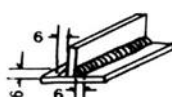
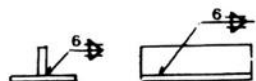
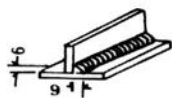
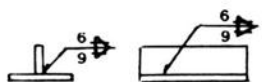
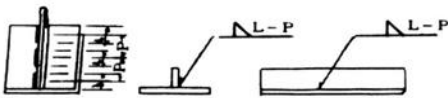
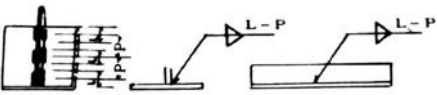
Welding Symbols

✓ (Bevel) Type Groove Welding	Symbol	✓	A vertical line across with other line, 45° angle between two lines, same height
Weld zone	Real shape		The mark of floor plan
Arrow side			
The opposite side of arrow			
Using t-joint base plate Groove angle 45° Root gap 6.4Mm			
J Type Groove Welding	Symbol	J	A vertical line with a quarter circle and the length of straight part is half of radius
Arrow side			
The opposite side of arrow			
Groove depth 28mm Groove angle 35° Root radius 13mm Root gap 2mm			

Both side J Type Groove Welding	Symbol	K	
Weld zone	Real shape		
	The mark of floor plan		
Both side			
Groove depth 27mm Groove angle 35° Root radius 13mm Root gap 3mm			
Flare V and Flare X Type Groove Welding	Symbol	X	Flare V type is that 2 quarter circles face back together Flare X type is that 2 half circles face back together
Arrow side			
The opposite side of arrow			
Both side			

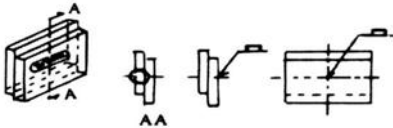
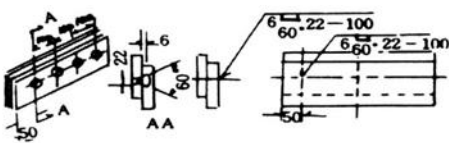
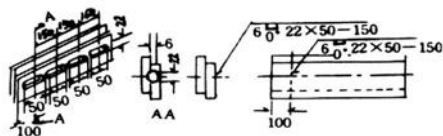
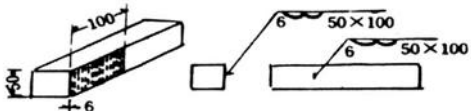
Welding Symbols

Flare V and Flare K Type Groove Welding	Symbol		Flare V type : a vertical line with a quarter circle Flare K type : a vertical line with a half circle
Weld zone	Real shape		
	The mark of floor plan		
Arrow side			
The opposite side of arrow			
Both side			
Fillet Welding	Symbol		right-angled isosceles triangle, one horizontal line from the median point of the perpendicular line
Arrow side			
The opposite side of arrow			
Both side			
The length of leg: 6mm			

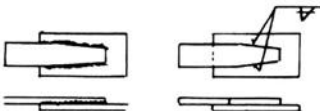
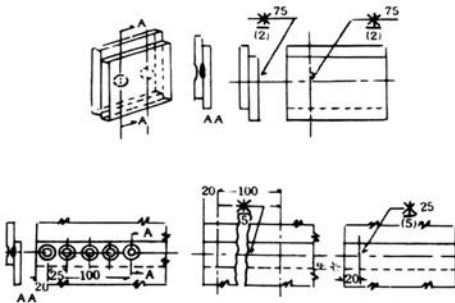
Fillet Welding	Symbol		right-angled isosceles triangle, one horizontal line from the median point of the perpendicular line
Weld zone	Real shape		The mark of floor plan
The length of leg: 6mm X 12mm			
The length of welding: 500mm			
The length of both side of legs: 6mm			
Different length of both side of legs			
Fillet Welding	Symbol	Parallel 	Zigzag 
Arrow side			
The opposite side of arrow			
Both side			

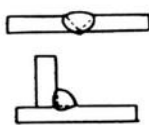
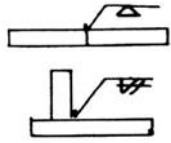
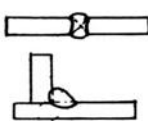
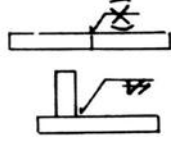
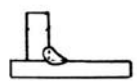
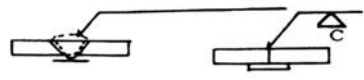
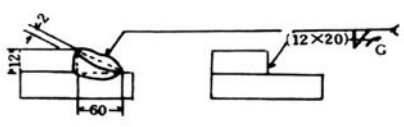
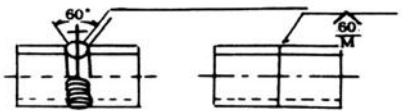
Welding Symbols

Fillet Welding		Symbol	Parallel	Zigzag	
Weld zone		Real shape		The mark of floor plan	
The parallel welding Weld length 50mm Weld pitch : 150mm					
The length of leg in front of the crossed weld arrow : 6mm The length of the opposite side leg of arrow : 9mm Weld length 50mm Weld pitch : 300mm					
The length of both side legs of the crossed weld : 6mm Weld length: 50mm Weld pitch : 300mm					
Fillet Welding		Symbol		an upside-down isosceles trapezoid, the length of lower base is 1/2 of the upper one	
Groove type	Arrow side				
	The opposite side of arrow				
Circle type	Arrow side				

Flux Welding		Symbol		an upside-down isosceles trapezoid, the length of lower base is 1/2 of the upper one
Weld zone		Real shape		The mark of floor plan
Groove type	The opposite side of arrow			
Circle type	Hole diameter : 22mm Weld pitch : 100mm Groove angle : 60c° Weld length : 6mm			
Groove type	Hole diameter : 22mm Weld pitch : 50mm Groove angle : 0c° Weld length : 6mm			
Bead or Built Up Welding		Symbol		the height of arc is 1/2 of radius, in case of built up welding, put two of them in a row
Arrow side				
The opposite side of arrow				
The thickness of built-up welds : 6mm Width 50mm Length : 300mm				

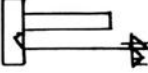
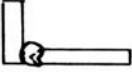
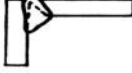
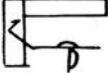
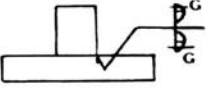
Welding Symbols

Fillet Welding	Symbol	Field Welding	•	Circular-Patch Welding	○	Circular-Patch Field Welding	⊙
Weld zone	Real shape		The mark of floor plan				
In case of field fillet welding							
In case of circular-patch sequential fillet welding							
In case of sequential circular-patch field fillet welding							
Spot Welding	Symbol	✱					
Using smooth electrode on the arrow side							

The Welding Surface Phenomenon	Symbol	Convex 	Concave 	Flatness 
Weld zone	Real shape		The mark of floor plan	
In the case that the surface of butt welding and fillet welding are flat				
In the case that the surface of butt welding and fillet welding are flat				
In the case that the surface of fillet welding is concave				
Finishing Method	Symbol	Chipping C	Grinding G	Cutting M
In case of finish of chipping on the butt weld zone				
Finish of grinding on the scalene fillet weld zone and make it 2mm concave shape				
Finish of cutting on the butt weld zone of circle plank, omit the sub-symbol because it obviously is circular-patch				

Welding Symbols

Combination use of symbol

Flux Welding	Symbol		an upside-down isosceles trapezoid, the length of lower base is 1/2 of the upper one
Weld zone	Real shape The mark of floor plan		
The combination of bead and bevel groove welding	 		
The combination of bevel groove and fillet welding	 		
The combination of K type welding and fillet welding	 		
The combination of J type, fillet and bead welding	 		
The combination of both side J type, fillet welding, finish grinding symbol and concave symbol	 		
Projection Welding	Symbol		
Arrow side			
The opposite side of arrow			

Welded Joint Categories

SM/AV

SAW

GM/AV

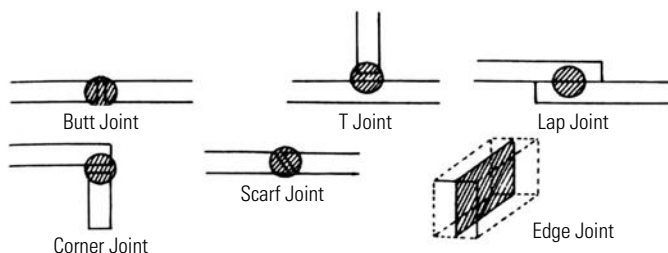
GT/AV

FC/AV

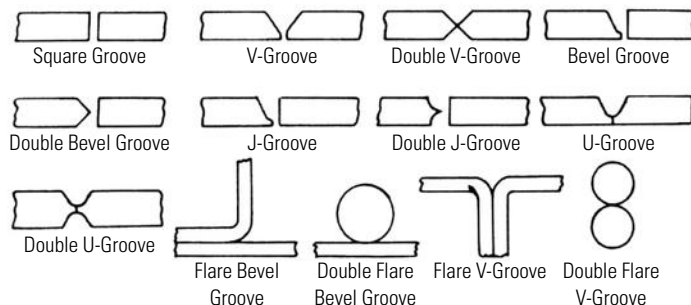
Non-FERROUS

APPENDIX

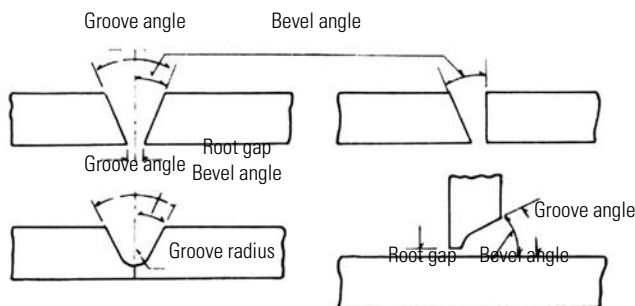
Picture 1 Joint shape



Picture 2 Groove shape

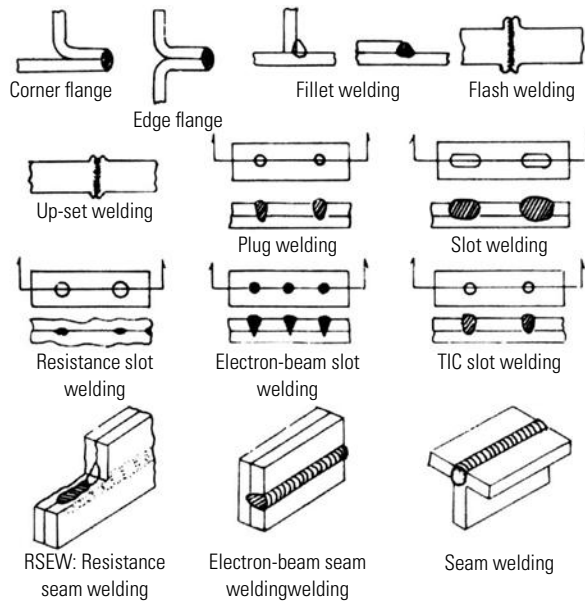


Picture 3 The definition of groove term

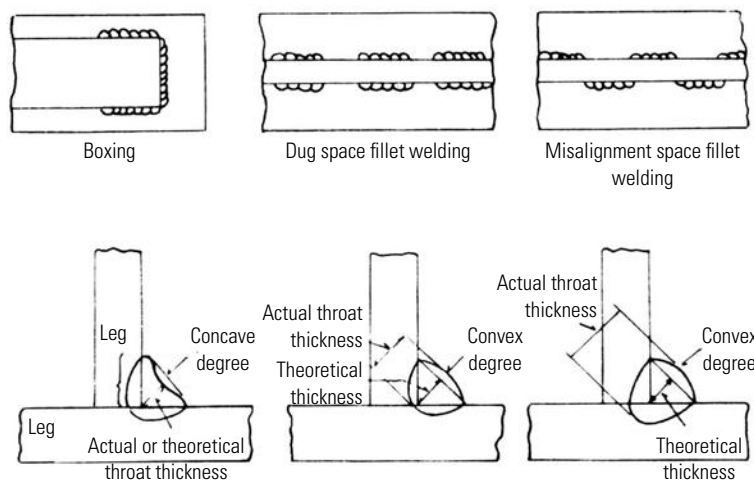


Welded Joint Categories

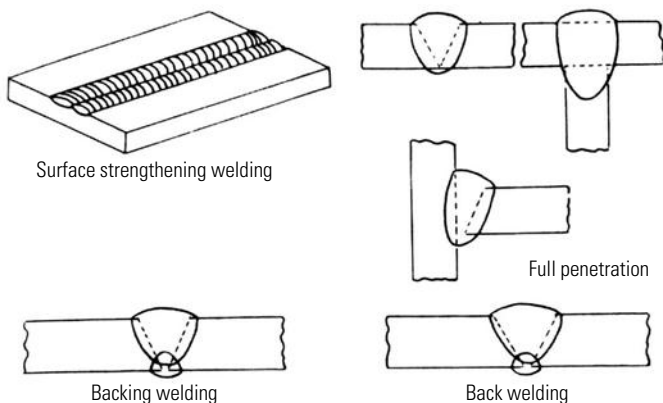
Picture 4 Joint shape



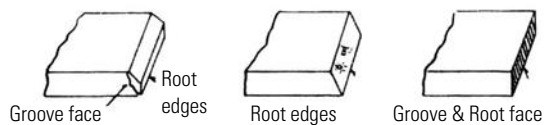
Picture 5 The definition of fillet welding term



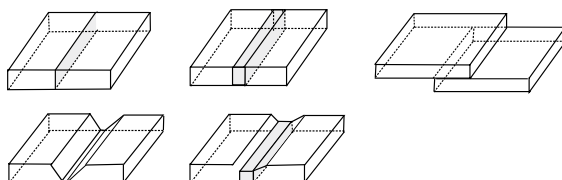
Picture 6 The definition of welding term



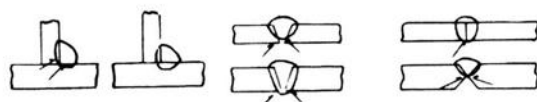
Picture 7 The definition of joint term



(A) The definition of groove face, root edges and groove & root face



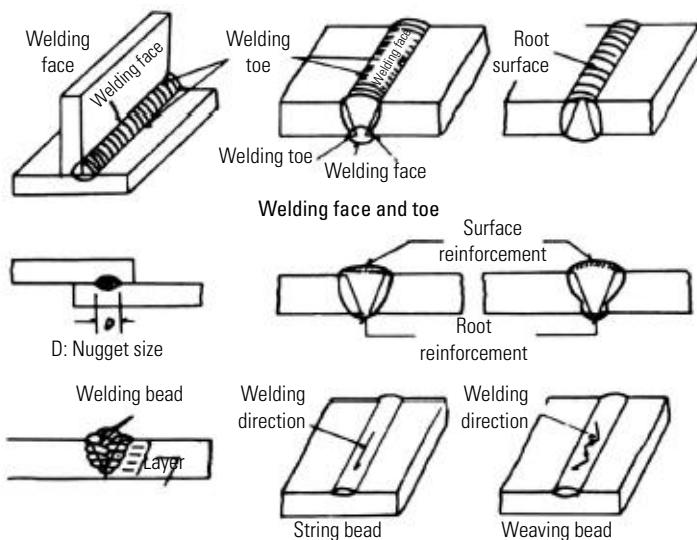
(B) Root of joint



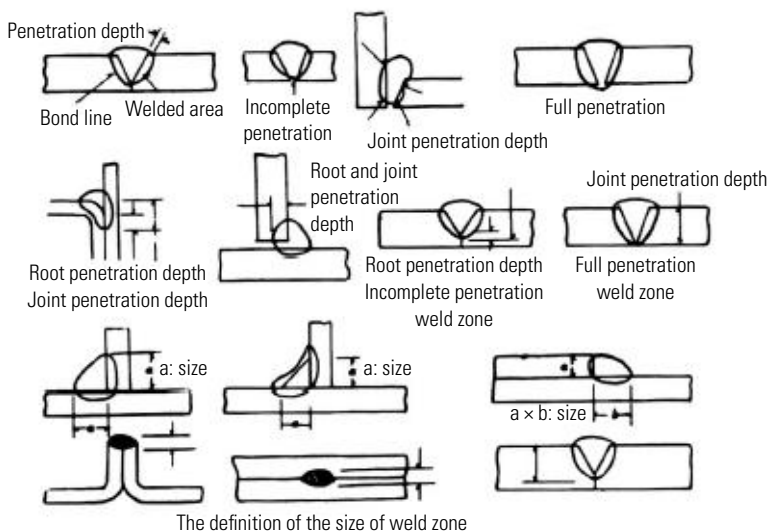
(C) Root of weld

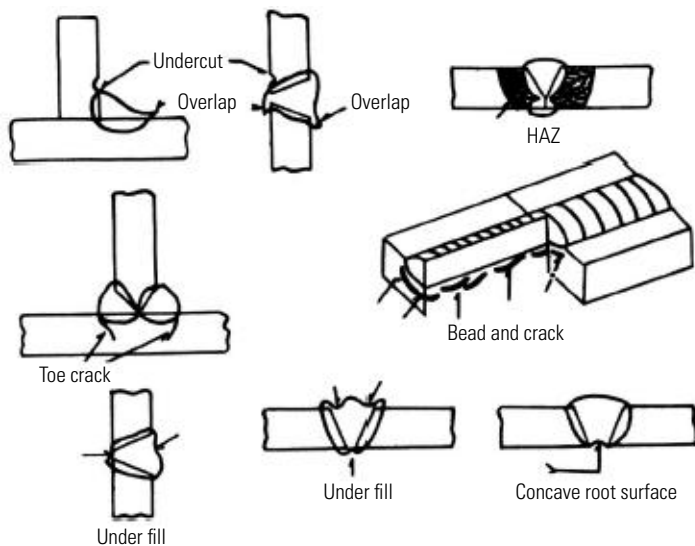
Welded Joint Categories

Picture 8 The definition of welding term



Picture 9 Weld penetration and weld zone size



Picture 10 Weld defects

Consumption Calculation

1 Calculation Method of Materials Consumption

The weight of deposited weld metal(W_D) = $(A+B) \times L \times \rho$ (1)

The weight of deposited weld metal(W_D) = $W \times \eta$ (2)

According to (1) and (2), the welding materials demand could be calculated with the following equation.

$$W(\text{gr}) = \frac{(A+B) \times \rho}{\eta} \times L$$

Attention:

A: cross selection of groove(cm^2)

B: cross selection of built-up(cm^2)

L: welding length(cm)

ρ : the proportion of deposited weld metal

η : deposition efficiency($\frac{\%}{100}$)

The materials demand could be calculated on the supposition that the following statement (including deposition efficiency, build-up amount and the proportion). Please be noted there could be a little difference between the calculation result and actual demand.

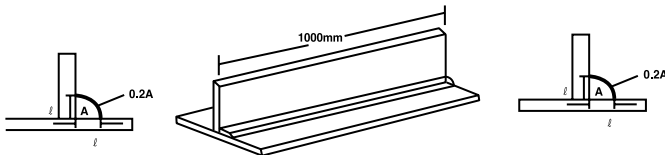
- Reinforcement amount: 20% of the cross sectional area
- Deposition efficiency

Submerged Arc Welding	99%
Gas Metal Arc Welding(98%Ar/2%O ₂)	98%
Gas Metal Arc Welding(75%Ar/25%CO ₂)	96%
Gas Metal Arc Welding(CO ₂)	93%
Metal Cored Wires	93%
Gas Shielded Flux Cored Wires	85%
Self Shielded Flux Cored Wires	82%
Shielded Metal Arc Welding	55%(except 50mm at Holded area)
- Proportion: Mild Steel 7.85
Stainless Steel 304 8.02
Stainless Steel 316 7.94

2 The demand of standard joint and welding materials

The following is the calculation of mild steel flux cored wire demand per 1m of welding length

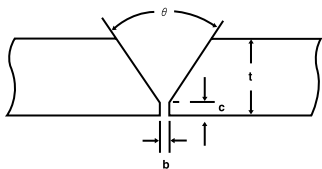
(1) In case of Fillet welding



The amount of CO₂ flux cored wire for the fillet welding

Leg length (mm)	Demand quantity (kg/m)	Leg length (mm)	Demand quantity (kg/m)	Note
4	0.089	10	0.554	The following is the equation $W(\text{gr/m}) = 5.54\ell^2$ $W(\text{gr/m}) = 5.54\ell^2$ $[\ell : \text{Leg length}(\text{mm})]$
5	0.139	11	0.670	
6	0.199	12	0.798	
7	0.271	13	0.936	
8	0.355	14	1.086	
9	0.449	15	1.247	

(2) In case of a butt welding



θ	$\tan \frac{\theta}{2}$
45°	0.414
50°	0.466
60°	0.577
70°	0.700

$$W = \frac{\{(b \times t) + (t - c)^2 \tan \frac{\theta}{2}\} \times 1.2 \times \rho}{\eta} \times L$$

In case of CO₂ flux cored wire:

$$W(\text{gr/m}) = 11.08 \{ bt + (t - c)^2 \tan \frac{\theta}{2} \}$$

(The unit of b, c, t is mm)

Reference:

- In case of coated electrode $W(\text{gr/m}) = 17.13 \{ bt + (t - c)^2 \tan \frac{\theta}{2} \}$
- In case of CO₂ solid wire $W(\text{gr/m}) = 10.13 \{ bt + (t - c)^2 \tan \frac{\theta}{2} \}$

Consumption Calculation

3 The demand quantity of welding rod when V-type Butt welding (Kg/m)

Plate Thickness (mm)	In Case of Coated Electrodes							Plate Thickness (mm)	In Case of CO ₂ Flux Cored Wire						
	(θ°)	c(mm) b(mm)	0	1	2	3	4		(θ°)	c(mm) b(mm)	0	1	2	3	4
6	45	0	0.26	0.18	0.11	0.06	0.03	6	45	0	0.17	0.11	0.07	0.04	0.02
		1	0.36	0.28	0.22	0.17	0.13			1	0.23	0.18	0.14	0.11	0.08
		2	0.46	0.38	0.32	0.27	0.23			2	0.30	0.25	0.21	0.17	0.15
		3	0.56	0.49	0.42	0.37	0.34			3	0.36	0.31	0.27	0.24	0.22
		4	0.67	0.59	0.52	0.47	0.44			4	0.43	0.38	0.34	0.31	0.28
		5	0.77	0.69	0.63	0.58	0.56			5	0.50	0.45	0.41	0.37	0.35
		6	0.87	0.79	0.73	0.68	0.65			6	0.56	0.51	0.47	0.44	0.42
	60	0	0.36	0.25	0.16	0.09	0.04		60	0	0.23	0.11	0.07	0.04	0.02
		1	0.46	0.35	0.26	0.19	0.14			1	0.30	0.18	0.14	0.11	0.08
		2	0.56	0.45	0.36	0.29	0.25			2	0.36	0.25	0.21	0.17	0.15
		3	0.66	0.56	0.47	0.40	0.35			3	0.43	0.31	0.27	0.24	0.22
		4	0.77	0.66	0.57	0.50	0.45			4	0.50	0.38	0.34	0.31	0.28
		5	0.87	0.76	0.67	0.60	0.55			5	0.56	0.45	0.41	0.37	0.35
		6	0.97	0.86	0.77	0.71	0.66			6	0.63	0.51	0.47	0.44	0.42
9	45	0	0.57	0.45	0.35	0.26	0.18	9	45	0	0.37	0.29	0.22	0.17	0.11
		1	0.73	0.61	0.50	0.41	0.33			1	0.47	0.39	0.32	0.26	0.21
		2	0.88	0.76	0.66	0.56	0.49			2	0.57	0.49	0.42	0.36	0.31
		3	1.04	0.92	0.81	0.72	0.64			3	0.67	0.59	0.52	0.46	0.41
		4	1.19	1.07	0.96	0.87	0.79			4	0.77	0.69	0.62	0.56	0.51
		5	1.35	1.22	1.12	1.03	0.95			5	0.87	0.79	0.72	0.66	0.61
		6	1.50	1.38	1.27	1.18	1.10			6	0.97	0.89	0.82	0.76	0.71
	60	0	0.80	0.63	0.48	0.26	0.18		60	0	0.52	0.41	0.31	0.17	0.11
		1	0.95	0.79	0.64	0.41	0.33			1	0.62	0.51	0.41	0.26	0.21
		2	1.11	0.94	0.79	0.56	0.49			2	0.72	0.61	0.51	0.36	0.31
		3	1.26	1.10	0.95	0.72	0.64			3	0.82	0.71	0.61	0.46	0.41
		4	1.42	1.25	1.10	0.87	0.79			4	0.92	0.81	0.71	0.56	0.51
		5	1.57	1.40	1.26	1.03	0.95			5	1.02	0.91	0.81	0.66	0.61
		6	1.73	1.56	1.41	1.18	1.10			6	1.12	1.01	0.91	0.76	0.71

Plate Thickness (mm)	In Case of Coated Electrodes						Plate Thickness (mm)	In Case of CO ₂ Flux Cored Wire							
	(θ°)	c(mm) b(mm)	0	1	2	3		4	(θ°)	c(mm) b(mm)	0	1	2	3	4
19	45	0	2.56	2.30	2.05	1.82	1.60	19	45	0	1.66	1.49	1.33	1.17	1.03
		1	2.89	2.62	2.38	2.14	1.92			1	1.87	1.70	1.54	1.38	1.24
		2	3.21	2.95	2.70	2.47	2.25			2	2.08	1.91	1.75	1.60	1.45
		3	3.54	3.27	3.03	2.80	2.57			3	2.29	2.12	1.96	1.81	1.66
		4	3.86	3.60	3.35	3.12	2.90			4	2.50	2.33	2.17	2.02	1.87
		5	4.19	3.93	3.68	3.44	3.22			5	2.71	2.54	2.38	2.23	2.08
		6	4.51	4.25	4.00	3.77	3.55			6	2.92	2.75	2.59	2.44	2.30
	60	0	3.57	3.20	2.86	2.53	2.22		60	0	2.31	2.07	1.33	1.17	1.03
		1	3.89	3.53	3.18	2.86	2.55			1	2.52	2.38	1.54	1.38	1.24
		2	4.22	3.85	3.51	3.18	2.87			2	2.73	2.49	1.75	1.60	1.45
		3	4.54	4.18	3.83	3.51	3.20			3	2.94	2.70	1.96	1.81	1.66
		4	4.87	4.50	4.16	3.83	3.53			4	3.15	3.55	2.17	2.02	1.87
		5	5.20	4.83	4.48	4.16	3.85			5	3.36	3.12	2.38	2.23	2.08
		6	5.52	5.16	4.81	4.48	4.18			6	3.57	3.33	2.59	2.44	2.30
22	45	0	3.43	3.13	2.84	2.56	2.30	22	45	0	2.22	2.02	1.83	1.66	1.49
		1	3.81	3.50	3.21	2.94	2.67			1	2.46	2.27	2.08	1.90	1.73
		2	4.19	3.88	3.59	3.31	3.05			2	2.71	2.51	2.32	2.14	1.97
		3	4.56	4.26	3.97	3.69	3.43			3	2.95	2.75	2.57	2.39	2.22
		4	4.94	4.63	4.34	4.07	3.81			4	3.20	3.00	2.81	2.63	2.46
		5	5.32	5.01	4.72	4.44	4.18			5	3.44	3.24	3.05	2.84	2.71
		6	5.69	5.39	5.10	4.82	4.56			6	3.68	3.29	3.30	3.12	2.95
	60	0	4.78	4.36	3.95	3.57	3.20		60	0	3.09	2.82	2.56	2.31	2.07
		1	5.16	4.74	4.33	3.94	3.58			1	3.34	3.06	2.80	2.56	2.32
		2	5.54	5.11	4.71	4.32	3.96			2	3.58	3.31	3.04	2.80	2.56
		3	5.91	5.49	5.08	4.70	4.33			3	3.83	3.55	3.29	3.04	2.80
		4	6.29	5.87	5.46	5.08	4.71			4	4.07	3.79	3.53	3.28	3.05
		5	6.67	6.24	5.84	5.45	5.09			5	4.31	4.04	3.78	3.53	3.29
		6	7.05	6.62	6.21	5.83	5.46			6	4.56	4.28	4.02	3.77	3.53

References

1 Hardness conversion table

Vickers Hardness (DPH)	Brinell hardness 10mm Ball 3,000kg load		Rockwell Hardness		Shore Hardness	Tensile Strength (kgf/mm ²) (approx)
	Standard Ball	Tungsten Carbide Ball	B scale	C scale		
940	-	-	-	68.0	97	-
920	-	-	-	67.5	96	-
900	-	-	-	67.0	95	-
880	-	767	-	66.4	93	-
860	-	757	-	65.9	92	-
840	-	745	-	65.3	91	-
820	-	733	-	64.7	90	-
800	-	722	-	64.0	88	-
780	-	710	-	63.5	87	-
760	-	698	-	62.6	86	-
740	-	684	-	61.8	84	-
720	-	670	-	61.0	83	-
700	-	656	-	60.1	81	-
690	-	647	-	59.7	-	-
680	-	638	-	59.2	80	-
670	-	630	-	58.8	-	227
660	-	620	-	58.3	79	224
650	-	611	-	57.8	-	220
640	-	601	-	57.3	77	217
630	-	591	-	56.8	-	213
620	-	582	-	56.3	75	210
610	-	573	-	55.7	-	206
600	-	564	-	55.2	74	203
590	-	554	-	54.7	-	199
580	-	545	-	54.1	72	196
570	-	535	-	53.6	-	192
560	-	525	-	53.0	71	189
550	505	517	-	52.3	-	185
540	496	507	-	51.7	69	182
530	488	497	-	51.1	-	178
520	480	488	-	50.5	67	175
510	473	479	-	49.8	-	171
500	465	471	-	49.0	66	168
490	456	460	-	48.4	-	164
480	448	452	-	47.7	64	161
470	441	442	-	46.9	-	157
460	433	433	-	46.1	62	154
450	425	425	-	45.3	-	150
440	415	415	-	44.5	59	147
430	405	405	-	43.6	-	143
420	397	397	-	42.7	57	140

Vickers Hardness (DPH)	Brinell hardness 10mm Ball 3,000kg load		Rockwell Hardness		Shore Hardness	Tensile Strength (kgf/mm ²) (approx)
	Standard Ball	Tungsten Carbide Ball	B scale	C scale		
410	388	388	-	41.8	-	137
400	379	379	-	40.8	55	133
390	369	369	-	39.8	-	130
380	360	360	(110.0)	38.8	52	126
370	350	350	-	37.7	-	123
360	341	341	(109.0)	36.5	50	119
350	331	331	-	35.5	-	116
340	322	322	(108.0)	34.4	47	113
330	313	313	-	33.3	-	109
320	303	303	(107.0)	32.2	45	106
310	294	294	-	31.0	-	102
300	284	284	(105.5)	29.8	42	99
295	280	280	-	29.2	-	97.8
290	275	275	(104.5)	28.5	41	95.2
285	270	270	-	27.8	-	94.1
280	265	266	(103.5)	27.1	40	92.0
275	261	261	-	26.4	-	90.6
270	256	256	(102.0)	25.6	38	88.6
265	252	252	-	24.8	-	87.2
260	247	248	(101.2)	24.0	37	85.1
255	243	243	-	23.1	-	83.7
250	238	238	99.5	22.2	36	81.0
245	233	233	-	21.3	-	80.1
240	228	228	98.1	20.3	34	78.0
230	219	219	96.7	(18.0)	33	74.5
220	209	209	95.0	(15.7)	32	71.0
210	200	200	93.6	(13.4)	30	68.2
190	181	181	89.5	(8.5)	28	61.8
180	171	171	87.1	(6.0)	26	59.0
170	162	162	85.0	(0.3)	25	55.5
160	152	152	81.7	(0.0)	24	52.7
150	143	143	78.7	-	22	49.9
140	133	133	75.0	-	21	46.4
130	124	124	71.2	-	20	43.6
120	114	114	66.7	-	-	40.1
110	105	105	62.3	-	-	-
105	95	95	56.2	-	-	-
95	90	90	52.2	-	-	-
90	86	86	48.0	-	-	-
85	81	81	41.0	-	-	-

References

2 Stress conversion table (1)

(lbs/in ² → kgf/mm ²)										
lbs/in ²	0.000	1.000	2.000	3.000	4.000	5.000	6.000	7.000	8.000	9.000
Kgf/mm ²	Kgf/mm ²	Kgf/mm ²	Kgf/mm ²	Kgf/mm ²	Kgf/mm ²	Kgf/mm ²	Kgf/mm ²	Kgf/mm ²	Kgf/mm ²	Kgf/mm ²
0.000	0.000	0.703	1.406	2.109	2.812	3.515	4.218	4.922	5.625	6.328
10,000	7.031	7.734	8.437	9.140	9.843	10.546	11.249	11.952	12.655	13.359
20,000	14.063	14.765	15.468	16.171	16.874	17.577	18.280	18.983	19.686	20.398
30,000	21.092	21.796	22.499	23.202	23.905	24.608	25.311	26.014	26.717	27.420
40,000	28.123	28.826	29.529	30.233	30.936	31.639	32.342	33.045	33.748	34.451
50,000	35.154	35.857	36.560	37.263	37.966	38.669	39.373	40.076	40.779	41.482
60,000	42.185	42.888	43.591	44.294	44.997	45.700	46.403	47.106	47.810	48.513
70,000	49.216	49.919	50.622	51.325	52.028	52.731	53.434	54.137	54.840	55.543
80,000	56.247	56.950	57.653	58.356	59.059	59.762	60.465	61.168	61.871	62.574
90,000	63.277	63.980	64.683	65.387	66.090	66.793	67.496	68.199	68.902	69.605
100,000	70.308	71.011	71.714	72.417	73.120	73.824	74.527	75.230	75.933	76.635
110,000	77.339	78.042	78.745	79.448	80.151	80.854	81.557	82.261	82.964	83.667
120,000	84.370	85.073	85.776	86.479	87.182	87.885	88.588	89.291	89.994	90.698
130,000	91.401	92.104	92.807	93.510	94.213	94.916	95.619	96.322	97.025	97.728
140,000	98.431	99.134	99.838	100.541	101.244	101.947	102.650	103.353	104.056	104.759
150,000	105.462	106.165	106.868	107.571	108.275	108.978	109.681	110.384	111.087	111.790
160,000	112.493	113.196	113.899	114.502	115.305	116.008	116.712	117.415	118.118	118.821
170,000	119.524	120.227	120.930	121.633	122.336	123.039	123.742	124.445	125.148	125.852
180,000	123.555	127.258	127.961	128.664	129.367	130.070	130.773	131.476	132.179	132.882
190,000	133.585	134.289	134.992	135.695	136.398	137.101	137.804	138.507	139.210	139.913
200,000	140.161	141.319	142.022	142.726	143.429	144.132	144.835	145.538	146.241	146.944
210,000	147.647	148.350	149.058	149.756	150.459	151.166	151.866	152.569	153.272	153.975
220,000	154.678	155.381	156.084	156.787	157.490	158.193	158.896	159.599	160.303	161.006
230,000	161.709	162.412	163.115	163.818	164.521	165.224	165.927	166.630	167.333	168.036
240,000	168.740	169.443	170.146	170.849	171.552	172.255	172.958	173.661	174.364	175.067
250,000	175.770	176.473	177.177	177.880	178.583	179.286	179.989	180.692	181.395	182.098

lbs/in ²	100	200	300	400	500	600	700	800	900
Kgf/mm ²	0.0703	0.1406	0.2109	0.2812	0.3512	0.4218	0.4918	0.5625	0.6328

3 Stress conversion table (2)

(kgf/mm² → MPa) / Conversion Factor: 1kgf/mm² = 9.80665MPa

Kgf/mm ²	MPa										Kgf/mm ²
	0	0.1	0.2	0.3	0.4	0.5	0.6	0.7	0.8	0.9	
-		0.9807	1.9613	2.9420	3.9227	4.9033	5.8840	6.8647	7.8453	8.826	-
1	9.8067	10.787	11.768	12.749	13.729	14.710	15.691	16.671	17.652	18.633	1
2	19.613	20.594	21.575	22.555	23.536	24.517	25.497	26.478	27.459	28.439	2
3	29.420	30.401	31.381	32.362	33.343	34.323	35.304	36.285	37.265	38.246	3
4	39.227	40.207	41.188	42.169	43.149	44.130	45.111	46.091	47.072	48.053	4
5	49.033	50.014	50.995	51.975	52.956	53.937	54.917	55.898	56.879	57.859	5
6	58.840	59.821	60.801	61.763	62.763	63.743	64.724	65.705	66.685	67.666	6
7	68.647	69.627	70.608	71.589	72.569	73.550	74.531	75.511	76.492	77.473	7
8	78.453	79.434	80.415	81.395	82.376	83.357	84.337	85.318	86.299	87.279	8
9	88.260	89.241	90.221	91.202	92.138	93.163	94.144	95.125	96.105	97.086	9
10	98.067	99.047	100.03	101.01	101.99	102.97	103.95	104.63	105.91	106.89	10
11	107.87	108.85	109.83	110.82	111.80	112.78	113.76	114.74	115.72	116.70	11
12	117.68	118.66	119.64	120.62	121.60	122.58	123.56	124.54	125.53	126.51	12
13	127.49	128.47	129.45	130.43	131.41	132.39	133.37	134.35	135.33	136.31	13
14	137.29	138.27	139.25	140.24	141.22	142.20	143.18	144.16	145.14	146.12	14
15	147.10	148.08	149.06	150.04	151.02	152.00	152.98	135.96	154.95	155.93	15
16	156.91	157.89	158.87	159.85	160.83	161.81	162.79	163.77	164.75	165.73	16
17	166.71	167.69	168.67	169.66	170.64	171.62	172.60	173.58	174.56	175.54	17
18	176.52	177.50	178.48	179.46	180.44	181.42	182.40	183.38	184.37	185.35	18
19	186.33	187.31	188.29	189.27	190.25	191.23	192.21	193.19	194.17	195.15	19
20	196.13	197.11	198.09	199.07	200.06	201.04	202.02	203.00	203.98	204.96	20
21	205.94	206.92	207.90	208.88	209.86	210.84	211.82	212.80	213.78	214.77	21
22	215.75	216.73	217.71	218.69	219.69	220.65	221.63	222.61	223.59	224.57	22
23	225.55	226.53	227.51	228.49	229.48	230.46	231.44	232.42	233.40	234.77	23
24	235.36	236.34	237.32	238.30	239.28	240.26	241.24	242.22	243.20	244.19	24
25	245.17	246.15	247.13	248.11	249.09	250.07	251.05	252.03	253.01	253.99	25
26	254.97	255.95	256.93	257.91	258.90	259.88	260.86	261.84	262.82	263.80	26
27	264.78	265.76	266.74	267.72	268.70	269.68	270.66	271.64	272.62	273.61	27
28	274.59	275.57	276.55	277.53	278.51	279.49	280.47	281.45	282.43	283.41	28
29	284.39	285.37	286.35	287.33	288.32	289.30	290.28	291.26	292.24	293.22	29
30	294.20	295.18	296.16	297.14	298.12	299.10	300.08	301.06	302.04	303.03	30
31	304.01	304.99	305.97	306.95	307.93	308.91	309.89	310.87	311.85	312.83	31
32	313.81	314.79	315.77	316.75	317.74	318.72	319.70	320.68	321.66	322.64	32
33	323.62	324.60	325.58	326.56	327.54	328.52	329.50	330.48	331.46	332.45	33
34	333.63	334.61	335.59	336.57	337.55	338.53	339.51	340.49	341.47	342.45	34
35	343.23	344.21	345.19	346.17	347.16	348.14	349.12	350.10	351.08	352.06	35
36	353.04	354.02	355.00	355.98	356.96	357.94	358.92	359.90	360.88	361.87	36
37	362.85	363.83	364.81	365.79	366.77	367.75	368.73	369.71	370.69	370.67	37
38	372.65	373.63	374.61	375.59	376.58	377.56	378.54	379.52	380.50	381.48	38
39	382.46	383.44	384.42	385.40	386.38	387.36	388.34	389.32	390.30	391.29	39
40	392.27	393.25	394.23	395.21	396.19	397.17	398.15	399.13	400.11	401.09	40
41	402.07	403.05	404.03	405.01	406.00	406.98	407.96	408.94	409.92	410.90	41
42	411.88	412.86	413.84	414.82	415.80	416.78	417.76	418.74	419.72	420.71	42
43	421.69	422.67	423.65	424.63	425.61	426.59	427.57	428.55	429.53	430.51	43
44	431.49	432.47	433.45	434.43	435.42	436.40	437.38	438.35	439.34	440.32	44
45	441.30	442.28	443.26	444.24	445.22	446.20	447.18	448.16	449.14	450.13	45
46	451.11	452.09	453.07	454.05	455.03	456.01	456.99	457.97	458.95	459.93	46
47	460.91	461.89	462.87	463.85	464.84	465.82	466.80	467.97	468.76	469.74	47
48	470.72	471.70	472.68	473.66	474.64	475.62	476.60	477.58	478.56	479.55	48
49	480.53	481.51	482.49	483.47	484.45	485.43	486.41	487.39	488.37	489.35	49

SWAW

SAW

GMW

GTAW

FCW

Non-FERROUS

APPENDIX

References

(kgf/mm² → MPa) / Conversion Factor: 1kgf/mm² = 9.80665MPa

Kgf/mm ²	MPa										Kgf/mm ²
	0	0.1	0.2	0.3	0.4	0.5	0.6	0.7	0.8	0.9	
50	490.33	491.31	492.29	493.27	494.26	495.24	496.22	497.20	498.18	499.16	50
51	500.14	501.12	502.10	503.08	504.06	505.04	506.02	507.00	507.98	508.97	51
52	509.95	510.93	511.91	512.89	513.85	514.85	515.83	516.81	517.79	518.77	52
53	519.75	520.73	521.71	522.69	523.68	524.66	525.64	526.62	527.60	528.58	53
54	529.56	530.54	531.52	532.50	533.48	534.46	535.44	536.42	537.40	538.39	54
55	539.37	540.35	541.33	542.31	543.29	544.27	545.25	546.23	547.21	548.19	55
56	549.17	550.15	551.13	552.11	553.10	554.08	555.06	556.04	557.02	558.00	56
57	558.98	559.96	560.94	561.92	562.90	563.88	564.83	565.84	566.82	567.81	57
58	568.79	569.77	570.75	571.73	572.71	573.69	574.67	575.65	576.63	577.61	58
59	578.59	579.57	580.55	581.53	582.52	583.50	584.48	585.46	586.44	587.42	59
60	588.40	589.38	590.35	591.34	592.32	593.30	594.28	595.26	596.24	597.22	60
61	598.21	599.19	600.17	601.15	602.13	603.11	604.06	605.07	606.56	607.06	61
62	608.01	608.99	609.67	610.95	611.93	612.92	613.90	614.88	615.56	616.84	62
63	617.82	618.80	619.78	620.76	621.74	622.72	623.70	624.68	625.66	626.64	63
64	627.63	628.61	629.59	630.57	631.55	632.53	633.51	634.49	635.47	636.45	64
65	637.43	638.41	639.39	640.37	641.35	642.34	643.32	644.30	645.28	646.26	65
66	647.24	648.22	649.20	650.18	651.16	652.14	653.12	654.10	655.08	656.06	66
67	657.05	658.03	659.01	659.99	660.97	661.95	662.93	663.91	664.89	665.87	67
68	666.85	667.83	668.81	669.79	670.77	671.76	672.74	673.72	674.70	675.68	68
69	676.66	677.64	678.62	679.60	680.58	681.56	682.54	683.52	684.50	685.48	69
70	686.47	687.45	688.43	689.41	690.39	691.37	692.16	693.33	694.31	695.29	70
71	696.27	697.25	698.23	699.21	700.19	701.18	702.16	703.14	704.12	705.10	71
72	706.08	707.06	708.04	709.025	710.00	710.98	711.96	712.94	713.92	714.90	72
73	715.89	716.87	717.85	718.83	719.81	720.79	721.77	722.75	723.73	724.71	73
74	725.69	726.67	727.65	728.63	729.61	730.60	731.58	732.56	733.73	734.52	74
75	735.50	736.48	737.46	738.44	739.42	740.40	741.38	742.36	743.34	744.32	75
76	745.31	746.29	747.27	748.25	749.23	750.21	751.19	752.17	753.15	754.13	76
77	755.11	756.09	757.07	758.05	759.03	760.02	761.00	761.98	762.96	763.94	77
78	764.92	765.90	766.88	767.86	768.84	769.82	770.80	771.78	772.76	773.74	78
79	774.73	775.71	776.69	777.67	778.65	779.63	780.61	781.59	782.57	783.55	79
80	784.53	785.51	786.49	787.47	788.26	789.44	790.42	791.40	792.38	793.36	80
81	794.34	795.32	796.30	797.27	798.26	799.24	800.22	801.20	802.18	803.16	81
82	804.15	805.13	806.11	807.09	808.07	809.05	810.03	811.01	811.99	812.97	82
83	813.95	814.93	815.91	816.89	817.87	818.86	819.84	820.82	821.80	822.78	83
84	823.76	824.74	825.72	826.70	827.68	828.66	829.64	830.62	831.60	832.75	84
85	833.57	834.55	835.53	836.51	837.49	838.47	839.45	840.43	841.41	842.39	85
86	843.37	844.35	845.33	846.31	847.29	848.28	849.26	850.24	851.22	852.20	86
87	853.18	854.16	855.14	856.12	857.10	858.08	859.06	860.04	861.02	862.00	87
88	862.99	863.97	864.95	865.93	866.91	867.89	868.87	869.85	870.83	871.81	88
89	872.79	873.77	874.75	875.73	876.71	877.70	878.48	879.66	880.64	881.62	89
90	882.41	883.58	884.56	885.54	886.52	887.50	888.48	889.49	890.44	891.42	90
91	892.41	893.93	894.37	895.35	896.33	897.31	898.29	899.27	900.25	901.23	91
92	902.21	903.19	904.17	905.15	906.13	907.12	908.10	909.08	910.06	911.04	92
93	912.02	913.00	913.98	914.96	915.94	916.92	917.90	918.88	919.86	920.84	93
94	921.83	922.81	923.79	924.77	925.75	926.13	927.71	928.69	929.67	930.65	94
95	931.63	932.61	933.59	934.57	935.55	936.54	937.52	938.50	939.48	940.46	95
96	941.44	942.42	943.40	944.38	945.36	946.34	947.32	948.30	949.28	950.26	96
97	951.25	952.23	953.22	954.19	955.17	956.15	957.13	958.11	959.09	960.07	97
98	961.05	962.03	963.01	963.99	964.97	965.96	966.94	967.92	968.90	969.88	98
99	970.86	971.84	972.82	973.80	974.78	975.76	976.74	977.72	978.70	979.68	99

4 Stress conversion table (3)

(MPa → kgf/mm²) / Conversion Factor: 1MPa = 0.10197kgf/mm²

MPa	Kgf/mm ²										MPa
	0	0.1	0.2	0.3	0.4	0.5	0.6	0.7	0.8	0.9	
-	-	0.1020	0.2039	0.3059	0.4079	0.5099	0.6118	0.7138	0.8158	0.9177	
10	1.0197	1.1217	1.12237	1.3256	1.3276	1.5296	1.6315	1.7335	1.8355	1.9375	10
20	2.0394	2.1417	2.2434	2.3453	2.4473	2.5493	2.6543	2.7532	2.8552	2.9572	20
30	3.0591	3.1611	3.2631	3.3651	3.4670	3.5690	3.6710	3.7729	3.8749	3.9769	30
40	4.0789	4.1808	4.2828	4.3848	4.4868	4.5887	4.6907	4.7927	4.8946	4.9966	40
50	5.0936	5.2006	5.3025	5.4045	5.5065	5.6084	5.7104	5.8124	5.9144	6.0163	50
60	6.1183	6.2203	6.3222	6.4242	6.5262	6.6282	6.7301	6.8321	6.9341	7.0363	60
70	7.1380	7.2400	7.3420	7.4439	7.5499	7.6479	7.7498	7.8518	7.9538	8.0558	70
80	8.1577	8.2597	8.3617	8.4636	8.5656	8.6676	8.7696	8.8715	8.9735	9.0755	80
90	9.1774	9.2794	9.3814	9.4834	9.5853	9.6873	9.7893	9.8912	9.9932	10.095	90
100	10.197	10.290	10.401	10.503	10.605	10.707	10.809	10.911	11.013	11.115	100
110	11.217	11.319	11.421	11.523	11.625	11.727	11.829	11.931	12.033	12.135	110
120	12.237	12.339	12.441	12.543	12.644	12.764	12.848	12.950	13.052	13.154	120
130	13.256	13.358	13.460	13.562	13.644	13.766	13.868	13.970	14.072	14.174	130
140	14.276	14.378	14.480	14.582	14.674	14.786	14.888	14.990	15.092	15.194	140
150	15.296	15.398	15.500	15.602	15.704	15.806	15.908	16.010	16.112	16.213	150
160	16.315	16.417	16.519	16.621	16.723	16.825	16.927	17.029	17.131	17.233	160
170	17.335	17.437	17.539	17.641	17.743	17.845	17.947	18.049	18.151	18.253	170
180	18.355	18.457	18.559	18.661	18.763	18.865	18.967	19.069	19.171	19.273	180
190	19.375	19.477	19.579	19.681	19.782	19.884	19.986	20.088	20.190	20.292	190
200	20.394	20.496	20.598	20.700	20.802	20.904	21.006	21.108	21.210	21.312	200
210	21.44	21.516	21.618	21.720	21.822	21.924	22.026	22.128	22.230	22.332	210
220	22.434	22.536	22.638	22.740	22.842	22.944	23.046	23.148	23.250	23.352	220
230	23.453	23.555	23.657	23.759	23.861	23.963	24.065	24.167	24.269	24.371	230
240	24.473	24.575	24.677	24.779	24.881	24.983	25.085	25.187	25.289	25.391	240
250	25.493	25.595	25.697	25.799	25.901	26.003	26.015	26.207	26.309	26.411	250
260	26.513	26.614	26.717	26.899	26.921	27.022	27.124	27.223	27.328	27.430	260
270	27.532	27.634	27.736	27.838	27.940	27.042	28.144	28.246	28.348	28.450	270
280	28.552	28.654	28.756	28.858	28.960	29.062	29.164	29.266	29.368	29.470	280
290	29.572	29.674	29.776	29.878	29.980	30.082	30.184	30.286	30.388	30.490	290
300	30.591	30.693	30.795	30.897	30.999	31.101	31.203	31.305	31.407	31.509	300
310	31.611	31.713	31.815	31.917	32.019	32.121	32.223	32.325	32.427	32.529	310
320	32.631	32.733	32.835	32.937	33.039	33.141	33.243	33.345	33.447	33.549	320
330	33.651	33.753	33.855	33.957	34.059	34.160	34.262	34.364	34.466	34.568	330
340	34.670	34.772	34.874	34.976	35.078	35.180	35.282	35.384	35.486	35.588	340
350	35.690	35.792	35.894	35.996	36.098	36.200	36.302	36.404	36.506	36.608	350
360	36.710	36.812	36.914	37.016	37.118	37.220	37.322	37.424	37.526	37.628	360
370	37.729	37.831	37.933	38.035	38.137	38.239	38.341	38.443	38.545	38.647	370
380	38.749	38.851	38.953	39.055	39.157	39.259	39.361	39.463	39.565	39.667	380
390	39.769	39.871	39.973	40.075	40.177	40.279	40.381	40.483	40.585	40.687	390
400	40.789	40.891	40.993	41.095	41.197	41.299	41.400	41.502	41.604	41.706	400
410	41.808	41.910	42.012	42.114	42.216	42.318	42.420	42.522	42.624	42.726	410
420	42.848	42.930	43.032	43.134	43.236	43.338	43.440	43.542	43.644	43.746	420
430	43.848	44.050	44.052	44.154	44.256	44.358	44.460	44.562	44.664	44.766	430
440	44.868	44.969	45.071	45.173	45.275	45.377	45.479	45.581	45.683	45.785	440
450	45.88	45.989	46.091	46.193	46.295	46.397	46.499	46.601	46.703	46.805	450
460	46.907	47.009	47.111	47.213	47.315	47.417	47.519	47.621	47.723	47.825	460
470	47.927	48.029	48.131	48.233	48.335	48.437	48.538	48.640	48.742	48.844	470
480	48.946	49.048	49.150	49.253	49.354	49.456	49.558	49.660	49.762	49.864	480
490	49.966	50.068	50.170	50.272	50.374	50.476	50.578	50.680	50.782	50.884	490

SWAW

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Non-FERROUS

APPENDIX

References

(MPa → kgf/mm²) / Conversion Factor: 1MPa = 0.10197kgf/mm²

MPa	Kgf/mm²										MPa
	0	0.1	0.2	0.3	0.4	0.5	0.6	0.7	0.8	0.9	
500	50.986	51.088	51.190	51.292	51.394	51.496	51.598	51.700	51.802	51.904	500
510	52.006	52.107	52.209	52.311	52.413	52.515	52.617	52.719	52.821	52.923	510
520	53.025	53.127	53.229	53.33	53.433	53.535	53.637	53.739	53.841	53.943	520
530	54.025	54.147	54.249	54.351	54.453	54.555	54.657	54.759	54.861	54.963	530
540	55.265	55.167	55.269	55.371	55.473	55.575	55.677	55.778	55.880	55.982	540
550	56.084	56.186	56.288	56.390	56.492	56.594	56.696	56.798	56.900	57.002	550
560	57.104	57.206	57.308	57.410	57.512	57.614	57.716	57.818	57.920	58.022	560
570	58.124	58.226	58.328	58.430	58.532	58.634	58.736	58.838	58.940	59.042	570
580	59.144	59.246	59.347	59.449	59.551	59.653	59.755	59.857	59.959	60.061	580
590	60.163	60.265	60.367	60.469	60.571	60.673	60.775	60.877	60.979	61.081	590
600	61.183	61.285	61.387	61.489	61.591	61.693	61.795	61.897	61.999	62.101	600
610	62.203	62.305	62.407	62.509	62.611	62.713	62.815	62.916	63.018	63.120	610
620	63.222	63.324	63.426	63.528	63.630	63.732	63.834	63.936	64.038	64.140	620
630	64.242	64.344	64.446	64.548	64.650	64.752	64.854	64.956	65.058	65.160	630
640	65.262	65.364	65.466	65.568	65.670	65.772	65.874	65.976	66.078	66.180	640
650	66.282	66.384	66.486	66.588	66.689	66.791	66.893	66.995	67.097	67.199	650
660	67.301	67.403	67.404	67.607	67.709	67.811	67.913	68.15	68.117	68.219	660
670	68.321	68.432	68.525	68.627	68.729	68.831	68.933	69.035	69.137	69.239	670
680	69.341	69.443	69.545	69.647	69.749	69.851	69.953	70.055	70.156	70.258	680
690	70.360	70.462	70.564	70.666	70.768	70.870	70.972	71.074	71.176	71.278	690
700	71.380	71.482	71.584	71.686	71.788	71.890	71.992	72.094	72.196	72.298	700
710	72.400	72.402	72.604	72.706	72.808	72.910	73.012	73.114	73.216	73.318	710
720	73.420	73.522	73.624	73.725	73.827	73.929	74.031	74.133	74.235	74.337	720
730	74.439	74.541	74.643	74.745	74.847	74.949	75.051	75.153	75.255	75.357	730
740	75.459	75.561	75.663	75.765	75.867	75.969	76.071	76.173	76.275	76.377	740
750	76.479	76.581	76.682	76.785	76.887	76.989	77.081	77.193	77.294	77.396	750
760	77.498	77.600	77.702	77.804	77.906	78.008	78.110	78.212	78.314	78.416	760
770	78.578	78.620	78.722	78.824	78.926	79.028	79.130	78.232	79.334	79.436	770
780	79.538	79.640	79.742	79.844	79.946	80.048	80.150	80.252	80.354	80.456	780
790	80.558	80.660	80.762	80.863	80.965	81.067	81.169	81.271	81.373	81.475	790
800	81.577	81.679	81.762	81.833	81.985	82.087	82.189	82.291	82.393	82.495	800
810	82.597	82.699	82.801	82.903	83.005	83.107	83.209	83.311	83.413	83.515	810
820	83.617	83.719	83.821	83.923	84.025	84.127	84.229	84.331	84.433	84.534	820
830	84.636	84.738	84.840	84.942	85.044	85.146	85.248	85.350	85.452	85.554	830
840	85.656	85.758	85.860	85.962	86.064	86.166	86.268	86.370	86.472	86.574	840
850	86.676	86.778	86.880	86.982	87.084	87.186	87.288	87.390	87.492	87.594	850
860	87.696	87.798	87.900	88.002	88.103	88.205	88.307	88.409	88.511	88.613	860
870	88.715	88.817	88.919	89.021	89.123	89.225	89.327	89.429	89.531	89.633	870
880	89.735	89.837	89.939	90.041	90.143	90.245	90.347	90.449	90.551	90.653	880
890	90.755	90.857	90.959	91.061	91.163	91.265	91.367	91.469	91.571	91.672	890
900	91.774	91.876	91.978	92.080	92.182	92.284	92.386	92.488	92.590	92.692	900
910	92.794	92.896	92.998	93.100	93.202	93.304	93.406	93.508	93.610	93.712	910
920	93.814	93.916	94.018	94.120	94.222	94.324	94.426	94.528	94.630	94.732	920
930	94.834	94.936	95.038	95.140	95.241	95.343	95.445	95.547	95.649	95.751	930
940	95.853	95.955	96.057	96.159	96.261	96.363	96.465	96.567	96.669	96.771	940
950	96.873	96.975	97.077	97.179	97.281	97.383	97.485	97.587	97.689	97.791	950
960	97.893	97.995	98.097	98.199	98.301	98.403	98.505	98.607	98.709	98.811	960
970	98.912	99.014	99.116	99.218	99.320	99.422	99.524	99.626	99.728	99.830	970
980	99.932	100.03	100.13	100.23	100.33	100.43	100.53	100.63	100.73	100.83	980
990	100.95	101.05	101.15	101.25	101.35	101.45	101.55	101.65	101.75	101.85	990

5 Impact value conversion table (1)

(ft.-lbs → kgf-m) / Conversion Factor: 1ft.-lbs = 0.138255kgf-m

ft.-lbs	0	1	2	3	4	5	6	7	8	9	ft.-lbs
	Kgm	Kgm	Kgm	Kgm	Kgm	Kgm	Kgm	Kgm	Kgm	Kgm	Kgm
0	0.000	0.138	0.276	0.415	0.553	0.691	0.830	0.968	1.106	1.244	0
10	1.383	1.521	1.659	1.797	1.936	2.074	2.212	2.350	2.489	2.627	10
20	2.765	2.903	3.042	3.180	3.318	3.456	3.595	3.733	3.871	4.009	20
30	4.148	4.286	4.424	4.562	4.701	4.839	4.977	5.116	5.254	5.392	30
40	5.530	5.667	5.807	5.945	6.083	6.222	6.360	6.498	6.636	6.774	40
50	6.913	7.051	7.189	7.328	7.466	7.604	7.742	7.881	8.019	8.157	50
60	8.295	8.434	8.572	8.710	8.848	8.987	9.125	9.263	9.401	9.540	60
70	9.678	9.816	9.955	10.093	10.231	10.369	10.508	10.646	10.784	10.922	70
80	11.061	11.199	11.337	11.475	11.614	11.752	11.890	12.028	12.167	12.305	80
90	12.443	12.581	12.720	12.858	12.996	13.134	13.273	13.411	13.549	13.687	90
100	13.826	13.964	14.105	14.540	14.379	14.517	14.655	14.794	14.932	15.070	100
110	15.208	15.347	15.482	15.623	15.761	15.900	16.038	16.176	16.314	16.453	110
120	16.591	16.729	16.867	17.006	17.144	17.282	17.420	17.559	17.697	17.835	120

SWAW

SAW

GMAW

GTAW

FCAW

Non-FERROUS

APPENDIX

References

6 Impact value conversion table (2)

(kgf·m → N·m or J) / Conversion Factor: 1kgf·m = 9.80665N·m(or J)

kgf·m	N·m(or Joule)									
	0	0.1	0.2	0.3	0.4	0.5	0.6	0.7	0.8	0.9
	-	0.9807	1.9613	2.9420	3.9227	4.9033	5.8840	6.8647	7.8453	8.8260
1	9.8066	10.787	11.768	12.749	13.729	14.710	15.691	16.671	17.652	18.633
2	19.613	20.594	21.575	22.555	23.533	24.517	25.497	26.478	27.652	28.439
3	29.420	30.401	31.381	32.362	33.343	34.323	35.304	36.285	37.265	38.246
4	39.229	40.207	41.188	42.169	43.149	44.130	45.111	46.091	47.072	48.053
5	49.033	50.014	50.995	51.975	52.956	53.937	54.917	55.898	56.879	57.859
6	58.844	59.821	60.801	61.728	62.763	63.743	64.724	65.705	66.685	67.666
7	68.647	69.627	70.608	71.589	72.569	73.550	74.531	75.511	76.492	77.473
8	78.453	78.434	80.415	81.395	82.376	83.357	84.337	85.318	86.299	87.279
9	88.260	89.241	90.221	91.202	92.183	93.163	94.144	95.125	96.105	97.086
10	98.066	99.047	100.03	101.01	101.99	102.97	103.95	104.93	105.91	106.89
11	107.87	108.85	109.83	110.82	111.80	112.78	113.76	114.74	115.72	116.70
12	117.68	118.66	119.64	120.62	121.60	122.58	123.56	124.54	125.53	126.51
13	127.49	128.47	129.45	130.43	131.41	132.39	133.37	134.35	135.33	136.31
14	137.29	138.27	139.25	140.24	141.22	142.20	143.18	144.16	145.14	146.12
15	147.10	148.08	149.06	150.04	151.02	152.00	152.98	153.96	154.95	155.93
16	156.91	157.89	158.87	159.85	160.83	161.81	162.72	163.77	164.75	165.73
17	166.71	167.69	168.67	169.66	170.64	171.62	172.60	173.58	174.56	175.54
18	176.52	177.50	178.48	179.46	180.44	181.42	182.40	183.38	184.37	185.35
19	186.33	187.31	188.29	189.27	190.25	191.23	192.21	193.19	194.17	195.15
20	196.13	197.11	198.09	199.07	200.06	201.04	202.02	203.00	203.98	204.96
21	205.94	206.92	207.90	208.88	209.86	210.84	211.82	212.80	213.78	214.77
22	215.75	216.73	217.71	218.69	219.67	220.65	221.63	222.61	223.59	224.57
23	225.55	226.53	227.51	228.49	229.48	230.46	231.44	232.42	233.40	234.38
24	235.36	236.34	237.32	238.30	239.28	240.26	241.24	242.22	243.20	244.19
25	245.17	246.15	247.13	248.11	249.09	250.07	251.05	252.03	253.01	253.99
26	254.97	255.95	256.93	257.91	258.89	259.87	260.85	261.83	262.81	263.80
27	264.78	265.76	266.74	267.72	268.70	269.68	270.66	271.64	272.62	273.61
28	274.59	275.57	276.55	277.53	278.51	279.49	280.47	281.45	282.43	283.41
29	284.39	285.37	286.35	287.33	288.32	289.30	290.28	291.26	292.24	293.22
30	294.20	295.18	296.16	297.14	298.12	299.10	300.08	301.06	302.04	303.03
31	304.01	304.99	305.97	306.95	307.93	308.91	309.89	310.87	311.85	312.83
32	313.81	314.79	315.77	316.75	317.74	318.72	319.70	320.68	321.66	322.64
33	323.62	324.60	325.58	326.56	327.54	328.52	329.50	330.48	331.46	332.45
34	333.43	334.41	335.39	336.37	337.35	338.33	339.31	340.29	341.27	342.25
35	343.32	344.21	345.19	346.17	347.16	348.14	349.12	350.10	350.88	351.87
36	353.04	354.02	355.00	355.98	356.96	357.94	358.92	359.90	360.88	361.87
37	362.85	363.83	364.81	365.79	366.77	367.75	368.73	369.71	370.69	371.67
38	372.35	373.33	374.31	375.29	376.27	377.25	378.23	379.21	380.19	381.18
39	382.46	383.44	384.42	385.40	386.38	387.36	388.34	389.32	390.30	391.29
40	392.27	393.25	394.23	395.21	396.19	397.17	398.15	399.13	400.11	401.09
41	402.07	403.05	404.03	405.01	406.00	406.98	407.96	408.94	409.92	410.90
42	411.88	412.86	413.84	414.82	415.80	416.78	417.76	418.74	419.72	420.71
43	421.69	422.67	423.65	424.63	425.61	426.59	427.57	428.55	429.53	430.51
44	431.49	432.47	433.45	434.43	435.42	436.40	437.38	438.36	439.34	440.32
45	441.30	442.28	443.26	444.24	445.22	446.20	447.18	448.16	449.14	450.13
46	451.11	452.09	453.07	454.05	455.03	456.01	456.99	457.97	458.95	459.93
47	460.91	461.89	462.87	463.85	464.83	465.82	466.80	467.78	468.76	469.74
48	470.72	471.70	472.68	473.66	474.64	475.62	476.60	477.58	478.56	479.55
49	480.53	481.51	482.49	483.47	484.45	485.43	486.41	487.39	488.37	489.35

(kgf-m → N-m or J) / Conversion Factor: 1kgf-m = 9.80665N-m(or J)

kgf-m	N-m(or Joule)									
	0	0.1	0.2	0.3	0.4	0.5	0.6	0.7	0.8	0.9
50	490.33	491.31	492.29	493.27	494.26	495.24	496.22	497.20	498.18	499.16
51	500.14	501.12	502.10	503.27	504.06	505.04	506.02	507.99	507.98	508.97
52	509.95	510.93	511.91	512.89	513.87	514.85	515.83	516.82	517.79	518.77
53	519.75	520.73	521.71	522.69	523.68	524.66	525.64	526.32	527.64	528.58
54	529.56	530.54	531.52	532.50	533.48	534.46	535.44	536.45	537.64	538.39
55	539.37	540.35	541.33	542.31	543.48	534.46	535.44	536.42	537.64	538.39
56	549.17	550.15	551.13	552.11	553.10	544.27	555.03	556.06	557.02	558.00
57	558.98	559.96	560.94	561.92	562.90	563.88	564.86	565.84	566.82	567.81
58	568.79	569.77	570.75	571.73	572.71	573.69	574.67	575.65	576.63	577.61
59	578.59	579.57	580.55	581.53	582.52	583.50	584.48	585.46	586.44	587.42
60	588.40	589.38	590.36	591.34	592.32	593.30	594.28	595.26	596.24	597.22
61	598.21	599.19	600.17	601.15	602.13	603.11	604.09	605.07	606.05	607.03
62	608.01	608.99	609.97	610.95	611.93	612.92	613.90	614.88	615.86	616.84
63	617.81	618.80	619.78	620.76	621.74	622.72	623.70	624.68	625.66	626.64
64	627.63	628.61	629.59	630.57	631.55	632.53	633.51	634.49	635.47	636.45
65	637.43	638.41	639.39	640.37	641.35	642.34	643.32	644.30	645.28	646.26
66	647.24	648.22	649.20	650.18	651.16	652.14	653.12	654.10	655.08	656.06
67	657.05	658.03	659.01	659.99	660.97	661.95	662.93	663.91	664.89	665.87
68	666.85	667.83	668.81	669.99	670.77	671.76	672.74	673.72	674.70	675.68
69	676.66	677.64	678.62	679.60	680.58	681.56	682.54	683.52	684.50	685.48
70	686.47	687.45	688.43	689.41	690.39	691.37	692.35	693.33	694.31	695.29
71	696.27	697.25	698.23	699.21	700.19	701.18	702.16	703.14	704.12	705.10
72	706.08	707.06	708.04	709.02	710.00	710.98	711.96	712.94	713.92	714.90
73	715.89	716.87	717.85	718.83	719.81	720.79	721.77	722.75	723.73	724.71
74	725.69	726.67	727.65	728.63	729.61	730.60	731.58	732.56	733.54	734.52
75	735.50	736.48	737.46	738.44	739.42	740.40	741.38	742.36	743.34	744.32
76	745.31	746.29	747.27	748.25	749.23	750.21	751.19	752.17	753.15	754.13
77	755.11	756.09	757.07	758.05	759.03	760.02	761.00	761.98	762.96	763.94
78	764.92	765.90	766.88	767.86	768.84	769.82	770.80	771.78	772.76	773.74
78	774.73	775.71	776.69	777.67	778.65	779.63	780.61	781.59	782.57	783.55
80	784.53	785.51	786.49	787.47	788.45	789.44	790.42	791.40	792.38	793.36
81	794.34	795.32	796.30	797.28	798.26	799.24	800.22	801.20	802.18	803.16
82	804.15	805.13	806.11	807.09	808.07	809.05	810.03	811.01	811.99	812.97
83	813.95	814.93	815.91	816.89	817.87	818.86	819.84	820.82	821.80	822.78
84	823.76	824.74	825.72	826.70	827.68	828.66	829.64	830.62	831.60	832.58
85	833.56	834.74	835.53	836.70	837.68	838.66	839.64	840.62	841.60	842.58
86	843.37	844.35	845.72	846.51	847.49	848.47	849.45	850.43	851.41	852.39
87	853.18	854.16	855.14	856.12	857.10	858.08	859.06	860.04	861.02	862.00
88	862.99	863.97	864.95	865.93	866.91	867.89	868.87	869.85	870.83	871.81
89	872.79	873.77	874.75	875.73	876.71	877.70	878.68	879.66	880.64	881.62
90	882.60	883.58	884.56	885.54	886.52	887.50	888.48	889.46	890.44	891.23
91	892.41	893.39	894.37	895.35	896.33	897.31	898.28	899.27	900.25	901.23
92	902.21	903.19	904.17	905.15	906.13	907.12	908.10	909.08	910.06	911.04
93	912.02	913.00	913.98	914.96	915.94	916.92	917.90	918.88	919.86	920.84
94	921.83	922.81	923.79	924.77	925.75	926.73	927.71	928.69	929.67	930.65
95	931.63	932.61	933.59	934.57	935.55	936.54	937.54	938.50	939.48	940.46
96	941.44	942.42	943.40	944.38	945.36	946.34	947.32	948.30	949.28	950.26
97	951.25	952.23	953.21	954.19	955.17	956.15	957.13	958.11	959.09	960.07
98	961.05	962.03	963.01	963.99	964.97	965.96	966.94	967.92	968.90	969.88
99	970.86	971.84	972.82	973.80	974.72	975.76	976.74	977.72	978.70	979.68
100	980.66									

SWAW

SAW

GMAW

GTAW

FCAW

Non-FERROUS

APPENDIX

References

7 Temperature conversion table

0~45			46~91			92~450			460~910		
°C		°F	°C		°F	°C		°F	°C		°F
-17.8	0	32	7.7	46	114.8	33.3	92	197.6	238	460	860
-17.2	1	33.8	8.2	47	116.8	33.8	93	199.4	243	470	878
-16.7	2	35.6	8.8	48	118.8	34.4	94	201.2	249	480	896
-16.1	3	37.4	9.3	49	120.2	34.8	95	203.0	254	490	914
-15.6	4	39.2	9.9	50	122.0	35.5	96	204.8	260	500	932
-15.0	5	41.0	10.4	51	123.8	36.1	97	206.6	265	510	950
-14.4	6	42.8	11.1	52	125.8	36.6	98	208.4	271	520	968
-13.9	7	44.6	11.5	53	127.4	37.1	99	210.2	276	530	986
-13.3	8	46.4	12.1	54	129.2	37.7	100	212.0	282	540	1004
-12.8	9	48.2	12.6	55	131.0	38	100	212	288	550	1022
-12.2	10	50.0	13.2	56	132.8	43	110	230	293	560	1040
-11.7	11	51.8	13.7	57	134.6	49	120	248	299	570	1058
-11.1	12	53.6	14.3	58	136.4	54	130	266	304	580	1076
-10.6	13	55.4	14.8	59	138.4	60	140	284	310	590	1094
-10.0	14	57.2	15.6	60	140.0	65	150	302	315	600	1112
-9.4	15	59.0	16.0	61	141.8	71	160	320	321	610	1130
-8.9	16	60.8	16.6	62	143.6	76	170	338	326	620	1148
-8.3	17	62.6	17.1	63	145.4	83	180	356	332	630	1166
-7.7	18	64.4	17.7	64	147.2	88	190	374	338	640	1184
-7.2	19	66.2	18.2	65	149.0	93	200	392	343	650	1202
-6.7	20	68.0	18.8	66	150.8	99	210	410	349	660	1220
-6.1	21	69.8	19.3	67	152.6	100	212	413	354	670	1238
-5.6	22	71.6	19.9	68	154.4	104	220	428	360	680	1256
-5.0	23	73.4	20.4	69	156.2	110	230	446	365	690	1274
-4.4	24	75.2	21.0	70	158.0	115	240	464	371	700	1292
-3.9	25	77.0	21.5	71	159.8	121	250	482	376	710	1310
-3.3	26	78.8	22.2	72	161.6	127	260	500	382	720	1328
-2.8	27	80.6	22.7	73	163.4	132	270	518	387	730	1346
-2.2	28	82.4	23.3	74	165.2	138	280	536	393	740	1364
-1.7	29	84.2	23.8	75	167.0	143	290	554	399	750	1382
-1.1	30	86.0	24.4	76	168.8	149	300	572	404	760	1400
-0.6	31	87.8	25.0	77	170.6	154	310	590	410	770	1418
0	32	89.6	25.5	78	172.4	160	320	608	415	780	1436
0.6	33	91.4	26.2	79	174.2	165	330	626	421	790	1454
1.1	34	93.2	26.8	80	176.0	171	340	644	426	800	1472
1.7	35	95.0	27.3	81	177.8	177	350	662	432	810	1490
2.2	36	96.8	27.7	82	179.6	182	360	680	438	820	1508
3.3	38	100.4	28.8	84	183.2	193	380	716	449	840	1544
3.9	39	102.2	29.3	85	185.0	199	390	734	454	850	1562
4.4	40	104.0	29.9	86	186.8	204	400	752	460	860	1580
5.0	41	105.8	30.4	87	188.6	210	410	770	465	870	1598
5.6	42	107.6	31.0	88	190.4	215	420	788	471	880	1616
6.1	43	109.3	31.5	89	192.2	221	430	806	476	890	1634
6.7	44	111.2	32.1	90	194.0	226	440	824	482	900	1652
7.2	45	113.0	32.6	91	195.8	232	450	842	487	910	1670

$$^{\circ}\text{C} = (^{\circ}\text{F} - 32) \times 5/9$$

$$^{\circ}\text{F} = (^{\circ}\text{C} \times 9/5) + 32$$

920~1370			1380~1830			1840~2290			2300~2750		
$^{\circ}\text{C}$	$^{\circ}\text{F}$		$^{\circ}\text{C}$	$^{\circ}\text{F}$		$^{\circ}\text{C}$	$^{\circ}\text{F}$		$^{\circ}\text{C}$	$^{\circ}\text{F}$	
493	920	1688	748	1380	2516	1003	1840	3344	1260	2300	4172
498	930	1706	752	1390	2534	1008	1850	3362	1266	2310	4190
504	940	1724	760	1400	2552	1014	1860	3380	1271	2320	4208
510	950	1742	765	1410	2570	1019	1870	3398	1277	2330	4244
520	970	1778	776	1430	2606	1030	1890	3434	1288	2350	4262
526	980	1796	782	1440	2624	1036	1900	3452	1293	2360	4280
532	990	1814	787	1450	2642	1041	1910	3470	1299	2370	4298
538	1000	1832	793	1460	2660	1047	1920	3488	1304	2380	4316
543	1010	1850	798	1470	2678	1052	1930	3506	1310	2390	4334
549	1020	1868	804	1480	2696	1058	1940	3524	1316	2400	4552
555	1030	1886	809	1490	2714	1063	1950	3542	1321	2410	4370
560	1040	1904	815	1500	2732	1069	1960	3560	1327	2420	4388
565	1050	1922	820	1510	2750	1074	1970	3578	1332	2430	4406
571	1060	1940	827	1520	2768	1080	1980	3596	1338	2440	4424
576	1070	1958	831	1530	2786	1085	1990	3614	1343	2450	4442
582	1080	1976	838	1540	2804	1093	2000	3632	1349	2460	4460
587	1090	1994	842	1550	2822	1099	2010	3650	1354	2470	4478
593	1100	2012	849	1560	2840	1104	2020	3668	1360	2480	4496
604	1120	2048	860	1580	2876	1116	2040	3704	1371	2500	4532
609	1130	2066	864	1590	2894	1124	2050	3722	1377	2510	4550
616	1140	2084	871	1600	2912	1127	2060	3740	1382	2520	4568
620	1150	2102	876	1610	2930	1132	2070	3758	1388	2530	4586
626	1160	2120	882	1620	2948	1138	2080	3776	1393	2540	4604
631	1170	2138	887	1630	2966	1143	2090	3794	1399	2550	4622
637	1180	2156	893	1640	2984	1149	2100	3812	1404	2560	4640
642	1190	2174	898	1650	3002	1154	2110	3830	1410	2570	4658
648	1200	2192	904	1660	3020	1160	2120	3848	1416	2580	4676
653	1210	2210	909	1670	3038	1166	2130	3866	1421	2590	4694
659	1220	2228	915	1680	3056	1171	2140	3884	1427	2600	4712
664	1230	2246	920	1690	3074	1177	2150	3902	1432	2610	4730
670	1240	2264	926	1700	3092	1182	2160	3920	1438	2620	4748
675	1250	2282	934	1710	3110	1188	2170	3938	1443	2630	4766
682	1260	2300	937	1720	3128	1193	2180	3956	1449	2640	4784
686	1270	2318	942	1730	3146	1199	2190	3974	1454	2650	4802
692	1280	2336	948	1740	3164	1204	2200	3992	1460	2660	4820
697	1290	2354	953	1750	3182	1210	2210	4010	1466	2670	4838
704	1300	2372	959	1760	3200	1216	2220	4028	1471	2680	4856
708	1310	2390	964	1770	3218	1221	2230	4046	1477	2690	4874
715	1320	2408	970	1780	3236	1227	2240	4064	1482	2700	4892
719	1330	2426	975	1790	3255	1232	2250	4082	1488	2710	4910
726	1340	2444	981	1800	3272	1238	2260	4100	1493	2720	4928
734	1350	2462	986	1810	3290	1243	2270	4118	1499	2730	4946
737	1360	2480	992	1820	3308	1249	2280	4136	1504	2740	4964
741	1370	2498	997	1830	3326	1254	2290	4154	1510	2750	4982

SMW

SAW

GMW

GTAW

FCW

Non-FERROUS

APPENDIX

References

8 Unit conversion table of inch and millimeter

Conversion Factor: 1inch = 25.4mm

Inch		mm	Inch		mm
1/64	0.015625	0.3937	33/64	0.515625	13.0969
1/32	0.03125	0.7938	17/32	0.53125	13.4938
3/64	0.046875	1.1906	35/65	0.546875	13.8906
1/16	0.0625	1.5875	9/16	0.5625	14.2875
5/64	0.078125	1.9844	37/64	0.578125	14.6844
3/32	0.09375	2.3812	19/32	0.59375	15.0821
7/64	0.109375	2.7781	39/64	0.607375	15.4781
1/8	0.125	3.175	5/8	0.625	15.875
9/64	0.140625	3.5719	41/64	0.640625	16.2719
5/32	0.15625	3.9688	23/32	0.65625	16.6688
11/64	0.171875	4.3656	43/64	0.671875	17.656
3/16	0.1875	4.7625	11/16	0.6875	17.4625
13/64	0.203125	5.1554	45/64	0.703125	17.8554
7/32	0.21875	5.5562	23/32	0.71875	18.2562
15/64	0.234375	5.9531	47/64	0.734375	18.6531
1/4	0.25	6.35	3/4	0.75	19.05
17/64	0.265625	6.7459	49/64	0.785625	19.4469
9/32	0.28125	7.1438	25/32	0.75125	19.8438
19/64	0.296875	7.5406	51/64	0.796895	20.2406
5/16	0.3125	7.9375	13/16	0.8125	20.6375
21/64	0.328125	8.3344	53/64	0.828125	21.0344
11/32	0.34375	8.7312	27/32	0.74375	21.4312
23/64	0.359375	9.1281	55/64	0.859375	21.8241
3/8	0.375	9.525	7/8	0.875	22.225
25/64	0.390625	9.9219	57/64	0.890625	22.6219
13/32	0.40625	10.3188	29/32	0.90625	23.0188
27/64	0.421875	10.7156	59/64	0.921875	23.4156
7/16	0.4375	11.112	15/16	0.9375	23.8125
29/64	0.453125	11.5094	61/64	0.953125	24.2094
15/32	0.46875	11.9062	31/32	0.96875	24.6082
31/64	0.484375	12.3031	63/64	0.984375	25.0031
1/2	0.5	12.7	1	1	25.4

Length

Meter	Inch	Feet	Yard	Mile
0.30303	11.9305	0.994211	0.331403	0.000188
1.81818	71.5832	5.96527	1.98842	0.001129
3927.27	154619	12884.9	4294.99	2.44033
1	39.3707	3.28089	1.09363	0.000621
0.025399	1	0.08333	0.027777	0.000015
0.030494	12	1	0.333333	0.00189
0.914383	36	3	1	0.00568
1609.31	63360	5280	1760	1

Weight

Gram	Kilogram	Ounce	Pound	Long Ton	Short Ton
3750	5.75	132.28	8.2672	0.00375	0.004133
600	0.6	21.1647	1.32279	0.0006	0.000661
1	0.001	0.03527	0.0022	0.000001	0.000001
1000	1	35.273	2.20459	0.001	0.001102
28.3495	0.02835	1	0.0525	0.000028	0.000031
453.592	0.45359	16	1	0.00045	0.0005
1016047	36	35840	2240	1	1.12
907178	63360	32000	2000	0.892857	1

References

9 Steel plate weight table

Thickness		Weight		Weight/plate					
mm	inch	kg/ft²	lb/ft²	3 feet × 6 feet		4 feet × 8 feet		5 feet × 10 feet	
				kg	lb	kg	lb	kg	lb
1	0.0394	0.7293	1.608	13.1	28.94	23.3	51.46	36.5	80.40
1.2	0.0172	0.8752	1.930	15.8	34.74	28.0	61.76	43.8	86.50
1.4	0.0551	1.021	2.251	18.4	40.52	32.7	72.03	51.1	112.6
1.6	0.0630	1.167	2.573	21.0	46.31	37.3	82.34	58.4	128.7
1.8	0.0709	1.313	2.895	23.6	52.11	42.0	92.64	65.7	144.8
2	0.0787	1.459	3.217	26.3	57.91	46.7	102.9	73.0	160.9
2.3	0.0906	1.677	3.697	30.2	66.55	53.7	118.3	83.9	184.9
2.6	0.1024	1.896	4.180	34.1	75.24	60.7	133.8	94.8	209.0
2.9	0.1142	2.115	4.663	38.1	83.93	67.7	142.2	106	233.2
3.2	0.1260	2.334	5.146	42.0	92.63	74.7	164.7	117	257.3
3.5	0.1378	2.553	5.628	46.0	101.3	81.7	180.1	128	281.4
4	0.1575	2.917	6.431	52.5	115.8	93.3	205.8	146	321.6
4.5	0.1772	3.282	8.040	65.6	144.7	117	257.3	182	402.0
5	0.1969	3.647	8.040	65.6	144.7	117	257.3	182	402.0
5.5	0.2165	4.011	8.843	72.2	159.2	128	283.0	201	442.2
6	0.2362	4.376	9.647	78.8	173.6	140	308.7	219	482.4
6.5	0.2559	4.740	10.45	85.3	188.1	152	334.4	237	522.5
7	0.2756	5.105	11.25	91.9	202.5	163	360.0	255	562.5
8	0.3150	5.834	14.47	118	260.5	210	463.0	328	723.5
10	0.3937	7.293	16.08	131	289.4	233	514.6	365	804.0
11	0.4331	8.022	17.69	144	318.4	257	566.1	401	884.5
12	0.4724	8.752	19.30	158	347.4	280	617.6	438	965.0

Thickness		Weight		Weight/plate					
mm	inch	kg/ft ²	lb/ft ²	3 feet × 6 feet		4 feet × 8 feet		5 feet × 10 feet	
				kg	lb	kg	lb	kg	lb
13	0.5118	9.481	20.90	171	376.2	303	668.8	474	1045
14	0.5512	10.21	22.51	184	405.2	327	720.3	511	1126
15	0.5906	10.94	24.12	197	434.2	350	771.8	547	1206
16	0.6299	11.67	25.73	210	463.1	373	823.4	584	1287
19	0.7480	13.86	30.56	249	550.1	444	979.9	693	1528
22	0.8661	16.04	35.36	389	636.5	513	1132	802	1768
25	0.9843	18.23	40.19	328	723.4	583	1286	912	2010
28	1.1024	20.42	45.02	368	810.4	653	1441	1021	2251
32	1.2598	23.34	51.46	420	926.3	747	1647	1167	2573
36	1.4173	26.25	57.87	473	1042	840	1852	1313	2894
40	1.5348	29.17	64.31	525	1158	933	2058	1459	3216
45	1.7717	32.82	72.35	591	1302	1050	2315	1641	3618
50	1.9685	36.47	80.40	656	1447	1167	2573	1824	4020
1/32	0.7938	0.5789	1.276	10.4	22.97	18.5	40.83	28.9	63.8
1/16	1.5875	1.158	2.553	20.8	45.95	37.1	81.70	57.9	127.7
3/32	2.3813	1.737	3.829*	31.3	68.92	55.6	122.5	86.9	191.5
1/8	3.1750	2.316	5.106	41.7	91.91	74.1	163.5	116	255.3
5/32	3.9688	2.894	6.380	52.1	114.8	92.6	204.2	145	319.0
3/16	4.7625	3.473	7.657	62.5	137.8	111	245.0	174	382.9
7/32	5.5563	4.052	8.933	72.9	160.8	130	285.9	203	446.7
1/4	6.3500	4.631	10.21	83.4	183.8	148	326.7	232	510.5
9/32	7.1438	5.210	11.49	93.8	206.8	167	367.7	261	574.5

Welding Standards

Classification	Code	Standard Name
Global Standard	ISO	International Organization for Standardization
National Standard	KS	Korean Industrial Standards
	JIS	Japanese Industrial Standards
	ANSI	American National Standards Institute
	BS	British Standards
	DIN	Deutsch Industrie Normen
	NF	Normes Francaises
	UNI	Ente Nazionale Italiano di Unificazione
	DOCT (GOST)	The National standards of Soviet Union
Group Standard	IIW	International Institute of Welding
	AWS	American Welding Society
	ASME	American Society of Mechanical Engineers
	ASTM	American Society for Testing and Materials
	AISI	American Iron and Steel Institute
	SAE	Society of Automotive Engineers
	MIL	Military Specification and Standards
	VDEh	Verein Deutscher Eisenhüttenleute
	JRS	Japanese Welding Engineering Society Standard
	WES	Japan Welding Engineering Society Standards
	CSA	Canadian Standards Association
	CWB	Canadian Welding Bureau (Welding-related Division of CSA)
	KR	Korean Register of Shipping
	ABS	American Bureau of Shipping
	LR	Lloyd's Register
	DNV	Det Norske Veritas
	NK	Nippon Kaiji Kyokai
	BV	Bureau Veritas
	GL	Germanischer Lloyd
	CCS	China Classification Society
	RINA	Registro Italiano Navale
	RS	Russian Maritime Register of Shipping
	CRS	Croatian Register of Shipping
	TÜV	Technischer Überwachungs Verein

SMAW

1 AWS A 5.1

Specification for carbon steel electrodes for Shielded Metal Arc Welding

<u>E</u>	<u>XX</u>	<u>YY</u>	-	<u>1</u>	<u>HZ</u>	<u>R</u>
①	②	③		④	⑤	⑥

- ① Designates an electrode
- ② Designates the minimum tensile strength (ksi) - See Table 2
- ③ Designates the welding position, the type of covering, and the kind of welding current
- See Table 1
- ④ Designates that the electrode meets the requirements for improved toughness
- ⑤ Designates that the electrode meets the requirements of the diffusible hydrogen test
- See Table 4
- ⑥ Designates that the electrode meet the requirements of the absorbed moisture test - See Table 3

table 1 Electrode Classification

AWS Classification		Type of Covering	Welding Position	Type Current
A 5.1	A 5.1M			
E6010	E4310	High cellulose sodium	F, V, OH, H	DCEP
E6011	E4311	High cellulose potassium	F, V, OH, H	AC or DCEP
E6012	E4312	High titania sodium	F, V, OH, H	AC or DCEN
E6013	E4313	High titania potassium	F, V, OH, H	AC, DCEP, or DCEN
E6018	E4318	Low-hydrogen potassium, iron powder	F, V, OH, H	AC or DCEP
E6019	E4319	Iron oxide titania potassium	F, V, OH, H	AC, DCEP, or DCEN
E6020	E4320	High iron oxide	H-Fillet, F	AC or DCEN AC, DCEP, or DCEN
E6022	E4322	High iron oxide	F, H-Fillet	AC or DCEN
E6027	E4327	High iron oxide, iron powder	H-Fillet, F	AC or DCEN AC, DCEP, or DCEN
E7014	E4914	Iron powder, titania	F, V, OH, H	AC, DCEP, or DCEN
E7015	E4915	Low-hydrogen sodium	F, V, OH, H	DCEP
E7016	E4916	Low-hydrogen potassium	F, V, OH, H	AC or DCEP
E7018	E4918	Low-hydrogen potassium, iron powder	F, V, OH, H	AC or DCEP
E7018M	E4918M	Low-hydrogen iron powder	F, V, OH, H	DCEP
E7024	E4924	Iron powder, titania	H-Fillet, F	AC, DCEP, or DCEN
E7027	E4927	High iron oxide, iron powder	H-Fillet, F	AC or DCEN AC, DCEP, or DCEN
E7028	E4928	Low-hydrogen potassium, iron powder	H-Fillet	AC or DCEP
E7048	E4948	Low-hydrogen potassium, iron powder	F, OH, H, V-down	AC or DCEP

table 2 Tension Test Requirements

AWS Classification		Tensile Strength		Yield strength at 0.2% Offset		Elongation Percentage In 4X Diameter Length
A 5.1	A 5.1M	A 5.1 (ksi)	A 5.1M (MPa)	A 5.1 (ksi)	A 5.1M (MPa)	
E6010	E4310	60	430	48	330	22
E6011	E4311	60	430	48	330	22
E6012	E4312	60	430	48	330	17
E6013	E4313	60	430	48	330	17
E6018	E4318	60	430	48	330	22
E6019	E4319	60	430	48	330	22
E6020	E4320	60	430	48	330	22
E6022	E4322	60	430	Not Specified		Not Specified
E6027	E4327	60	430	48	330	22
E7014	E4914	70	490	58	400	17
E7015	E4915	70	490	58	400	22
E7016	E4916	70	490	58	400	22
E7018	E4918	70	490	58	400	22
E7024	E4924	70	490	58	400	17 ^c
E7027	E4927	70	490	58	400	22
E7028	E4928	70	490	58	400	22
E7048	E4948	70	490	58	400	22
E7018M	E4918M	Note	Note	53-72	370-500	24

table 3 Moisture Contents Limits For Electrode Coverings

AWS Classification		Electrode Designation		Limit of Moisture Content, % by Wt, Max.	
A 5.1	A 5.1M	A 5.1	A 5.1M	As-Received or conditioned	As-Exposed
E6018	E4318	E6018	E4318	0.6	Not Specified
E7015	E4915	E7015	E4915		
E7016	E4916	E7016	E4916		
		E7016-1	E4916-1		
E7018	E4918	E7018	E4918		
		E7018-1	E4918-1		
E7028	E4928	E7028	E4928		
E7048	E4948	E7048	E4948	0.3	0.4
E6018	E4318	E6018R	E4318R		
E7015	E4915	E7015R	E4915R		
E7016	E4916	E7016R	E4916R		
		E7016-1R	E4916-1R		
E7018	E4918	E7018R	E4918R		
		E7018-1R	E4918-1R		
E7028	E4928	E7028R	E4928R	0.1	0.4
E7048	E4948	E7048R	E4948R		
E7018M	E4918M	E7018M	E4918M		

table 4 Diffuible Hydrogen Limits for Weld Metal

AWS Classification		Diffuible Hydrogen Designator	Diffuible Hydrogen Content, Average mL/100g Deposited Metal, Max.
A 5.1	A 5.1M		
E7018M	E4918M	None	4
E6018	E4318	H16 H8 H4	16 8 4
E7015	E4915		
E7016	E4916		
E7018	E4918		
E7028	E4928		
E7048	E4948		

2 AWS A 5.4**table 1** Chemical Composition Requirements for Undiluted Weld Metal

AWS Classification	Weight Percent ^b										
	C ^a	Cr	Ni	Mo	Cb(Nb) plus Ta	Mn	Si	P	S	N	Cu
E209-XX ^e	0.06	2.50-24.0	9.5-12.0	1.5-3.0	-	4.0-7.0	1.00	0.04	0.03	0.10-0.30	0.75
E219-XX	0.06	19.0-21.5	5.5-7.0	0.75	-	8.0-10.0	1.00	0.04	0.03	0.10-0.30	0.75
E240-XX	0.06	17.0-19.0	4.0-6.0	0.75	-	10.5-13.5	1.00	0.04	0.03	0.10-0.30	0.75
E307-XX	0.04-0.14	18.0-21.5	9.0-10.7	0.5-1.5	-	3.30-4.75	1.00	0.04	0.03	-	0.75
E308-XX	0.08	18.0-21.0	9.0-11.0	0.75	-	0.5-2.5	1.00	0.04	0.03	-	0.75
E308H-XX	0.04-0.08	18.0-21.0	9.0-11.0	0.75	-	0.5-2.5	1.00	0.04	0.03	-	0.75
E308L-XX	0.04	18.0-21.0	9.0-11.0	0.75	-	0.5-2.5	1.00	0.04	0.03	-	0.75
E308Mo-XX	0.08	18.0-21.0	9.0-12.0	2.0-3.0	-	0.5-2.5	1.00	0.04	0.03	-	0.75
E308MoL-XX	0.04	18.0-21.0	9.0-12.0	2.0-3.0	-	0.5-2.5	1.00	0.04	0.03	-	0.75
E309-XX	0.15	22.0-25.0	12.0-14.0	0.75	-	0.5-2.5	1.00	0.04	0.03	-	0.75
E309L-XX	0.04	22.0-25.0	12.0-14.0	0.75	-	0.5-2.5	1.00	0.04	0.03	-	0.75
E309Cb-XX	0.12	22.0-25.0	12.0-14.0	0.75	0.70-1.00	0.5-2.5	1.00	0.04	0.03	-	0.75
E309Mo-XX	0.12	22.0-25.0	12.0-14.0	2.0-3.0	-	0.5-2.5	1.00	0.04	0.03	-	0.75
E309LMo-XX	0.04	22.0-25.0	12.0-14.0	2.0-3.0	-	0.5-2.5	1.00	0.04	0.03	-	0.75
E310-XX	0.08-0.20	25.0-28.0	20.0-22.5	0.75	-	1.0-2.5	0.75	0.03	0.03	-	0.75
E310H-XX	0.35-0.45	25.0-28.0	20.0-22.5	0.75	-	1.0-2.5	0.75	0.03	0.03	-	0.75
E310Cb-XX	0.12	25.0-28.0	20.0-22.0	0.75	0.70-1.00	1.0-2.5	0.75	0.03	0.03	-	0.75
E310Mo-XX	0.12	25.0-28.0	20.0-22.0	2.0-3.0	-	1.0-2.5	0.75	0.03	0.03	-	0.75
E312-XX	0.15	28.0-32.0	8.0-10.5	0.75	-	0.5-2.5	1.00	0.04	0.03	-	0.75
E316-XX	0.08	17.0-20.0	11.0-14.0	2.0-3.0	-	0.5-2.5	1.00	0.04	0.03	-	0.75
E316H-XX	0.04-0.08	17.0-20.0	11.0-14.0	2.0-3.0	-	0.5-2.5	1.00	0.04	0.03	-	0.75
E316L-XX	0.04	17.0-20.0	11.0-14.0	2.0-3.0	-	0.5-2.5	1.00	0.04	0.03	-	0.75
E317-XX	0.08	18.0-21.0	12.0-14.0	3.0-4.0	-	0.5-2.5	1.00	0.04	0.03	-	0.75
E317L-XX	0.04	18.0-21.0	12.0-14.0	3.0-4.0	-	0.5-2.5	1.00	0.04	0.03	-	0.75

AWS Classification^{SMAW}

SMAW

E318-XX	0.08	17.0-20.0	11.0-14.0	2.0-3.0	6 C,min to 1.00 max.	0.5-2.5	1.00	0.04	0.03	-	0.75
E320LR-XX	0.07	19.0-21.0	32.0-36.0	2.0-3.0	8 C,min to 1.00 max.	0.5-2.5	1.00	0.04	0.03	-	3.0-4.0
E320-XX	0.03	19.0-21.0	32.0-36.0	2.0-3.0	8 C,min to 0.40 max.	1.5-2.5	0.30	0.020	0.015	-	3.0-4.0
E330-XX	0.18-0.25	14.0-17.0	33.0-37.0	0.75	-	1.0-2.5	1.00	0.04	0.03	-	0.75
E330H-XX	0.35-0.45	14.0-17.0	33.0-37.0	0.75	-	1.0-2.5	1.00	0.04	0.03	-	0.75
E347-XX	0.08	18.0-21.0	9.0-11.0	0.75	6 C,min to 1.00 max	0.5-2.5	1.00	0.04	0.03	-	0.75
E349-XX	0.13	18.0-21.0	8.0-10.0	0.35- 0.65	0.75-1.20	0.5-2.5	1.00	0.04	0.03	-	0.75
E383-XX	0.03	26.5-29.0	30.0-33.0	3.2-4.2	-	0.5-2.5	0.90	0.02	0.02	-	0.6-1.5
E385-XX	0.03	19.5-21.5	24.0-26.0	4.2-5.2	-	1.0-2.5	0.90	0.03	0.02	-	1.2-2.0
E410-XX	0.12	11.0-13.5	0.7	0.75	-	1.0	0.90	0.04	0.03	-	0.75
E410NiMo-XX	0.06	11.0-12.5	4.0-5.0	0.40- 0.70	-	1.0	0.90	0.04	0.03	-	0.75
E430-XX	0.10	15.0-18.0	0.6	0.75	-	1.0	0.90	0.04	0.03	-	0.75
E502-XX	0.10	4.0-6.0	0.4	0.45- 0.65	-	1.0	0.90	0.04	0.03	-	0.75
E630-XX	0.05	16.00- 16.75	4.5-5.0	0.75	0.15-0.30	0.25-0.75	0.75	0.04	0.03	-	3.25- 4.00
E16-8 2-XX	0.10	14.5-16.5	7.5-9.5	1.0-2.0	-	0.5-2.5	0.60	0.03	0.03	-	0.75
E7Cr-XX	0.10	6.0-8.0	0.4	0.45- 0.65	-	1.0	0.90	0.04	0.03	-	0.75
E2209-XX	0.04	21.5-23.5	8.5-10.5	2.5-3.5	-	0.5-2.0	0.90	0.04	0.03	0.08-0.20	0.75
E2553-XX	0.06	24.0-27.0	6.5-8.5	2.9-3.9	-	0.5-1.5	1.0	0.04	0.03	0.10-0.25	1.5-2.5

Notes:

- Analysis shall be made for the elements for which specific values are shown in the table. If however, the presence of other elements is indicated in the course of routine analysis, further analysis shall be made to determine that the total these other elements, except iron, is not present in excess of 0.50 percent.
- Single values are maximum percentages.
- Classification suffix-XX may be - 15, -16, -17, -25 or -26
- Vanadium shall be 0.10 to 0.30 percent
- Titanium shall be 0.15 percent max.
- Tungsten shall be from 1.25 to 1.75 percent.

table 2 Mechanical Property Requirement of All-Weld Metal for Covered Electrodes

AWS Classification	Tensile strength. mi.		Elongation min. Percent	Heat Treatment
	ksi	MPa		
E209-XX	100	690	15	none
E219-XX	90	620	15	none
E240-XX	100	690	15	none
E307-XX	85	590	30	none
E308-XX	80	550	35	none
E308H-XX	80	550	35	none
E308L-XX	75	520	35	none
E308Mo-XX	80	550	35	none
E309-XX	80	550	35	none
E309L-XX	75	520	30	none
E309Cb-XX	80	550	30	none
E309Mo-XX	80	550	30	none
E309MoL-XX	75	520	30	none
E310-XX	80	550	30	none
E310H-XX	90	620	10	none
E310Cb-XX	80	550	25	none
E310Mo-XX	80	550	30	none
E312-XX	95	660	22	none
E316-XX	75	520	30	none
E316H-XX	75	520	30	none
E316L-XX	70	490	30	none
E317-XX	80	550	30	none
E317L-XX	75	520	30	none
E318-XX	80	550	25	none
E320-XX	80	550	30	none
E320LR-XX	75	520	30	none
E330-XX	75	520	25	none
E330H-XX	90	620	10	none
E347-XX	75	520	30	none
E349-XX	100	690	25	none
E383-XX	75	520	30	none
E385-XX	75	520	30	none
E410-XX	75	450	20	a
E410NiMo-XX	110	760	15	c
E430-XX	65	450	20	d
E502-XX	60	420	20	b
E505-XX	60	420	20	b
E630-XX	135	930	7	e
E16-8-2-XX	80	550	35	none
E7Cr-XX	60	420	20	b
E2209-XX	100	690	20	none
E2553-XX	110	760	15	none

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Notes:

- a. Heat to 1350 to 1400°F(730 to 760°C), hold for one hour, furnace cool at rate of 100°F(60°C)per hour to 600°F(315°C) and air cool to ambient.
- b. Heat to 1550 to 1600°F(840 to 870°C), hold for two hour, furnace cool at rate not exceeding 100°F(55°C)per hour to 1100°F(595°C) and air cool to ambient.
- c. Heat to 1100 to 1150°F(595 to 620°C), hold for one hour, and air cool to ambient.
- d. Heat to 1400 to 1450°F(760 to 790°C), hold for two hour, furnace cool at rate not exceeding 100°F(55°C)per hour to 1100°F(595°C) and air cool to ambient.
- e. Heat to 1875 to 1925°F(1025 to 1050°C), hold for one hour, and air cool to ambient, and than precipitation harden at 1135 to 1165°F(610 to 630°C), hold for four hours, and air cool to ambient.

3 AWS A 5.5

table 1 Composition Requirements of Covered electrodes for Low Alloy Steels

Electrode Classification	Chemical Composition, Percent								
	C	Mn	P	S	Si	Ni	Cr	Mo	V
Carbon-Molybdenum Steel Electrodes									
E7010-A1	0.12	0.60	0.03	0.03	0.40	...	...	0.40 to 0.65	...
E7011-A1		0.60			0.40				
E7015-A1		0.90			0.60				
E7016-A1		0.90			0.60				
E7018-A1		0.90			0.80				
E7020-A1		0.60			0.40				
E7027-A1		1.00			0.40				
Chromium-Molybdenum Steel Electrodes									
E8016-B1 E8018-B1	0.05 to 0.12	0.90	0.03	0.03	0.60 0.80	...	0.40 to 0.65	0.40 to 0.65	...
E7016-B2L	0.05	0.90	0.03	0.03	0.60	...	1.00 to 1.50	0.40 to 0.65	...
E8016-B2 E8018-B2	0.05 to 0.12	0.90	0.03	0.03	0.60	...	1.00 to 1.50	0.40 to 0.65	...
					1.00	...	2.00 to 2.50	0.90 to 1.20	...
E9015-B3 E9016-B3 E9018-B3	0.05 to 0.12	0.90	0.03	0.03	1.00 0.60 0.80	...	2.00 to 2.50	0.90 to 1.20	...
E8018-B3L					0.80	...	2.00 to 2.50	0.90 to 1.20	...
E8015-B3L					1.00	...	1.75 to 2.25	0.40 to 0.65	...
E8016-B5	0.07 to 0.15	0.04 to 0.70	0.03	0.03	0.30 to 0.60	...	0.40 to 0.60	1.00 to 1.25	0.05

Nickel Steel Electrodes									
E8016-C1 E8018-C1	0.12	1.25	0.03	0.03	0.60 0.80	2.00 to 2.75	...	...	...
E8016-C2 E8018-C2	0.12	1.25	0.03	0.03	0.60 0.80	3.00 to 3.75	...	...	...
E8016-C3 E8018-C3	0.12	0.04 to 1.25	0.03	0.03	0.80	0.80 to 1.10	0.15	0.35	0.05
Manganese-Molybdenum Steel Electrodes									
E8018-D1	0.12	1.00 to 1.75	0.03	0.03	0.80	...	...	0.25 to 0.45	...
E10015-D2 E10016-D2 E10018-D2	0.15	1.65 to 2.00	0.03	0.03	0.60 0.60 0.80	...	...	0.25 to 0.45	...
Other Low-Alloy Steel Electrodes									
EXX10-G EXX11-G EXX13-G EXX15-G EXX16-G EXX18-G E7020-G	...	1.00min	...	...	0.80min	0.50min.	0.30min.	0.20min.	0.10min.
E9018-M E10018-M E11018-M E12018-M	0.10 0.10 0.10 0.10	0.60 to 1.25 0.75 to 1.70 1.30 to 1.80 1.30 to 2.25	0.030 0.030 0.030 0.030	0.030 0.030 0.030 0.030	0.80 0.60 0.60 0.60	1.40 to 1.80 1.40 to 2.10 1.25 to 2.50 1.75 to 2.25	0.15 0.35 0.40 0.30 to 1.50	0.35 0.25 to 0.50 0.25 to 0.50 0.30 to 0.55	0.05 0.05 0.05 0.05

Note: Single values shown are Maximum percentage except where otherwise specified

table 2 Mechanical Property Requirements of All Weld Metal for Covered Electrodes for Low Alloy Steels

AWS Classification	Tensile Strength min. psi	Yield Strength at 0.2 Percent offset, psi	Elongation 2 inch, min, Percent
E7010-X	70,000	57,000	22
E7011-X			22
E7015-X			25
E7016-X			22
E7018-X			22
E7020-X			22
E7027-X	80,000	67,000	22
E8010-X			19
E8011-X			19
E8013-X			16
E8015-X			19
E8016-X			19
E8018-X			19
E8016-C3	80,000	68,000 to 80,000	24
E8018-C3			
E9010-X	90,000	77,000	17
E9011-X			17
E9013-X			14
E9015-X			17
E9016-X			17
E9018-X			17
E9018-M	90,000	78,000 to 110,000	24
E10010-X	100,000	87,000	16
E10011-X			16
E10013-X			13
E10015-X			16
E10016-X			16
E10018-X			16
E10018-M	100,000	88,000 to 90,000	20
E11051-X	110,000	97,000	15
E11016-X			
E11018-X			
E11081-M	110,000	98,000 to 110,000	20
E12015-X	120,000	107,000	14
E12016-X			
E12018-X			
E12018-M	120,000	108,000 to 120,000	18
E12018-M1			

table 3 Impact-Property Requirements of Covered Electrodes for Low Alloy Steels

AWS Classification	Minimum V-Notch Impact Requirement
E8018-NM E8016-C3 E8018-C3	20 ft·lb at -40°F ^b (27J at -40°C)
E8016-D3 E8018-D3 E8015-D1 E8018-D1 E10015-D2 E10016-D2 E10018-D2	20 ft·lb at -60°F ^b (27J at -51°C)
E7018-W1 E8018-W2	20 ft·lb at 0°F ^b (27J at -18°C)
E9018-M E10018-M E11018-M E12018-M	20 ft·lb at -60°F ^b (27J at -51°C)
E12018-M1	50 ft·lb at 0°F ^b (68J at -18°C)
E8016-C1 E8018-C1	20 ft·lb at -75°F ^b (27J at -59°C)
E7015-C1L E7016-C1L E7018-C1L E8016-C2 E8018-C2	20 ft·lb at -100°F ^b (27J at -73°C)
E7015-C2L E7016-C2L E7018-C2L	20 ft·lb at -150°F ^b (27J at -101°C)
All other classifications	Not required

- a. The extremely lowest value obtained together with the extremely highest value shall be disregarded for this test. Two of the three remaining values shall be greater than the specified 20 ft·lb energy level; one of the three may be lower but shall not be less than 15 ft·lb. The computed average value of the three remaining values shall be equal to, or greater than, the 20 ft·lb energy level
- b. As-welded impact properties.
- c. Stress-relieved properties.

SAW

1 AWS A 5.17

Specification for carbon steel electrodes and fluxes for Submerged Arc Welding

F S X X X – ECXXX – HX
① ② ③ ④ ⑤ ⑥ ⑦

- ① Indicates a submerged arc welding flux
- ② Indicates that the welding flux being classified is made solely from crushed slag or is a blend of Crushed slag with unused (virgin) flux. Omission of the “S” indicates that the flux being classified is virgin flux
- ③ Indicates the minimum tensile strength – See Table 2
- ④ Designates the condition of heat treatment in which the tests were conducted ; “A” for as Welded and “P” for postweld heat treated
- ⑤ Indicates a temperature in “°F” (For impact test) – See Table 3
- ⑥ Indicates classification of the electrode – Refer to Table 1
- ⑦ Optional supplemental diffusible hydrogen designator – See Table 4

table 1 Chemical Composition Requirements for Solid Electrodes

Electrode Classification	UNS Number	wt. percent						
		C	Mn	Si	S	P	Cu ⁽⁴⁾	Ti
Low-Manganese Electrodes								
EL8	K01008	0.10	0.25/0.60	0.07	0.030	0.030	0.35	-
EL8K	K01009	0.10	0.25/0.60	0.10/0.25	0.030	0.030	0.35	-
EL12	K01012	0.04/0.14	0.25/0.60	0.10	0.030	0.030	0.35	-
Medium-Manganese Electrodes								
EM11K	K01111	0.07/0.15	1.00/1.50	0.65/0.85	0.030	0.025	0.35	-
EM12	K01112	0.06/0.15	0.80/1.25	0.10	0.030	0.030	0.35	-
EM12K	K01113	0.05/0.15	0.80/1.25	0.10/0.35	0.030	0.030	0.35	-
EM13K	K01313	0.06/0.16	0.90/1.40	0.35/0.75	0.030	0.030	0.35	-
EM14K	K01314	0.06/0.19	0.90/1.40	0.35/0.75	0.025	0.025	0.35	0.03/0.17
EM15K	K01515	0.10/0.20	0.80/1.25	0.10/0.35	0.030	0.030	0.35	-
High-Manganese Electrodes								
EH10K	K01210	0.07/0.15	1.30/1.70	0.05/0.25	0.025	0.025	0.35	-
EH11K	K11140	0.07/0.15	1.40/1.85	0.80/1.15	0.030	0.030	0.35	-
EH12K	K01213	0.06/0.15	1.50/2.00	0.25/0.65	0.025	0.025	0.35	-
EH14	K11585	0.10/0.20	1.70/2.20	0.10	0.030	0.030	0.35	-
EG	Not-Specified							

table 2 A5.17 Tension Test Requirements

Flux-Electrode Classifications	Tensile Strength, psi	Yield Strength, psi	Elongations, %
F6XX-EXXX	60 000-80 000	48 000	22
F7XX-EXXX	70 000-95 000	58 000	22

table 3 A5.17 Impact Test Requirements

Digit	Maximum Test Temperature, °F	Minimum Test Average Energy Level
0	0	20 ft-lbf
2	-20	
4	-40	
5	-50	
6	-60	
8	-80	
Z	No impact requirements	

table 4 Diffusible Hydrogen Requirements

AWS Flux-Electrode Combination Classification	Optional Supplemental Diffusible Hydrogen Designation	Average Diffusible Hydrogen Maximum (mL/100g Deposited Metal)
All	H16	16.0
All	H8	8.0
All	H4	4.0
All	H2	2.0

2 AWS A 5.23

Specification for low alloy steel electrodes and fluxes for Submerged Arc Welding

F X X X - E C XXX N - XN
 ① ② ③ ④ ⑤ ⑥ ⑦ ⑧ ⑨

- ① Indicates flux
- ② Indicates the minimum tensile strength (in increments of 10,000 psi [69Mpa] of weld metal with the flux and some specific classification of electrode deposited according to the welding conditions specified herein ,Two digits are used for weld metal of 100,000 psi(690 Mpa) tensile strength and higher – See Table. 7 AWS A5. 23 - 97
- ③ Designates the condition of heat treatment in which the test were conducted: “A” for as-welded and “P” for postweld heat treated. The time and temperature of the PWHT are specified herein
- ④ Indicates the lowest temperature at which the impact strenght of the weld metal referred to above meets or exceeds 20 ft-lb(27J)

AWS Classification^{SAW}

SAW

- ⑤ Indicates electrode
- ⑥ Indicates composite electrode, Omission of the “C” indicates solid electrode
- ⑦ Classification of the electrode used in depositing the weld metal referred to above – See Table 1
- ⑧ The “N” is used only when footnote C to Tables 1 and 2 apply – See Appendix A 2,2 for explanation
- ⑨ Indicates the chemical composition of the weld metal. One or more letters or digits are used – See Table 2

Example

F9P0 - EB3 - B3 is a complete designation. It refers to a flux that will produce weld metal which, in the postweld heat - treated condition, will have a tensile strength no lower than 90,000 psi and Charpy V - notch impact strength of at least 20ft lb at 0°F when deposited with an EB3 electrode under the conditions called for in this specification/ The composition of the weld metal will be B3 (see Table 2)

table 1 Composition Requirements for Electrodes

Electrode Class.	Chemical Composition, Percent													Remarks
	C	Mn	Si	S	P	Cr	Ni	Mo	Cu	V	Al	Ti	Zr	
EL12	0.04/0.14	0.25/0.60	0.10	0.030	0.030	-	-	-	0.35	-	-	-	-	carbon
EM12K	0.05/0.15	0.80/1.25	0.10/0.35	0.030	0.030	-	-	-	0.35	-	-	-	-	steel
EA1	0.07/0.17	0.65/1.00	0.20	0.030	0.025	-	-	0.45/0.65	0.35	-	-	-	-	C-Mo
EA2	0.07/0.17	0.95/1.35	0.20	0.030	0.025	-	-	0.45/0.65	0.35	-	-	-	-	
EA3	0.07/0.17	1.65/2.20	0.20	0.030	0.025	-	-	0.45/0.65	0.35	-	-	-	-	steel
EA4	0.07/0.17	1.20/1.70	0.20	0.030	0.025	-	-	0.45/0.65	0.35	-	-	-	-	
EB2	0.07/0.15	0.45/1.00	0.05/0.30	0.030	0.025	1.00/1.75	-	0.45/0.65	0.35	-	-	-	-	
EB2H	0.28/0.33	0.45/0.80	0.55/0.75	0.015	0.015	1.00/1.50	-	0.10/0.65	0.30	0.20/0.30	-	-	-	Cr-Mo
EB3	0.05/0.15	0.40/0.80	0.05/0.30	0.025	0.025	2.25/3.00	-	0.90/1.10	0.35	-	-	-	-	
EB5	0.18/0.23	0.40/0.70	0.40/0.60	0.025	0.025	0.45/0.65	-	0.90/1.10	0.35	-	-	-	-	steel
EB6	0.10	0.35/0.70	0.05/0.60	0.025	0.025	4.50/6.00	-	0.45/0.70	0.35	-	-	-	-	
EB6H	0.25/0.40	0.75/1.00	0.25/0.50	0.030	0.025	4.80/6.00	-	0.45/0.65	0.35	-	-	-	-	
ENi1	0.12	0.75/1.25	0.05/0.30	0.020	0.020	0.15	0.75/1.25	0.30	0.35	-	-	-	-	Ni steel
ENi2	0.12	0.75/1.25	0.05/0.30	0.020	0.020	-	2.10/2.90	-	0.35	-	-	-	-	
ENi3	0.13	0.60/1.20	0.05/0.30	0.020	0.020	0.15	3.10/3.80	-	0.35	-	-	-	-	
ENi4	0.12/0.19	0.60/1.00	0.10/0.30	0.020	0.015	-	1.60/2.10	0.10/0.30	0.35	-	-	-	-	
EF1	0.07/0.15	0.90/1.70	0.15/0.35	0.025	0.025	-	0.95/1.60	0.25/0.55	0.35	-	-	-	-	
EF2	0.10/0.18	1.70/2.40	0.20	0.025	0.025	-	0.40/0.80	0.40/0.65	0.35	-	-	-	-	

EF3	0.10/0.18	1.70/2.40	0.30	0.025	0.025	-	0.70/1.10	0.40/0.65	0.35	-	-	-	-	
EF4	0.16/0.23	0.60/0.90	0.15/0.35	0.035	0.025	0.10/0.60	0.10/0.80	0.15/0.30	0.35	-	-	-	-	
EF5	0.10/0.17	1.70/2.20	0.20	0.010	0.010	0.25/0.50	2.30/2.80	0.45/0.65	0.50	-	-	-	-	Other low
EF6	0.07/0.15	1.45/1.90	0.10/0.30	0.015	0.015	0.20/0.55	1.75/2.25	0.40/0.65	0.25	-	-	-	-	alloy steel
EM2	0.10	1.25/1.80	0.20/0.60	0.010	0.010	0.30	1.40/2.10	0.25/0.55	0.25	0.05	0.10	0.10	0.10	
EM3	0.10	1.40/1.80	0.20/0.60	0.010	0.010	0.55	1.90/2.60	0.25/0.65	0.25	0.04	0.10	0.10	0.10	
EM4	0.10	1.40/1.80	0.20/0.60	0.010	0.010	0.60	2.00/2.80	0.30/0.65	0.25	0.03	0.10	0.10	0.10	
EW	0.12	0.35/0.65	0.20/0.35	0.040	0.030	0.50/0.80	0.40/0.80	-	0.30/0.80	-	-	-	-	
EG	-	-	-	-	-	-	-	-	-	-	-	-	-	

table 2 Chemical Composition Requirements for Solid Electrodes

Electrode Class.	Chemical Composition, Percent										Remarks
	C	Mn	Si	S	P	Cr	Ni	Mo	Cu	V,Ti,Zr	
A1	0.12	1.00	0.80	0.040	0.030	-	-	0.40/0.65	0.35	-	C-Mo steel
A2	0.12	1.40	0.80	0.040	0.030	-	-	0.40/0.65	0.35	-	
A3	0.15	2.10	0.80	0.040	0.030	-	-	0.40/0.65	0.35	-	
A4	0.15	1.60	0.80	0.040	0.030	-	-	0.40/0.65	0.35	-	
B2	0.15	1.20	0.80	0.010	0.030	1.00/1.50	-	0.40/0.65	0.35	-	Cr-Mo steel
B2H	0.10/0.25	1.20	0.80	0.040	0.030	1.00/1.50	-	0.40/0.65	0.35	0.30V	
B3	0.15	1.20	0.80	0.040	0.030	2.00/2.50	-	0.90/1.20	0.35	-	
B4	0.12	1.20	0.80	0.040	0.030	1.75/2.25	-	0.40/0.65	0.35	-	
B5	0.18	1.20	0.80	0.040	0.030	0.45/0.65	-	0.90/1.20	0.35	-	
B6	0.12	1.20	0.80	0.040	0.030	0.45/6.00	-	0.40/0.65	0.35	-	
B6H	0.10/0.25	1.20	0.80	0.040	0.030	0.45/6.00	-	0.40/0.65	0.35	-	
Ni1	0.12	1.60	0.80	0.030	0.030	0.15	0.75/1.10	0.35	0.35	0.05Ti	Ni steel
Ni2	0.12	1.60	0.80	0.030	0.030	-	2.00/2.90	-	0.35	-	
Ni3	0.12	1.60	0.80	0.030	0.030	0.15	2.80/3.80	-	0.35	-	
Ni4	0.14	1.60	0.80	0.030	0.030	-	1.40/2.10	0.35	0.35	-	
F1	0.12	0.70/1.50	0.80	0.040	0.030	0.15	0.90/1.70	0.55	0.35	-	Other low alloy steel
F2	0.17	1.25/2.25	0.80	0.040	0.030	-	0.40/0.80	0.40/0.65	0.35	-	
F3	0.17	1.25/2.25	0.80	0.040	0.030	-	0.70/1.10	0.40/0.65	0.35	-	
F4	0.17	1.60	0.80	0.040	0.030	0.60	0.40/0.80	0.25	0.35	0.03Ti	
F5	0.17	1.20/1.80	0.80	0.030	0.030	0.65	2.00/2.80	0.30/0.80	0.50	-	
F6	0.14	0.80/1.85	0.80	0.030	0.030	0.65	1.50/2.25	0.60	0.40	-	
M1	0.10	0.60/1.60	0.80	0.040	0.030	0.15	1.25/2.00	0.35	0.30	0.03Ti	
M2	0.10	0.90/1.80	0.80	0.040	0.030	0.35	1.40/2.10	0.25/0.65	0.30	0.03Ti	
M3	0.10	1.30/2.25	0.80	0.030	0.030	0.65	1.80/2.60	0.20/0.70	0.35	0.03Ti	
M4	0.10	0.50/1.60	0.80	0.040	0.030	0.80	2.00/2.80	0.30/0.80	0.30	0.03Ti	
W	0.12	0.50/1.60	0.80	0.040	0.030	0.45/0.70	0.40/0.80	-	0.30/0.75	-	
G	-	-	-	-	-	-	-	-	-	-	

table 3 Mechanical Property Requirements

AWS Classification	Tensile Strength (psi)	Yield Strength (psi)	Elongation (%)
F7XX-EXXX-X	70,000-95,000	≥58,000	≥22
F8XX-EXXX-X	80,000-100,000	≥68,000	≥20
F9XX-EXXX-X	90,000-110,000	≥78,000	≥17
F10XX-EXXX-X	100,000-120,000	≥88,000	≥16
F11XX-EXXX-X	110,000-130,000	≥98,000	≥15
F12XX-EXXX-X	120,000-140,000	≥108,000	≥14

table 4 Impact Strength Requirements

Digit	Impact Values (ft-lb)	Digit	Impact Values (ft-lb)
Z	-	6	≥20(-60°F)
0	≥20(0°F)	8	≥20(-80°F)
2	≥20(-20°F)	10	≥20(-100°F)
4	≥20(-40°F)	15	≥20(-150°F)
5	≥20(-50°F)		

table 5 Postweld Heat-treatment Temperature

Weld metal Classification	Postweld-Heat-Treatment-Temperature °F±25(°C±14)
F4, F5, F6	1050 (566)
M1, M2, M3, M4, W	1125 (607)
A1, A2, A3, A4, B1	
B2, B2H, B5, Ni1, Ni2	1150 (621)
Ni3, Ni4, F1, F2, F3	
B3, B4	1275 (691)
B6, B6H, B8	1375 (746)

GMAW

1 AWS A 5.18

Specification for carbon steel electrodes and rods for gas shielded arc welding

<u>E (ER)</u>	<u>XX</u>	<u>C(S)</u> -	<u>X</u>	<u>Y</u>	<u>HZ</u>
①	②	③	④	⑤	⑥

- ① Designates use as either an electrode or rod (ER), or use only as an electrode (E)
- ② Designates the minimum tensile strength
- ③ Indicates whether the filler metal is solid (S) or composite (C).
- ④ Indicates the chemical composition of a solid electrode or the chemical composition of the weld metal produced by a composite electrode. The use of the “GS” suffix designates filler metals intended for single pass applications only.
- ⑤ Indicates the type of shielding gas used for classification of composite electrodes.
- ⑥ Optional supplemental diffusible hydrogen designator.

table 1 Chemical composition requirements for solid electrodes and rods : refer to Table as below

AWS Classifications		UNS Number	Weight Percent												
A5.18	A5.18M		C	Mn	Si	S	P	Ni	Cr	Mo	V	Cu	Ti	Zr	Al
ER70S-2	ER48S-2	K10726	0.07	0.90 to 1.40	0.45 to 0.70	0.025	0.035	0.15	0.15	0.15	0.03	0.50	0.05 to 0.15	0.02 to 0.12	0.05 to 0.15
ER70S-3	ER48S-3	K11022	0.06 to 0.15	0.90 to 1.40	0.45 to 0.75	0.025	0.035	0.15	0.15	0.15	0.03	0.50	-	-	-
ER70S-4	ER48S-4	K11132	0.06 to 0.15	1.00 to 1.50	0.65 to 0.85	0.025	0.035	0.15	0.15	0.15	0.03	0.50	-	-	-
ER70S-6	ER48S-6	K11140	0.06 to 0.15	1.40 to 1.85	0.80 to 1.15	0.025	0.035	0.15	0.15	0.15	0.03	0.50	-	-	-
ER70S-7	ER48S-7	K11125	0.07 to 0.15	1.5 0to 2.00	0.505 to 0.85	0.025	0.035	0.15	0.15	0.15	0.03	0.50	-	-	-
ER70S-G	ER48S-G	-	Not specified												

table 2 Chemical composition requirements for weld metal from composite electrodes

AWS Classifications		UNS Number	Shielding Gas	Weight Percent									
A5.18	A5.18M			C	Mn	Si	S	P	Ni	Cr	Mo	V	Cu
Multiple Pass Classifications													
E70C-3X	E-48C-3X	W07703	75~80% Ar/Balance CO ₂ or CO ₂	0.12	1.75	0.90	0.03	0.03	0.50	0.20	0.30	0.08	0.50
E70C-6X	E-48C-6X	W07706	75~80% Ar/Balance CO ₂ or CO ₂	0.12	1.75	0.90	0.03	0.03	0.50	0.20	0.30	0.08	0.50
E70C-G(X)	E-48C-G(X)	-	f	Not specified									
Single Pass Classifications													
E70C-GS(X)	E-48C-GS(X)	-	f	Not specified									

AWS Classification^{GMAW}

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table 3 Tension test requirements (As welded)

AWS Classification		Shielding Gas	Tensile Strength (minimum)		Yields Strength (minimum)		Elongation Percent (minimum)
A5.18	A5.18M		psi	Mpa	psi	Mpa	
ER70S-2	ER48S-2	CO ₂	70,000	480	58,000	400	22
ER70S-3	ER48S-3						
ER70S-4	ER48S-4						
ER70S-6	ER48S-6						
ER70S-7	ER48S-7						
ER70S-G	ER48S-G	d	70,000	480	58,000	400	22
E70C-3X	E48C-3X	75-80% Ar/Balance CO ₂ or CO ₂	70,000	480	58,000	400	22
E70C-6X	E48C-6X						
E70C-G(X)	E48C-G(X)	d	70,000	480	58,000	400	22
E70C-GS(X)	E48C-GS(X)	d	70,000	480	Not specified		Not specified

table 4 Impact test requirements (As welded)

AWS Classification		Average Impact Strength (minimum)	
A5.18	A5.18M	A5.18	A5.18M
ER70S-2	ER48S-2	20ft-lbf at -20°F	27 J at -30°C
ER70S-3	ER48S-3	20ft-lbf at 0°F	27 J at -20°C
ER70S-4	ER48S-4	Not Required	Not Required
ER70S-6	ER48S-6	20ft-lbf at -20°F	27 J at -30°C
ER70S-7	ER48S-7	20ft-lbf at -20°F	27 J at -30°C
ER70S-G	ER48S-G	As agreed between supplier and purchasers	
E-70C-G(X)	E-48C-G(X)	As agreed between supplier and purchasers	
E-70C-3X	E-48C-3X	20ft-lbf at 0°F	27 J at -20°C
E-70C-6X	E-48C-6X	20ft-lbf at -20°F	27 J at -30°C
E-70C-GS(X)	E-48C-GS(X)	Not Required	Not Required

2 AWS A 5.28

Specification for low-alloy steel electrodes and rods for gas shielded arc welding

E(ER) XX X – X HZ
 ① ② ③ ④ ⑤

- ① Designates use as either electrode or rod (ER), or use only as an electrode (E)
- ② Tensile strength designator
- ③ Indicates whether the filler metal is solid (S) or composite stranded or metal cored (C)
- ④ Indicates the chemical composition of a solid electrode or the chemical composition of the weld metal produced by a composite electrode
- ⑤ Optional supplemental diffusible hydrogen designator

table 1 Chemical composition requirements for solid electrodes and rods

AWS Classifications		UNS Number	Weight Percent														Other Elements Total
A5.28	A5.28M		C	Mn	Si	P	S	Ni	Cr	Mo	V	Ti	Zr	Al	Cu		
Carbon-Molybdenum Steel Eelectrodes and Rods																	
ER70S-A1	ER49S-A1	K11235	0.12	1.30	0.30-0.70	0.025	0.025	0.20	-	0.40-0.65	-	-	-	-	0.35	0.50	
Chromium-Molybdenum Steel Electrodes and Rods																	
ER80S-B2	ER55S-B2	K20900	0.07-0.12	0.40-0.70	0.40-0.70	0.025	0.025	0.20	1.20-1.50	0.40-0.65	-	-	-	-	0.35	0.50	
ER70S-B2L	ER49S-B2L	K20500	0.05	0.40-0.70	0.40-0.70	0.025	0.025	0.20	1.20-1.50	0.40-0.65	-	-	-	-	0.35	0.50	
ER90S-B3	ER62S-B3	K30960	0.07-0.12	0.40-0.70	0.40-0.70	0.025	0.025	0.20	2.30-2.70	0.90-1.20	-	-	-	-	0.35	0.50	
ER80S-B3L	ER55S-B3L	K30560	0.05	0.40-0.70	0.40-0.70	0.025	0.025	0.20	2.30-2.70	0.90-1.20	-	-	-	-	0.35	0.50	
ER80S-B6	ER55S-B6	K50280	0.10	0.40-0.70	0.50	0.025	0.025	0.60	4.50-6.00	0.45-0.65	-	-	-	-	0.35	0.50	
ER80S-B8	ER55S-B8	K50480	0.10	0.40-0.70	0.50	0.025	0.025	0.50	8.00-10.50	0.80-1.20	-	-	-	-	0.35	0.50	
ER90S-B9	ER62S-B9	K50482	0.07-0.13	1.20	0.15-0.50	0.010	0.010	0.80	8.00-10.50	0.850-1.20	0.15-0.30	-	-	0.04	0.20	0.50	
Nickel Steel Electrodes and Rods																	
ER80S-Ni1	ER55S-Ni1	K11260	0.12	1.25	0.40-0.80	0.025	0.025	0.80-1.10	0.15	0.35	0.05	-	-	-	0.35	0.50	
ER80S-Ni2	ER55S-Ni2	K21240	0.12	1.25	0.40-0.80	0.025	0.025	2.00-2.75	-	-	-	-	-	-	0.35	0.50	
ER80S-Ni3	ER55S-Ni3	K31240	0.12	1.25	0.40-0.80	0.025	0.025	3.00-3.75	-	-	-	-	-	-	0.35	0.50	

AWS Classification^{GMAW}

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Manganese-Molybdenum Steel electrodes and Rods																
ER80S-D2	ER55S-D2	K10945	007-0.12	1.60-2.10	0.50-0.80	0.025	0.025	0.15	-	0.40-0.60	-	-	-	-	0.50	0.50
ER90S-D2	ER62S-D2															
Other Low-Alloy Steel Electrodes and Rods																
ER100S-1	ER69S-1	K10882	0.08	1.25-1.80	0.20-0.55	0.010	0.010	1.40-2.10	0.30	0.25-0.55	0.05	0.10	0.10	0.10	0.25	0.50
ER110S-1	ER76S-1	K21015	0.09	1.40-1.80	0.20-0.55	0.010	0.010	1.90-2.60	0.50	0.25-0.55	0.04	0.10	0.10	0.10	0.25	0.50
ER120S-1	ER83S-1	K21030	0.10	1.40-1.80	0.25-0.60	0.010	0.010	2.00-2.80	0.60	0.30-0.65	0.03	0.10	0.10	0.10	0.25	0.50
ERXXS-G	ERXXS-G	-	Not specified													

table 2 Chemical composition requirements for weld metal from composite electrodes

AWS Classifications		UNS Number	Weight Percent													
A5.28	A5.28M		C	Mn	Si	P	S	Ni	Cr	Mo	V	Ti	Zr	Al	Cu	Other Elements Total
Chromium-Molybdenum Weld Metal																
E80C-B2	E55C-B2	W52030	0.05-0.12	0.40-1.00	0.25-0.60	0.025	0.030	0.20	1.00-1.50	0.40-0.65	0.03	-	-	-	-	0.50
E70C-B2L	E49C-B2L	W52130	0.05	0.40-1.00	0.25-0.60	0.025	0.030	0.20	1.00-1.50	0.40-0.65	0.03	-	-	-	0.35	0.50
E90C-B3	E62C-B3	W53030	0.05-0.12	0.40-1.00	0.25-0.60	0.025	0.030	0.20	2.00-2.50	0.90-1.20	0.03	-	-	-	0.35	0.50
E80C-B3L	E55C-B3L	W53130	0.05	0.40-1.00	0.25-0.60	0.025	0.030	0.20	2.00-2.50	0.90-1.20	0.03	-	-	-	0.35	0.50
E80C-B6	E55C-B6		0.10	0.40-1.00	0.25-0.60	0.025	0.025	0.60	4.50-6.00	0.45-0.65	0.03	-	-	-	0.35	0.50
E80C-B8	E55C-B8		0.10	0.40-1.00	0.25-0.60	0.025	0.025	0.20	8.00-10.50	0.80-1.20	0.03	-	-	-	0.35	0.50
E80C-B9	E55C-B9		0.08-0.13	1.20	0.50	0.020	0.015	0.80	8.00-10.50	0.85-1.20	0.15-0.30	-	-	0.04	0.20	0.50
Nickel Steel Electrodes and Rods																
E80C-Ni1	E55C-Ni1	W21030	0.12	1.50	0.90	0.025	0.030	0.80-1.10	-	0.30	0.03	-	-	-	0.35	0.50
E70C-Ni2	E49C-Ni2	W22030	0.08	1.25	0.90	0.025	0.030	1.75-2.75	-	-	0.03	-	-	-	0.35	0.50
E80C-Ni2	E55C-Ni2	W22030	0.12	1.50	0.90	0.025	0.030	1.75-2.75	-	-	0.03	-	-	-	0.35	0.50
E80C-Ni3	E55C-Ni3	W23030	0.12	1.50	0.90	0.025	0.030	2.75-3.75	-	-	0.03	-	-	-	0.35	0.50

Manganese-Molybdenum Steel Electrodes and Rods																
E90C-D2	E62C-D2	W19230	0.12	1.00-1.90	0.90	0.025	0.030	-	-	0.40-0.60	0.03	-	-	-	0.35	0.50
Other Low-Alloy Steel Electrodes and Rods																
E90C-K3	E62C-K3		0.15	0.75-2.25	0.80	0.025	0.025	0.50-2.50	0.15	0.25-0.65	0.03	-	-	-	0.35	0.50
E100C-K3	E69C-K3		0.15	0.75-2.25	0.80	0.025	0.025	0.50-2.50	0.15	0.25-0.65	0.03	-	-	-	0.35	0.50
E110C-K3	E76C-K3		0.15	0.75-2.25	0.80	0.025	0.025	0.50-2.50	0.15	0.25-0.65	0.03	-	-	-	0.35	0.50
E110C-K4	E76C-K4		0.15	0.75-2.25	0.80	0.025	0.025	0.50-2.50	0.15-0.65	0.25-0.65	0.03	-	-	-	0.35	0.50
E120C-K4	E83C-K4		0.15	0.75-2.25	0.80	0.025	0.025	0.50-2.50	0.15-0.65	0.25-0.65	0.03	-	-	-	0.35	0.50
E80C-W2	E55C-W2		0.12	0.50-1.30	0.35-0.80	0.025	0.030	0.40-0.80	0.45-0.70	-	0.03	-	-	-	0.30-0.75	0.50
EXXC-G	EXXC-G	-	Not specified													

table 3 Tension test requirements

AWS Classification		Shielding Gas	Tensile Strength (minimum)		Yields Strength (minimum)		Elongation Percent (minimum)	Testing Condition
A5.28	A5.28M		psi	Mpa	psi	Mpa		
ER70S-B2L ER70C-B2L ER70S-A1	ER49S-B2L E49C-B2L ER49S-A1	Argon/1~5% O ₂ (Classes SG-AO-1 thru SG-AO-5)	75,000	515	58,000	400	19	PWHT
ER80S-B2 E80C-B2	ER55S-B2 E55C-B2		80,000	550	68,000	470	19	
ER80S-B3L E80C-B3L	ER55S-B3L E55S-B3L		80,000	550	68,000	470	17	
ER90S-B3 E90C-B3	ER62S-B3 E62C-B3		90,000	620	78,000	540	17	
ER80S-B6	ER55S-B6		80,000	550	68,000	470	17	
E80C-B6	E55C-B6		80,000	550	68,000	470	17	
ER80S-B8	ER55S-B8		80,000	550	68,000	470	17	
E80C-B8	E55C-B8		80,000	550	68,000	470	17	
ER90S-B9	ER62S-B9	Argon/5% CO ₂ (Class SG-AC-5)	90,000	620	60,000	410	16	
E90C-B9	E62C-B9	Argon/5~25% CO ₂ (Classes SG-AC-5 thru SG-AC-25)						

AWS Classification^{GMAW}

GMAW

ER70C-Ni2	E49C-Ni2	Argon/1~5% O ₂ (Classes SG-AO-1 thru SG-AO-5)	70,000	480	58,000	400	24	PWHT
ER80S-Ni1 E80C-Ni1	ER55S-Ni1 E55C-Ni1		80,000	550	68,000	470	24	As-Welded
ER80S-Ni2 E80C-Ni2 ER80S-Ni3 E80C-Ni3	ER55S-Ni2 E55C-Ni2 ER55S-Ni3 E55C-Ni3		80,000	550	68,000	470	24	PWHT
ER80S-D2	ER55S-D2	CO ₂ (Classes SG-C)	80,000	550	68,000	470	17	As-Welded
ER90S-D2 E90C-D2	ER62S-D2 E62C-D2	Argon/1~5% O ₂ (Classes SG-AO-1 thru SG-AO-5)	90,000	620	78,000	540	17	As-Welded
ER100S-1	ER69S-1	Argon/2% O ₂ (Class SG-AO-2)	100,000	690	88,000	610	16	As-Welded
ER110S-1	ER76S-1		110,000	760	95,000	660	15	
ER120S-1	ER83S-1		120,000	830	105,000	730	14	
E90C-K3	E62C-K3	Argon/5~25% CO ₂ (Classes SG-AC-5 thru SG-AC-25)	90,000	620	78,000	540	18	As-Welded
E100C-K3	E69C-K3		100,000	690	88,000	610	16	
E110C-K3 E110C-K4	E76C-K3 E76C-K4		110,000	710	98,000	680	15	
E120C-K4	E83C-K4		120,000	830	108,000	750	15	
E80C-W2	E55C-W2		80,000	550	68,000	470	22	
ER70S-G E70C-G		(d)	70,000	480	(e)	(e)	(e)	(e)
ER80S-G E80C-G		(d)	80,000	550	(e)	(e)	(e)	(e)
ER90S-G E90C-G		(d)	90,000	620	(e)	(e)	(e)	(e)
ER100S-G E100C-G		(d)	100,000	690	(e)	(e)	(e)	(e)
ER110S-G E110C-G		(d)	110,000	760	(e)	(e)	(e)	(e)
ER120S-G E120C-G		(d)	120,000	830	(e)	(e)	(e)	(e)

table 4 Impact test requirements

AWS Classification		Average Impact Energy Absorber ^{a,b} (minimum)		Testing Condition
A5.28	A5.28M	A5.28	A5.28M	
ER70S-A1	ER49S-A1	Not Required	Not Required	-
ER70S-B2L	ER49S-B2L			
E70C-B2L	E49C-B2L			
ER80S-B2	ER55S-B2			
E80C-B2	E55C-B2			
ER80S-B3L	ER55S-B3L			
E80C-B3L	E55S-B3L			
ER90S-B3	ER62S-B3			
E90C-B3	E62C-B3			
ER80S-B6	ER55S-B6			
E80C-B6	E55C-B6			
ER80S-B8	ER55S-B8			
E80C-B8	E55C-B8			
ER90S-B9	ER62S-B9			
E90C-B9	E62C-B9			
ER80S-Ni1	ER55S-Ni1	20ft-lbf at -50°F	27 J at -45°C	As-Welded
E80C-Ni1	E55C-Ni1	20ft-lbf at -80°F	27 J at -60°C	PWHT ^b
E70C-Ni2	E49C-Ni2			
ER80S-Ni2	ER55S-Ni2			
E80C-Ni2	E55C-Ni2	20ft-lbf at -100°F	27 J at -75°C	PWHT ^b
ER80S-Ni3	ER55S-Ni3			
E80C-Ni3	E55C-Ni3	20ft-lbf at -20°F	27 J at -30°C	As-Welded
ER80S-D2	ER55S-D2			
ER90S-D2	ER62S-D2			
E90C-D2	E62C-D2	50ft-lbf at -60°F	27 J at -50°C	As-Welded
ER100S-1	ER69S-1			
ER110S-1	ER76S-1			
ER120S-1	ER83S-1	20ft-lbf at -60°F	27 J at -50°C	As-Welded
E90C-K3	E62C-K3			
E100C-K3	E69C-K3			
E110C-K3	E76C-K3			
E110C-K4	E76C-K4			
E120C-K4	E83C-K4	20ft-lbf at -20°F	27 J at -30°C	As-Welded
E80C-W2	E55C-W2			
ERXXS-G	ERXXS-G	As agreed between supplier and purchasers	As agreed between supplier and purchasers	-
EXXC-G	EXXC-G			-

FCAW

1 AWS A 5.18

Specification for carbon steel electrodes for Flux Cored Arc Welding

<u>E</u>	<u>X</u>	<u>X</u>	<u>T</u>	–	<u>X</u>	<u>X</u>	–	<u>J</u>	<u>X</u>	<u>HX</u>
①	②	③	④		⑤	⑥		⑦	⑧	⑨

- ① Designates an electrode
- ② Tensile strength designator
- ③ Welding position designator (“0” is for flat and horizontal position only, “1” is for all positions)
- ④ This designator identifies the electrode as a flux cored electrode
- ⑤ Usability designator
- ⑥ Shielding gas designator
- ⑦ The letter “J” designates that the electrodes meet the requirements for improved toughness (27J at -40°C)
- ⑧ The letter “D” or “Q” when present in this position indicates that the weld metal will meet supplemental mechanical property requirements with welding done using low heat input and high heat input – See Table 2, 3
- ⑨ Optional supplemental diffusible hydrogen designator – See Table 1

table 1 Optional hydrogen limits for weld metal^a

Optional Supplemental Diffusible Hydrogen Designator	Average Diffusible Hydrogen Max. mL/100g Deposited Metal
H16	16.0
H8	8.0
H4	4.0

table 2 Procedure requirements for “D” and “Q” optional supplemental designators

Optional Supplemental Designator	Procedure Heat Input (Fast or Slow Cooling Rate)	Preheat Temperature °F(°C)	Interpass Temperature °F(°C)	Heat Input Requirement for Any Single Pass	Required Average Heat Input for All Passes
D	Low (Fast cooling rate)	70° ± 25°F [20° ± 15°C]	200° ± 25°F [90° ± 15°C]	For electrode dimaters < 3/32 in. [2.4mm]	
				33 kJ/in. [1.3 kJ/mm] maximum	30 + 2, -5 kJ/in. [1.2 + 0.1, -0.2 kJ/mm]
				For electrode dimaters < 3/32 in. [2.4mm]	
				44 kJ/in. [1.7 kJ/mm] minimum	40 + 2, -5 kJ/in. [1.6 + 0.1, -0.2 kJ/mm]

Q	High (Slow cooling rate)	300° ± 25°F [150° ± 15°C]	500° ± 50°F [260° ± 25°C]	75 kJ/in. [3.0 kJ/mm] minimum	80 + 5, -2 kJ/in. [3.1 + 0.2, -0.1 kJ/mm]
	Low (Fast cooling rate)	70° ± 25°F [20° ± 15°C]	150°F max. [65°C max.]	33 kJ/in. [1.3 kJ/mm] minimum	30 + 2, -5 kJ/in. [1.2 + 0.1, -0.2 kJ/mm]
	High (Slow cooling rate)	300° ± 25°F [150° ± 15°C]	300° ± 25°F [150° ± 15°C]	60 kJ/in. [2.4 kJ/mm] minimum	70 + 5, -2 kJ/in. [2.8 + 0.2, -0.1 kJ/mm]

table 3 Mechanical property requirements for “D” and “Q” optional supplemental designators

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

2 AWS A 5.29

Specification for low-alloy steel electrodes for Flux Cored Arc Welding

E X X T X – X X – J HX
 ① ② ③ ④ ⑤ ⑥ ⑦ ⑧ ⑨

- ① Designates an electrode
- ② Tensile strength designator – See Table 1
- ③ Welding position designator (“0” is for flat and horizontal position only, “1” is for all positions)
- ④ This designator identifies the electrode as a flux cored electrode
- ⑤ Usability designator
- ⑥ Deposit composition designator - See Table 2
- ⑦ Shielding gas designator
- ⑧ The letter “J” designates that the electrodes meet the requirements for improved toughness (27J at -40°C)
- ⑨ Optional supplemental diffusible hydrogen designator – See Table 3

table 1 A5.29 Mechanical property requirements

AWS Classification(s)	Condition	Tensile Strength (ksi)	Yield Strength (ksi)	Elongation Minimum (%)	Charpy V-Notch Impact Energy Minimum
E8XT1-K2C, -K2M E8XT5-K2C, -K3M	AW	80-100	68 min.	19	20 ft-lbf @-20°F
E9XT1-K2C, -K4M	AW	90-110	78 min.	17	20 ft-lbf @0°F
E9XT5-K2C, -K5M	AW	90-110	78 min.	17	20 ft-lbf @-60°F
E10XT1-K3C, -K3M	AW	100-120	88 min.	16	20 ft-lbf @0°F
E10XT5-K3C, -K4M	AW	100-120	88 min.	16	20 ft-lbf @-60°F
E11XT1-K3C, -K3M	AW	110-130	98 min.	15	20 ft-lbf @0°F
E11XT5-K3C, -K4M	AW	110-130	98 min.	15	20 ft-lbf @-60°F
E11XT1-K4C, -K4M	AW	110-130	98 min.	15	20 ft-lbf @0°F
E11XT5-K4C, -K4M	AW	110-130	98 min.	15	20 ft-lbf @-60°F
E12XT5-K4C, -K4M	AW	120-140	108 min.	14	20 ft-lbf @-60°F
E12XT1-K5C, -K5M	AW	120-140	108 min.	14	Not-specified
E7XT5-K6C, -K6M	AW	70-90	58 min.	20	20 ft-lbf @-75°F
E6XT8-K6	AW	60-80	50 min.	22	20 ft-lbf @-20°F
E7XT8-K6	AW	70-90	58 min.	20	20 ft-lbf @-20°F
E10XT1-K7C, -K7M	AW	100-120	88 min.	16	20 ft-lbf @-60°F
E9XT8-K8	AW	90-110	78 min.	17	20 ft-lbf @-20°F
E10XT1-K9C, -K9M	AW	100-120	82-97	18	35 ft-lbf @-60°F
E8XT1-W2C, -W2M	AW	80-100	68 min.	19	20 ft-lbf @-20°F
EXXTX-G,-GC,-GM	The weld deposit composition, condition of test (AW or PWHT) and Charpy V-Notch impact properties are as agreed upon between the supplier and purchaser. Requirements for the tension test, positionality, slag system and shielding gas, if any, conform to those indicated by the digits used.				
EXXTX-X	The slag system, shielding gas, if any, condition of test (AW or PWHT) and Charpy V-Notch impact properties are as agreed upon between the supplier and purchaser. Requirements for the tension test, positionality and weld deposit composition conform to those indicated by the digits used.				
EXXTG-G	The slag system, shielding, if any, condition of test (AW or PWHT) and Charpy V-Notch impact properties and weld deposit composition are as agreed upon between the supplier and purchaser. Requirements for the tension test and positionality conform to those indicated by the digits used.				

table 2 Weld metal chemical composition requirements for classification to AWS A5.29/A5.29M (cont'd)

Weld Metal Designation	UNS Number	Weight Percent											
		C	Mn	P	S	Si	Ni	Cr	Mo	V	Al	Cu	Other
Other Low-Alloy Steel Electrodes													
K1	W2113X	0.15	0.80~1.40	0.030	0.030	0.80	0.80~1.10	0.15	0.20~0.65	0.05	-	-	-
K2	W2123X	0.15	0.50~1.75	0.030	0.030	0.80	1.00~2.00	0.15	0.35	0.05	1.8	-	-
K3	W2133X	0.15	0.75~2.25	0.030	0.030	0.80	1.25~2.60	0.15	0.25~0.65	0.05	-	-	-
K4	W2233X	0.15	1.20~2.25	0.030	0.030	0.80	1.75~2.60	0.20~0.60	0.20~0.65	0.03	-	-	-
K5	W2162X	0.10~0.25	0.60~1.60	0.030	0.030	0.80	0.75~2.00	0.20~0.70	0.15~0.55	0.05	-	-	-
K6	W2104X	0.15	0.50~1.50	0.030	0.030	0.80	0.40~1.00	0.20	0.15	0.05	1.8	-	-
K7	W2205X	0.15	1.00~1.75	0.030	0.030	0.80	2.00~2.75	-	-	-	-	-	-
K8	W2143X	0.15	1.00~2.00	0.030	0.030	0.40	0.50~1.50	0.20	0.20	0.05	1.8	-	-
K9	W23230	0.07	0.50~1.50	0.015	0.015	0.60	1.30~3.75	0.20	0.50	0.05	-	0.06	-
W2	W2013X	0.12	0.50~1.30	0.030	0.030	0.35~0.80	0.40~0.80	0.45~0.70	-	-	-	0.30~0.75	-
G	-	-	0.50	0.030	0.030	1.00	0.50	0.30	0.20	0.10	1.8	-	-

table 3 Diffusible hydrogen limits for weld metal

Optional Supplemental Diffusible Hydrogen Designator	Average Diffusible Hydrogen Max. mL/100g Deposited Metal
H16	16.0
H8	8.0
H4	4.0

3 AWS A5.36

Specification for carbon steel electrodes for Flux Cored Arc Welding

E X X TX – X X X – X – X HX
① ② ③ ④ ⑤ ⑥ ⑦ ⑧ ⑨ ⑩

- ① Designates an electrode
- ② Tensile strength designator
- ③ Position dsignator ("0" is for flat and horizontal position only, "1" is for all positions)
- ④ Usability designator
- ⑤ Shielding gas designator
- ⑥ Designates the condition of heat treatment
("A" is for as-welded, "P" is for postweld heat treatment)
- ⑦ Impact designator (This indicates the temperature in °F)
- ⑧ Deposit composition designator
- ⑨ The letter "D" or "Q" when present in this position indicates that the weld metal will meet supplemental mechanical property requirements with welding done using how heat input and high heat input - See Table 2, 3
- ⑩ Optional supplemental diffusible hydrogen designator - See Table 1

table 1 Optional hydrogen limits for weld metal^a

Optional Supplemental Diffusible Hydrogen Designator	Average Diffusible Hydrogen Max. mL/100g Deposited Metal
H16	16.0
H8	8.0
H4	4.0

table 2 Procedure requirements for “D” and “Q” optional supplemental designators

Optional Supplemental Designator	Procedure Heat Input (Fast or Slow Cooling Rate)	Preheat Temperature °F(°C)	Interpass Temperature °F(°C)	Heat Input Requirement for Any Single Pass	Required Average Heat Input for All Passes
D	Low (Fast cooling rate)	70° ± 25°F [20° ± 15°C]	200° ± 25°F [90° ± 15°C]	For electrode diameters < 3/32 in. [2.4mm]	
				33 kJ/in. [1.3 kJ/mm] maximum	30 + 2, -5 kJ/in. [1.2 + 0.1, -0.2 kJ/mm]
				For electrode diameters < 3/32 in. [2.4mm]	
				44 kJ/in. [1.7 kJ/mm] minimum	40 + 2, -5 kJ/in. [1.6 + 0.1, -0.2 kJ/mm]
Q	High (Slow cooling rate)	300° ± 25°F [150° ± 15°C]	500° ± 50°F [260° ± 25°C]	75 kJ/in. [3.0 kJ/mm] minimum	80 + 5, -2 kJ/in. [3.1 + 0.2, -0.1 kJ/mm]
	Low (Fast cooling rate)	70° ± 25°F [20° ± 15°C]	150°F max. [65°C max.]	33 kJ/in. [1.3 kJ/mm] minimum	30 + 2, -5 kJ/in. [1.2 + 0.1, -0.2 kJ/mm]
	High (Slow cooling rate)	300° ± 25°F [150° ± 15°C]	300° ± 25°F [150° ± 15°C]	60 kJ/in. [2.4 kJ/mm] minimum	70 + 5, -2 kJ/in. [2.8 + 0.2, -0.1 kJ/mm]

table 3 Mechanical property requirements for “D” and “Q” optional supplemental designators

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

EN/ISO Classification

1 EN 10204 : Metallic products – Type of inspection documents

General

1. This document specifies the different types of inspection documents supplied to the purchaser, in accordance with the requirements of the order, for the delivery of all metallic products e.g. plates, sheets, bars, forgings, castings, whatever their method of production
2. This document may also apply to non-metallic products
3. This document is used in conjunction with the product specifications which specify the technical delivery conditions of the products.

EN 10204 Reference	Designation of the document type	Document content	Document Validated by
Type 2.1	Declaration of Compliance with the order	Statement of Compliance with the order	The manufacturer
Type 2.2	Test report	Statement of Compliance with the order, With Indication of results of non-specific inspection	The manufacturer
Type 3.1	Inspection Certificate 3.1	Statement of compliance with the order, with Indication of results of Specific inspection	The manufacturer's authorized inspection representative independent of the manufacturing department
Type 3.2	Inspection Certificate 3.2	Statement of compliance with the order, with indication of results of specific inspection	The manufacturer's authorized inspection representative independent of the manufacturing department and either the purchaser's authorized inspection representative or the inspector designated by the official regulations

2 EN ISO 2560 : 2005

Welding consumables – Covered electrodes for manual metal arc welding of non-alloy and Fine grain steels – Classification

ISO 2560 – A – E 46 3 1Ni B 5 4 H5
 ① ② ③ ④ ⑤ ⑥ ⑦ ⑧

- ① Covered electrode/manual metal arc welding
- ② Strength and elongation – See Table 4
- ③ Impact properties – See Table 5

- ④ Chemical composition of all-weld metal – See Table 3
- ⑤ Type of electrode covering – See table 1
- ⑥ Nominal electrode efficiency and type of current
- ⑦ Welding position – See Table 2
- ⑧ Hydrogen content – See Table 6

table 1

Symbol	Type of covering
A	Acid covering
C	Cellulosic covering
B	Basic covering
R	Rutile covering
⋮	⋮

table 3

Symbol	Chemical composition		
	Mn	Mo	Ni
No Symbol	2.0	-	-
Mo	1.4	0.3~0.6	-
MnMo	1.4~2.0	0.3~0.6	-
1Ni	1.4	-	0.6~1.2

table 2

Symbol	Welding position
1	PA, PB, PC, PD, PE, PF & PG
2	PA, PB, PC, PD, PE & PF
3	PA & PB
4	PA
5	PA, PB & PG

PA = Flat position

PB = Horizontal vertical position

PC = Horizontal position

PD = Horizontal overhead position

PE = Overhead position

PF = Vertical up position

PG = Vertical down position

table 4

Symbol	Minimum Yield strength (MPa)	Tensile Strength (MPa)	Minimum Elongation (%)
35	355	440~570	22
38	380	470~600	20
42	420	500~640	20
46	460	530~680	20
50	500	560~720	18

table 5

Symbol	Test temperature (°C)
0	0
2	-20
3	-30
4	-40
5	-50
⋮	⋮

table 6

Symbol	Hydrogen content (ml/100g)
H5	5
H10	10
H15	15

EN/ISO Classification

3 EN ISO 17632 : 2008

Welding consumables – Tubular cored electrodes for gas shielded and non-gas shielded metal arc welding of non-alloy and fine grain steels – classification

ISO 17632 – A – T 46 3 1Ni B M 1 H5
 ① ② ③ ④ ⑤ ⑥ ⑦ ⑧

- ① Indicates a tubular cored electrode/metal arc welding
- ② Represents the tensile properties – See Table 2
- ③ Indicates impact properties of 47J, minimum – See Table 3
- ④ Chemical composition of all-weld metal – See Table 1
- ⑤ Type of electrode core – See Table 6
- ⑥ Shielding gas
- ⑦ Welding position – See Table 4
- ⑧ Hydrogen content – See Table 5

table 1

Composition Designation	Chemical composition (%)											
	C	Mn	Si	P	S	Cr	Ni	Mo	V	Nb	Al	Cu
No Symbol	-	2.0	-	-	-	0.2	0.5	0.2	0.08	0.05	2.0	0.3
Mo	-	1.4	-	-	-	0.2	0.5	0.3-0.6	0.08	0.05	2.0	0.3
MnMo	-	1.4-2.0	-	-	-	0.2	0.5	0.3-0.6	0.08	0.05	2.0	0.3
1Ni	-	1.4	0.80	-	-	0.2	0.6-1.2	0.2	0.08	0.05	2.0	0.3
1.5Ni	-	1.6	-	-	-	0.2	1.2-1.8	0.2	0.08	0.05	2.0	0.3
2Ni	-	1.4	-	-	-	0.2	1.8-2.6	0.2	0.08	0.05	2.0	0.3
3Ni	-	1.4	-	-	-	0.2	2.6-3.8	0.2	0.08	0.05	2.0	0.3
⋮												

table 2

Symbol	Minimum Yield strength (MPa)	Tensile Strength (MPa)	Minimum Elongation (%)
35	355	440-570	22
38	380	470-600	20
42	420	500-640	20
46	460	530-680	20
50	500	560-720	18

table 3

Symbol	Test temperature (°C)
0	0
2	-20
3	-30
4	-40
5	-50
⋮	⋮

table 5

Symbol	Hydrogen content (ml/100g)
H5	5
H10	10
H15	15

table 6

Symbol	Characteristics	Type of weld
R	Rutile, Slow freezing slag	Single, multiple pass
P	Rutile, Fast freezing slag	Single, multiple pass
B	Basic	Single, multiple pass
M	Metal powder	Single, multiple pass
⋮	⋮	⋮

table 4

Symbol	Welding position
1	PA, PB, PC, PD, PE, PF & PG
2	PA, PB, PC, PD, PE & PF
3	PA & PB
4	PA
5	PA, PB & PG

PA = Flat position

PB = Horizontal vertical position

PC = Horizontal position

PD = Horizontal overhead position

PE = Overhead position

PF = Vertical up position

PG = Vertical down position

EN/ISO Classification

4 EN ISO 14341 : 2011

Welding consumables – Wire electrodes and weld deposits for gas shielded metal arc welding of non alloy and fine grain steels – Classification

ISO 14341 – A – G 46 5 M21 3Si1
 ① ② ③ ④ ⑤

- ① Designates a wire electrode and/or deposit produced by gas shielded metal arc welding
- ② Strength and elongation – See Table 2
- ③ Impact properties – See Table 3
- ④ Shielding gas
- ⑤ Chemical composition of the wire electrode – See Table 1

table 1

Composition Designation	Chemical composition (%)											
	C	Si	Mn	P	S	Ni	Cr	Mo	V	Cu	Al	Ti+Zr
2Si	0.06~0.14	0.50~0.80	0.90~1.30	0.025	0.025	0.15	0.15	0.15	0.03	0.35	0.02	0.15
3Si1	0.06~0.14	0.70~1.00	1.30~1.60	0.025	0.025	0.15	0.15	0.15	0.03	0.35	0.02	0.15
3Si2	0.06~0.14	1.00~1.30	1.30~1.60	0.025	0.025	0.15	0.15	0.15	0.03	0.35	0.02	0.15
4Si1	0.06~0.14	0.80~1.20	1.60~1.90	0.025	0.025	0.15	0.15	0.15	0.03	0.35	0.02	0.15
2Ti	0.04~0.14	0.40~0.80	0.90~1.40	0.025	0.025	0.15	0.15	0.15	0.03	0.35	0.05~0.20	0.05~0.25
2Al	0.08~0.14	0.30~0.50	0.90~1.30	0.025	0.025	0.15	0.15	0.15	0.03	0.35	0.35~0.75	0.15
3Ni1	0.06~0.14	0.50~0.90	1.00~1.60	0.020	0.020	0.80~1.50	0.15	0.15	0.03	0.35	0.02	0.15
⋮												

table 2

Symbol	Minimum Yield strength (MPa)	Tensile Strength (MPa)	Minimum Elongation (%)
35	355	440~570	22
38	380	470~600	20
42	420	500~640	20
46	460	530~680	20
50	500	560~720	18

table 3

Symbol	Test temperature (°C)
0	0
2	-20
3	-30
4	-40
5	-50
⋮	⋮

5 EN ISO 14171 : 2011

Welding consumables – Solid wire electrodes, tubular cored electrodes and electrode/flux
Combinations for submerged arc welding of non alloy and fine grain steels - Classification

ISO 14171 – A – S 46 3 AB S2
 ① ② ③ ④ ⑤

- ① Electrode/flux combination for submerged arc welding
- ② Indicates the tensile properties – See Table 2
- ③ Indicates the impact properties – See Table 3
- ④ Type of welding flux (Refer to EN 14174)
- ⑤ Chemical composition of the wire electrode – See Table 1

table 1

Composition Designation	Chemical composition (%)								
	C	Si	Mn	P	S	Mo	Ni	Cr	Cu
S1	0.05-0.15	0.15	0.35-0.60	0.025	0.025	0.15	0.15	0.15	0.30
S2	0.07-0.15	0.15	0.80-1.30	0.025	0.025	0.15	0.15	0.15	0.30
S3	0.07-0.15	0.15	1.30-1.75	0.025	0.025	0.15	0.15	0.15	0.30
S4	0.07-0.15	0.15	1.75-2.25	0.025	0.025	0.15	0.15	0.15	0.30
S1Si1	0.07-0.15	0.15-0.40	0.35-0.60	0.025	0.025	0.15	0.15	0.15	0.30
S2Si1	0.07-0.15	0.15-0.40	0.80-1.30	0.025	0.025	0.15	0.15	0.15	0.30
S2Si2	0.07-0.15	0.40-0.60	0.80-1.30	0.025	0.025	0.15	0.15	0.15	0.30
⋮	⋮	⋮	⋮	⋮	⋮	⋮	⋮	⋮	⋮

table 2

Symbol	Minimum Yield strength (MPa)	Tensile Strength (MPa)	Minimum Elongation (%)
35	355	440-570	22
38	380	470-600	20
42	420	500-640	20
46	460	530-680	20
50	500	560-720	18

table 3

Symbol	Test temperature (°C)
0	0
2	-20
3	-30
4	-40
5	-50
⋮	⋮

Type Approvals

1 Flux covered arc welding rods for mild and high tensile steel

Approvals	Steel type	Yield point (N/mm ²)	Tensile strength (N/mm ²)	EL (%)	Impact value			Hydrogen contents (ml/100gr)
					Grade	°C	J	
KR	Mild steel	≥305	400~560	≥22	RMW1 RMW2 RMW3	20 0 -20	≥47(≥34)	Glycerin method ≤0.10H ≤0.05HH Mercury method ≤0.15H 0.08HH
	YP32,38 High tensile steel	≥375	490~660	≥22	RMW52 RMW53	0 -20	≥47(≥34)	
	YP50 High tensile steel	≥490	570~730	≥20	RMW61 RMW62 RMW63	0 -20 -30	≥47(≥34)	
ABS	Mild steel	≥305	400~655		1 2 3	20 0 -20 or -10	≥47(≥34) or ≥61	Glycerin method ≤0.10H ≤0.05H Mercury method ≤0.16H ≤0.08HH
	YP32,38 High tensile steel	≥370	490~655		1Y 2Y 3Y	20 or 0 0 or -20 -20 or -40	≥54(≥34) or ≥27	
LR	Mild steel	≥305	400~560		1 2 3	20 0 -20	≥47(≥34)	Glycerin method ≥0.1H Mercury method ≥0.15H
	YP32,38 High tensile steel	≥375	460~660		2Y 3Y	0 -20		
BV	Mild steel	≥305	400~560		1 2 3	20 0 -20	≥47(≥34)	Glycerin method ≤0.1H ≤0.05HH Mercury method ≤0.15H 0.08HH ≤0.05HH
	YP32,38 High tensile steel	≥375	490~660		2Y 3Y	0 -20		
DNV	Mild steel	≥305	400~560		1 2 3	20 0 -20	≥47(≥34)	Glycerin method ≤0.1H15 ≤0.05H10 Mercury method ≤0.15H15 ≤0.10H10 ≤0.05H5
	YP32,38 High tensile steel	≥375	490~660		2Y 3Y 4Y 5Y	0 -20 -40 -60		
	YP40 High tensile steel	≥400	510~690		2Y40 3Y40 4Y40	0 -20 -40	≥47(≥41)	
NK	Mild steel	≥305	400~560	≥22	KMW1 KMW2 KMW3	20 0 -20	≥47(≥34)	Glycerin method ≤0.1H15 ≤0.05H10 Mercury method ≤0.15H15 ≤0.10HH10
	YP32,38 High tensile steel	≥375	490~660		KMW52 KMW53 KMW54	0 -20 -40		
	YP40 High tensile steel	≥400	510~690		KMW52Y40 KMW53Y40 KMW54Y40	0 -20 -40	≥47(≥41)	

Remark: () value in impact value blank appears regulated value for butt welding

2 Mild steel and high-tensile steel arc welding material

Approvals	Steel type	Yield point (N/mm ²)	Tensile strength (N/mm ²)	EL (%)	Impact value		
					Grade	°C	J
KR	Mild steel	≥305	400~560	≥22	RMW1 RMW2 RMW3	20 0 -20	≥47(≥34)
	YP32,38 High tensile steel	≥375	490~660		RMW52 RMW53	0 -20	
	YP50 High tensile steel	≥490	570~730	≥20	RMW61 RMW62 RMW63	0 -20 -30	
ABS	Mild steel	≥305	400~655	≥22	1 2 3	20 0 -20 or -10	≥47(≥34) or ≥61
	YP32,38 High tensile steel	≥370	490~655		1Y 2Y 3Y	20 or 0 0 or -20 -20 or -40	≥54(≥34) or ≥27
LR	Mild steel	≥305	400~560		1 2 3	20 0 -20	≥47(≥34)
	YP32,38 High tensile steel	≥375	460~660		1Y 2Y 3Y	20 0 -20	
BV	Mild steel	≥305	400~560		1 2 3	20 0 -20	≥47(≥34)
	YP32,38 High tensile steel	≥375	490~660		1Y 2Y 3Y	20 0 -20	
DNV	Mild steel	≥305	400~560		I II III	20 0 -20	≥47(≥34)
	YP32,38 High tensile steel	≥375	490~660		IY IIY IIY IVY VY	20 0 -20 -40 -60	
	YP40 High tensile steel	≥400	510~690		IIY40 IIY40 IVY40	0 -20 -40	≥47(≥41)
NK	Mild steel	≥305	400~560		KMW1 KMW2 KMW3	20 0 -20	≥47(≥34)
	YP32,38 High tensile steel	≥375	490~660		KMW52 KMW53 KMW54	0 -20 -40	
	YP40 High tensile steel	≥400	510~690		KMW52Y40 KMW53Y40 KMW54Y40	0 -20 -40	≥47(≥41)

Remark: () value in impact value blank appears regulated value for butt vertical welding

SMW

SAW

GMW

GTAW

FCW

Non-FERROUS

APPENDIX

Type Approvals

3 Mild steel and high-tensile sub merged arc welding material

Approvals	Steel type	Yield point (N/mm ²)	Tensile strength (N/mm ²)	EL (%)	Impact value		
					Grade	°C	J
KR	Mild steel	≥305	400~560	≥22	RMW1 RMW2 RMW3	20 0 -20	≥34
	YP32,38 High tensile steel	≥375	490~660	≥22	RMW52 RMW53	0 -20	
	YP50 High tensile steel	≥490	570~730	≥20	RMW61 RMW62 RMW63	0 -20 -30	
ABS	Mild steel	≥305	400~655	≥22	1 2 3	20 0 -20 or -10	≥34 or ≥27
	YP32,38 High tensile steel	≥370	490~655		1Y 2Y 3Y	20 or 0 0 or -20 -20 or -30	≥40 or ≥27
LR	Mild steel	≥305	400~560		1 2 3	20 0 -20	≥34
	YP32,38 High tensile steel	≥375	460~660		1Y 2Y 3Y		
BV	Mild steel	≥305	400~560		1 2 3	20 0 -20	≥34
	YP32,38 High tensile steel	≥375	490~660		1Y 2Y 3Y	20 0 -20	
DNV	Mild steel	≥305	400~560		I II III	20 0 -20	≥34
	YP32,38 High tensile steel	≥375	490~660		IY IIY IIY IVY VY	20 0 -20 -40 -60	
	YP40 High tensile steel	≥400	510~690		IIY40 IIY40 IVY40	0 -20 -40	≥41
NK	Mild steel	≥305	400~560		KMW1 KMW2 KMW3	20 0 -20	≥34
	YP32,38 High tensile steel	≥375	490~660		KMW52 KMW53 KMW54	0 -20 -40	
	YP40 High tensile steel	≥400	510~690		KMW52Y40 KMW53Y40 KMW54Y40	0 -20 -40	≥41

Remark: () value in impact value blank appears regulated value for butt vertical welding

4 Low Temperature Arc Electrode, Gas Shield Arc Welding Materials and Sub Merged Arc Welding Material

Approvals	Steel type	Yield point (N/mm²)	Tensile strength (N/mm²)	EL (%)	Impact value		
					Grade	°C	J
KR	Low temperature steel	≥305	400-560	≥22	RMWL1 RSWL1 RAWL1	-40	≥34 (≥27)
		≥345	440-610		RMWL2 RSWL2 RAWL2	-60	
		≥375	490-660	≥21	RMWL3 RSWL3 RAWL3		-196
			≥590	≥25	RMWL91 RSWL91 RAWL91		
		≥410	≥660		RMWL92 RSWL92 RAWL92		
LR		≥375	≥460	≥22	1 1/2Ni	-80	≥34
			≥420	≥25	3 1/2Ni	-100	
			≥500		5Ni	-120	
			≥600		9Ni	-196	
DNV		≥305	400-560	≥22	5/V	-55	≥41
						-60	≥34
		≥375	490-660	5Y/VY	-55	≥41	
					-60	≥34	
		≥275	≥420	≥25	NV1.5Ni	-95	≥34
		≥345	≥440		NV3.5Ni	-115	
		≥390	≥570		NV5Ni	-140	
		≥490	≥640		NV9Ni	-196	
NK		≥305	400-560	≥22	KMWL1 KSWL1 KAWL1	-40	≥34 (≥27)
		≥345	440-610		KMWL2 KSWL2 KAWL2	-60	
		≥375	490-660	≥21	KMWL3 KSWL3 KAWL3		-196
			≥590	≥25	RMWL91 RSWL91 RAWL91		
	≥410	≥660	RMWL92 RSWL92 RAWL92				

Remark: () value in impact value blank appears RAWL(KAWL) case 1,2,3

SMW

SAW

GMW

GTAW

FCW

Non-FERROUS

APPENDIX

Type Approval Status

Classification Brand Name	Register of shipping & size(mm)			
	KR	ABS	LR	BV
S-4301.I	3 2.6-6.0	3 2.6-6.0	3 2.6-6.0	3 2.6-6.0
S-4303.V	3 2.6-6.0	3 2.6-6.0	3 2.6-6.0	3 2.6-6.0
S-6010.D	2 2.6-6.0	2, AWS A5.1: 2012 E6010 2.6-6.0	2 2.6-6.0	2 2.6-6.0
S-6011.D	2 2.6-6.0	2 2.6-6.0	2 2.6-6.0	2 2.6-6.0
S-6013.LF	2 2.6-6.0	2 2.6-6.0	2 2.6-6.0	2 2.6-6.0
S-6013.V	2 2.6-5.0	2 2.6-5.0	2 2.6-5.0	
S-6027.LF	3 4.0-8.0	3 4.0-8.0	3,3G 4.0-8.0	3 4.0-8.0
S-7016.H	3H10,3Y H10 2.6-6.0	3H10,3Y 2.6-6.0	3Y H15 2.6-6.0	3YHH 2.6-6.0
S-7016.LF	3H10,3Y H10 2.6-6.0	3H10,3Y 2.6-6.0	3Y H15 2.6-6.0	3,3YHH 2.6-6.0
S-7016.LS	3H10,3Y H10 (-60°C ≥34 J) 2.6-6.0	3 H10,3Y (-60°C ≥34 J) 2.6-6.0	5Y40 H15 2.6-6.0	3,3Y HH (-60°C ≥34 J) 2.6-6.0
S-76LTH		5Y, 5Y400 H5 2.6-5.0	5Y40 H5 2.6-5.0	
S-7016.M	3 H10,3Y H10 2.6-6.0	3H10,3Y 2.6-6.0		
S-7016.O	3 H10,3Y H10 3.2-5.0	3H10,3Y 2.6-5.0	3Y H15 2.6-5.0	
S-7018.G	3 H10,3Y H10 2.6-6.0	3H10,3Y AWS A5.1:2012 E7018 2.6-6.0	3Y H15 2.6-6.0	3Y HH 2.6-6.0
S-7018.GH				
S-7018.1		3 H10,3Y 2.6-5.0	3Y H15 2.6-5.0	3Y HH 2.6-5.0
S-7018.1H		4Y H5 2.6-5.0	4Y H5 2.6-5.0	4Y HHH 2.6-5.0
S-7014.F	2,2Y 2.6-6.0	2Y 2.6-6.0	2,2Y 2.6-6.0	2,2Y 2.6-6.0
S-7024.F		2 3.2-7.0	2,2Y,2YG 3.2-6.0	
S-7028.F	3Y 3.2-7.0	3,3Y 3.2-7.0	3,3Y,3YG 4.0-7.0	3,3Y 3.2-7.0
S-7048.V	3 H10,3Y H10 3.2-6.0	3 H10,3Y 3.2-6.0	3,3Y H15 3.2-6.0	3,3Y HH 3.2-6.0
S-7010.A1		AWS A5.5 E7010-A1 2.6-6.0	2Y 2.6-6.0	
S-8016.B2		AWS A5.5 E8016-B2 2.6-6.0		
S-8016.B2R		AWS A5.5 E8016-B2 (-30°C ≥27 J) 2.6-5.0		
S-8016.C1		AWS A5.5 E8016-C1 2.6-5.0		

Register of shipping & size(mm)			
DNV-GL	NK	TÜV	DB
3 2.6-6.0	KMW3 2.6-6.0		
3 2.6-6.0	KMW3 2.6-6.0		
2 2.6-6.0	KMW2 2.6-6.0	EN ISO 2560-A E 38 0 C 2 1 2.6-5.0	EN ISO 2560-A E 38 0 C 2 1 2.6-5.0
2 2.6-6.0	KMW2 2.6-6.0		
2 2.6-6.0	KMW2 2.6-6.0		
	KMW2 2.6-5.0	ISO 2560-A E 38 0 RC 1 1 2.6-5.0	EN ISO 2560-A E 38 0 RC 1 1 2.6-5.0
3 4.0-8.0	KMW3 4.0-8.0		
3Y H10 2.6-6.0	KMW53 HH 2.6-6.0		
3Y H10 2.6-6.0	KMW53 HH 2.6-6.0		
5Y H10 2.6-6.0			
5Y40 H5, NV 4-4L 2.6-5.0			
	KMW53 HH 2.6-6.0		
3Y H10 2.6-5.0	KMW53 HH 3.2-5.0		
3Y H10 2.6-6.0	KMW53 HH 2.6-6.0	EN ISO 2560-A E 42 3 B 1 2 H5 2.5-5.0	EN ISO 2560-A E 42 3 B 1 2 H5 2.5-5.0
3Y H10 2.6-5.0			
4Y H5 2.6-5.0			
2 2.6-6.0	KMW52 2.6-6.0		
2 3.2-7.0	KMW2,KMW52 3.2-6.0		
3 (25 t) 3.2-7.0	KMW3,KMW53 4.0-7.0		
3Y H10 3.2-6.0	KMW53 HH 3.2-6.0		

Type Approval Status

Classification Brand Name	Register of shipping & size(mm)			
	KR	ABS	LR	BV
S-8018.C3		AWS A5.5 E8018-C3 2.6-5.0		
S-8018.B2		AWS A5.5 E8018-B2 2.6-6.0		
S-86LTH		AWS A5.5 E8016-G (-60°C ≥ 47 J) 2.6-5.0		
S-9016.B3R		AWS A5.5 E9016-B3 (-30°C ≥ 27 J) 2.6-5.0		
S-9018.B3	AWS A5.5 E9018-B3 3.2-6.0	AWS A5.5 E9018-B3 3.2-6.0	AWS A5.5 E9018-B3 3.2-6.0	
S-8016.G		AWS A5.5 E8016-G 2.6-6.0		
S-9016.G		AWS A5.5 E9016-G 2.6-6.0		
S-10016.G		AWS A5.5 E10016-G 2.6-6.0		
S-10018.D2		AWS A5.5 E10018-D2 H4R 3.2-5.0		
S-11016.G		AWS A5.5 E11016-G 2.6-6.0		
S-9018.M		AWS A5.5 E9018-M 2.6-5.0		
S-11018.M		AWS A5.5 E11018-M 2.6-6.0		
S-2209.16	AWS A5.4 E2209-16 2.6-5.0	AWS A5.4 E2209-16 (-46°C ≥ 27J) 2.6-4.0		
S-308.16N	RD308 2.4-5.0	AWS A5.4 E308-16 2.4-5.0		
S-308L.16N	RD308L 2.4-5.0	AWS A5.4 E308L-16 2.4-5.0	304L 2.4-5.0	308L 2.0-5.0
S-308LT.16		AWS A5.4 E308L-16 (-196°C ≥ 27 J) 2.0-4.0		
S-308L.17		AWS A5.4 E308L-17 2.0-5.0		
S-309.16N	RD309 2.4-5.0	AWS A5.4 E309-16 2.4-5.0	SS/CMn 2.4-5.0	
S-309L.16	RD309L 2.0-5.0	AWS A5.4 E309L-16 2.0-5.0	SS/CMn 2.0-5.0	UP 2.0-5.0
S-309L.17		AWS A5.4 E309L-17 2.0-5.0		
S-309Mo.16		AWS A5.4 E309Mo-16 2.4-5.0		
S-309MoL.16				
S-316.16N	RD316 2.6-5.0	AWS A5.4 E316-16 2.4-5.0		UP 2.0-5.0
S-316L.16N	RD316L 2.4-5.0	AWS A5.4 E316L-16 2.4-5.0	316L 2.4-5.0	UP 2.0-5.0
S-316LT.16		AWS A5.4 E316L-16 (-196°C ≥ 27 J) 2.0-4.0		

Register of shipping & size(mm)			
DNV-GL	NK	TÜV	DB
-H10, NV2,25Cr1Mo 3.2-6.0			
	KD2209 2.6-4.0		
NV 308 2.4-5.0			
NV 308L 2.4-5.0	KD308L 2.4-5.0	EN ISO 3581-A - E 19 9 L R 2.0-5.0	E 19 9 L R (1.4316) DIN EN 1600 2.0-5.0
NV 309 2.4-5.0			
VL 309L 2.0-5.0	KD309L 2.0-5.0	EN ISO 3581-A - E 23 12 L R 2.0-5.0	E 23 12 L R (1.4332) DIN EN 1600 2.0-5.0
NV 309MoL (-20°C) 2.6-5.0		EN ISO 3581-A - E 23 12 2 L R 2.0-5.0	E 23 12 2 L R (1.4459) DIN EN 1600 2.0-5.0
NV 316 2.4-5.0			
NV 316L 2.4-5.0	KD316L 2.0-5.0	EN ISO 3581-A - E 19 12 3 L R 2.0-5.0	E 19 12 3 L R (1.4430) DIN EN 1600 2.0-5.0

SMW

SAW

GMW

GTAW

FCW

Non-FERROUS

APPENDIX

Type Approval Status

Classification Brand Name	Register of shipping & size(mm)			
	KR	ABS	LR	BV
S-316L.17		AWS A5.4 E316L-17 2.0-5.0		
SR-134				
SR-182				
SR-625		AWS A5.11 ENiCrMo-3 (-196°C ≥ 27 J) 3.2-4.0		
ST-2209 / I1	AWS A5.9 ER2209 Duplex Stainless Steel 1.6-3.2	AWS A5.9 ER2209 min. TS 690MPa, EL 20%, -50°C ≥ 27 J 0.8-3.2	S31803 1.6-3.2	
ST-308 / I1	RY308G 0.8-3.2	AWS A5.9 ER308 min. TS 550MPa, EL 35% 0.8-3.2		
ST-308L / I1	RY308L (-196°C ≥ 29 J) 0.8-3.2	AWS A5.9 ER308L min. TS 520MPa, EL 35% 0.8-3.2	304L (-196°C) 0.8-3.2	308L (KV -196°C) 0.8-3.2
ST-309 / I1		AWS A5.9 ER309 min. TS 550MPa, EL 30% 0.8-3.2		
ST-309L / I1		AWS A5.9 ER309L min. TS 520MPa, EL 30% 0.8-3.2	SS/CMn 0.8-3.2	309L min. TS 520MPa, EL 30% 0.8-3.2
ST-309MoL / I1				SA 309Mo 1.6-3.2
ST-316 / I1		AWS A5.9 ER316 min. TS 520MPa, EL 30% 0.8-3.2		
ST-316L / I1	RY316L (-196°C ≥ 29 J) 0.8-3.2	AWS A5.9 ER316L min. TS 490MPa, EL 30% 0.8-3.2	316L (-196°C) 0.8-3.2	316L (KV -196°C) 0.8-3.2
ST-347 / I1		AWS A5.9 ER347 0.8-3.2		
SM-309 / I1		AWS A5.9 ER309 0.8-3.2		
SM-309MoL / I1		AWS A5.9 ER309LMo 0.8-3.2		
SM-316L / I1		AWS A5.9 ER316L 0.8-3.2		
SMT-2594 / I1		AWS A5.9 ER2594 min. TS 760MPa, EL 15% 1.0-3.2	AWS A5.9 ER2594 (jxV6R-16) 1.0-3.2	
SMT-276 / I1		AWS A5.14 ERNiCrMo-4 1.0-3.2		
SMT-625 / I1 T:1.0-1.6 M:1.0-3.2	L92S 1.0-3.2	AWS A5.14 ERNiCrMo-3 (-196°C ≥ 34 J) 1.0-3.2	9Ni H15 1.0-3.2	AWS A5.14ERNiCrMo-3 UP KV-196 1.0-3.2
SMT-686 / I1				

Register of shipping & size(mm)			
DNV-GL	NK	TÜV	DB
VL 9Ni H5 2.6~5.0			
- Duplex Stainless Steel 1.6~3.2			
NV 308M 0.8~3.2			
VL 308L (-196°C) 0.8~3.2	KY308L 0.8~3.2		
VL 309L 0.8~3.2	KY309L 0.8~3.2		
VL 316L (-196°C) 0.8~3.2	KY316L 0.8~3.2		
- Duplex Stainless Steel (-50°C) 1.0~3.2			
-MS VL 1.5Ni, VL 9Ni 1.0~3.2	KSWL92 1.0~3.2		
Wire- AWS A5.14 ERNiCrMo-14 Clad welding of UNS N06686 -196°C, TS min. 690 N/mm² 0.8~3.2			

SMW

SAW

GMAW

GTAW

FCAW

Non-FERROUS

APPENDIX

Type Approval Status

Classification Brand Name	Register of shipping & size(mm)			
	KR	ABS	LR	BV
SMT-7030 / I1		AWS A5.7-2007 ERCuNi 1.2~3.2		
ST-9010 / I1	KS D7044 YCuNi-1 1.6~3.2			
SMT-08 / I1		AWS A5.14 ERNiMo-8 1.2~3.2		
ST-50G / I1	3YSG 1.2~3.2	AWS A5.18 ER70S-G 1.2~3.2	3Y H15 1.2~3.2	UP (-20°C) 1.2~3.2
ST-50.3 / I1		AWS A5.18 ER70S-3 (-50°C ≥27 J) 0.8~3.2		
ST-50.6 / I1		AWS A5.18 ER70S-6 (-30°C ≥27 J) 1.6~3.2		
ST-1N / I1		AWS A5.28 ER80S-Ni1 (-50°C ≥27 J) 1.6~3.2	AWS A5.28 ER80S-Ni1 1.2~3.2	SA4Y40 1.6~3.2
ST-72 / I1				
ST-90B3 / I1		AWS A5.28 ER90S-B3 (-30°C ≥27 J) 1.6~3.2		
SM-70 / C1	3SG, 3YSG(C) 0.8~1.6	3SA,3YSA 0.8~1.6	3YS H15 0.8~1.6	SA3,SA3YM 0.8~1.6
SM-70 / M21	3YSG(M2),3YMG(M2) 0.8~1.6	3SA,3YSA 0.8~1.6	3YS H15 0.8~1.6	SA3YM 0.8~1.6
SM-70EN / C1				
SM-70EN / M21				
SM-70G / C1	3SG, 3YSG, 3MG, 3YMG(C1) 0.8~1.6	3SA,3YSA 0.8~1.6	3YS H15 0.8~1.6	SA3,3YM 0.8~1.6
SM-70G / M21		3SA,3YSA 0.8~1.6		
SM-70GS / M21			3YS H15 0.8~1.6	
SM-70S / C1		3SA,3YSA 0.8~1.6	3S,3YS H15 0.8~1.6	
SM-70S / M21		3SA,3YSA 0.8~1.6	3S,3YS H15 0.8~1.6	
SM-80G / C1		AWS A5.28 ER80S-G (-20°C ≥47 J) 1.0~1.6		
SM-1N / 95%Ar+5%O ₂		AWS A5.28 ER80S-Ni1 0.8~1.6		
SC-EG2 Cored/ CBM600/C1	3V, 3YV 1.6	3,3Y H10 1.6	3,3Y 1.6	AV3,AV3Y 1.6
SC-EG2 Cored/ WS-600/C1	3YV 1.6	3Y 1.6		

Register of shipping & size(mm)			
DNV-GL	NK	TÜV	DB
VL 1.5Ni up to VL 9Ni 1.2~3.2			
IIIM 1.2~3.2	KSW53G 1.2~3.2		
		EN ISO 636-A - W 42 5 W3Si1 0.8~3.2	
IIIM 0.8~1.6	KSW53G(C) 0.8~1.6	EN ISO 14341-A - G42 2 C1 3Si1 0.8~1.6	G3Si1 DIN EN440 0.8~1.6
IIIM 0.8~1.6	KSW53G,KAW53MG (M2) 0.8~1.6	EN ISO 14341-A - G42 3 M21 3Si1 0.8~1.6	G3Si1 DIN EN440 0.8~1.6
IIY40MS 0.8~1.6		EN ISO 14341-A - G42 2 C1 4Si1 0.8~1.6	G4Si1 DIN EN ISO 14341-A 0.8~1.6
IVY40MS 0.8~1.6		EN ISO 14341-A - G46 4 M21 4Si1 0.8~1.6	G4Si1 DIN EN ISO 14341-A 0.8~1.6
IIIM 0.8~1.6	KSW53G,KAW53MG(C) 0.8~1.6		
IIIM 0.8~1.6	KSW3G,KSW53G(M2) KAW3MG,KAW53MG(M2) 0.8~1.6		
IIY (-20°C) 1.6	KEW53 1.6		
IIY 1.6	KEW53G(C) 1.6		

Type Approval Status

Classification Brand Name	Register of shipping & size(mm)			
	KR	ABS	LR	BV
SC-EG3/ BS-SG/C1	4Y40V H5 1.6	5Y400 H5 1.6	5Y40, 4Y 1.6	AV5Y40 HHH 1.6
SC-460 / C1	5Y46SG(C1) H5 1.2~1.4	5YQ460SA H5 1.2~1.4	5Y46S H5 1.2~1.4	SA5Y46 HHH 1.2~1.4
SC-70ML / M21		4Y400SA H5 1.2~1.6	4Y40S H5 1.2~1.6	SA4Y40M HHH 1.2~1.6
SC-70H Cored / C1		3YSA H10 1.6~2.4	3YS H10 1.6~2.4	
SC-70T Cored / C1		3YSAH10, 3YSA 1.2	3YS H10 1.2	SA3YM HH 1.2
SC-70T Cored / M21			3YS H5 1.2~1.6	SA3Y HHH 1.0~1.6
SC-70Z Cored / M21				
SC-71COT / C1	2YSG(C) H10 1.2~1.4	2YSA H10 1.2~1.4	2YS H10 1.2~1.4	SA2Y HH 1.2~1.4
SC-71HJ / C1	4Y40SG(C1) H10 1.2~1.4	4Y400SA H10 1.2~1.4	4Y40S H10 1.2~1.4	SA4Y40 HH 1.2~1.4
SC-71LH / C1	3YSG(C) H5 1.2~1.6	3YSA H5 1.2~1.6	3YS H5 1.2~1.6	SA3Y HHH 1.2~1.6
SC-71LHM Cored / M21		3YSA H5 1.2~1.6	3YS H5 1.2~1.6	SA3Y HHH 1.0~1.6
SC-71MJ		4YSA, 4Y400SA H5 1.2~1.6	4Y40S H5 1.2~1.6	SA4Y, SA4Y40 HHH 1.2~1.6
SC-71MSR / M21		4Y400SA H5 1.2	4Y40S H5 1.2	SA4Y40M HHH 1.2
SC-71SR / C1		4Y400SA H5 1.2~1.6	4Y40S H5 1.2~1.6	SA4Y40 HHH 1.2~1.6
SC-81LT / C1	5Y40SG(C) H5, L3SG(C) H5 1.2~1.4	5Y, 5Y400SA H5 1.2~1.4	5Y40S H5 1.2~1.4	SA5Y40M HHH 1.2~1.4
SC-80MR / M21				
SC-80K2 / C1	4Y40G(C) H5 (-60°C ≥34 J) 1.2~1.4	5Y400SA H5 1.2~1.4	5Y40S H5 1.2~1.4	SA5Y40 HHH 1.2~1.4
2 X SC-80K2 / C1	4Y40MG(C) 1.2~1.4	5Y400SA H5 1.2~1.4	5Y40M H5 1.2~1.4	SA5Y40 HHH 1.2~1.4
SC-81Ni2 / C1	5Y46SG(C1) H5 1.2~1.4	5YQ460SA H5 1.2~1.4	4Y47S H5 1.2~1.4	SA5Y46 HHH 1.2~1.4
SC-81Ni2M / M21			4Y47S H5 1.2~1.4	SA5Y46 HHH 1.2~1.4
SC-81SR / C1		5Y400SA H5 1.2	5Y40S H5, 5Y40srS 1.2	
SC-81SR / WS-601 / C1			5Y40S H5, 5Y40srS 1.2	

Register of shipping & size(mm)			
DNV-GL	NK	TÜV	DB
VY40 (H5) NV2-4L, NV4-4L 1.6	EW54Y40G(C) H5 (-60°C≥39J) 1.6		
VY46MS (H5) 1.2~1.4	KSW5Y46G(C) H5 KSW63Y47G(C) H5 (-20°C≥53J) 1.2~1.4		
IVY40MS H5 1.2~1.6		EN ISO 17632-A - T46 4 M M 2 H5 1.2~1.6	T46 4 M M 2 H5 DIN EN ISO 17632-A 1.2~1.6
IIIYMS H10 1.6~2.4			
IIIYMS H10 1.2		EN ISO 17632-A - T42 2 2 M C 1.2~1.6	T42 2 2 M C1 DIN EN ISO 17632-A 1.2~1.6
IIIYMS H5 1.2~1.6		EN ISO 17632-A - T46 2 M M 1.2~1.6	T46 2 M M1 DIN EN ISO 17632-A 1.2~1.6
IIYSM (H10) 1.2~1.4	KSW52G(C)H10 1.2~1.4		
IVY40MS H10 1.2~1.4	KSW54Y40G(C) H10 1.2~1.4		
IIIYMS H5 1.2~1.6	KSW53Y40G(C) H5 1.2~1.6	EN ISO 17632-A - T42 2 P C 1 H5 1.2~1.6	
IIIYMS H5 1.2~1.6		EN ISO 17632-A - T46 3 P M 1 H5 1.2~1.6	T46 3 P M1 H5 DIN EN ISO 17632-A 1.2~1.6
IVY40MS (H5) 1.2~1.6			
IVY40MS H5 1.2		EN ISO 17632-A - T46 4 P M 1 H5 1.2~1.4	T46 4 P M1 2 H5 DIN EN ISO 17632-A 1.2~1.4
IVY40MS (H5) 1.2~1.6			
VY40MS H5 VL 4-4L, VY 1.2~1.4	KSWL3G(C) H5, KSW54Y40G(C) H5 1.2~1.4		
VYMS (H5) 1.2~1.4			
VY40MS H5 NV4-4L 1.2~1.4	KAW54Y40MG(C), KSW54Y40G(C) H5 (-60°C≥34 J) 1.2~1.4		
VY40MS H5 NV4-4L 1.2~1.4	KAW54Y40MG(C) H5 (-60°C≥34 J) 1.2~1.4		
VY46MS (H5) 1.2~1.4	KSW63Y47G(C) H5 1.2~1.4		
VY46MS (H5) 1.2~1.4			
VY40SM (H5) NV2-4L, NV4-4L 1.2			

Type Approval Status

Classification Brand Name	Register of shipping & size(mm)			
	KR	ABS	LR	BV
SC-91K2 Cored / C1		AWS A5.29 E91T1-K2C (-40°C ≥50 J) 1.2		
SC-91LT / C1		5YQ500SA (H5) (-60°C ≥50 J) 1.2	5Y50S H5 1.2	
SF-70MX / C1	2SG, 2YSG (C1) H10 2MG, 2YMG(C1) H10 1.2~1.6	2SA, 2YSA H10, 2Y400SA 1.2~1.6	2S, 2YS H10 1.2~1.6	SA2YM HH 1.2~1.6
SF-71 / C1	2SMG, 2YSMG(C) H10 1.2~1.6	2SA, 2YSA H10, 2Y400SA 1.2~1.6	2S, 2YS H10 1.2~1.6	SA2M, SA2YM HH A2M, A2YM HH 1.2~1.6
SF-71 / CBM8061/ C1			2YS H10 1.2~1.4	
SF-71 / WS-601/C1				
SF-71LF / C1		2YSA H10 1.2~1.6	2S, 2YS H10 1.2~1.6	
SF-71LF / CBM8061/ C1			2S, 2YS H10 1.2~1.6	
SF-71MC / C1		3YSA H10 1.2~1.6	3YS H10 1.2~1.6	SA3YM HH 1.2~1.6
SF-71MC / M21		3YSA H10 (75%Ar+25%CO ₂) 1.2~1.6	3YS H10 1.2~1.6	SA3YM HH 1.2~1.6
SF-71R / C1		3YSA H5 AWS A5.36 E71T1-C1A(P)0-CS1 H4 1.2~1.4		
SF-71P / C1		4YSA H5 AWS A5.36 E71T1-C1A(P)4-CS1 H4 1.2~1.4		
SC-55 Cored		AWS A5.36 E81T1-C1A0-G 1.2~1.4		
Supercored70B / M21		3YSA H5 1.0~2.0	3S, 3YS H5 1.0~2.0	SA3YM HHH 1.0~2.0
Supercored70B/ CBM8061/M21			3S, 3YS 1.0~2.0	
Supercored70SB / C1	3YSG(C1) H5 1.2~1.6	3SA, 3YSA H5 1.2~1.6	3YSH5 1.2~1.6	SA3YM HHH 1.2~1.6
Supercored70SB / CBM8061/C1			3YSH5 1.2~1.6	
Supercored70NS / M21		3SAH5, 3YSA 0.9~1.6	3YS H5 0.9~1.6	SA3M, SA3YM HHH 0.9~1.6
Supercored70MXH / C1	3YSG(C)H5 3YMG(C) H5 1.4~2.0	3SAH5, 3YSA 1.4~2.0	3YS H5 1.4~2.0	SA3YM, A3YM HHH 1.4~2.0
2 X Supercored 70MXH / C1	3YMG(C) H5 1.4~2.0	3SAH5, 3YSA 1.4~2.0	3YM H5 1.4~2.0	SA3YM, A3YM HHH 1.4~2.0
Supercored 110 / C1	3Y69S(C) H5 1.2	AWS A5.29 E111T1-GC-H4 (IV-40°C ≥41J) 1.2		
Supercored71 / C1	3SMG(C) H10, 3YSMG(C) H10 0.9~1.6	3SA H10, 3YSA 0.9~1.6	3YS H10 0.9~1.6	SA3M, SA3YM, A3M, A3YM, HHH 0.9~1.6

Register of shipping & size(mm)			
DNV-GL	NK	TÜV	DB
IVY50MS (H5) 1.2~1.4			
VY50MS (H5) 1.2			
IYY40MS (H10) 1.2~1.6	KSW52Y40G(C) H10, KAW52G(C) H10 1.2~1.6		
IYY40MS (H10) 1.2~1.6	KSW52G(C) H10, KSW52Y40G(C) H10 1.2~1.6	EN ISO 17632-A - T42 0 P C 1 1.2~1.6	
	KSW52Y40G(C) 1.2~1.4		
IYYMSH10 1.2~1.6	KSW52G(C) H10 KAW52MG(C) 1.2~1.6		
IIYMS H10 1.2~1.6		EN ISO 17632-A - T42 2 P C 1 H10 1.2~1.6	DIN EN ISO 17632-A-T 46 2 P C 1 H10 1.2~1.6
IIYMS H10 1.2~1.6		EN ISO 17632-A - T46 3 P M 1 H10 1.2~1.6	DIN EN ISO 17632-A-T 46 3 P M 1 H10 1.2~1.6
IIYMS (H5) 1.0~2.0		EN ISO 17632-A - T42 4 B M 3 H5 1.2~1.6	T42 4 B M 3 H5 DIN EN ISO 17632-A 1.2~1.6
IIYMS H5 1.2~1.6	KSW53G(C) H5 1.2~1.6		
IIYMS H5 0.9~1.6		EN ISO 17632-A - T42 3 M M 3 0.9~1.6	T42 2 M M 3 DIN EN ISO 17632-A 0.9~1.6
IIYMS H5 1.4~2.0	KSW53G(C) H5 KAW53MG(C) H5 1.4~2.0		
IIYMS H5 1.4~2.0	KAW53MG(C) 1.4~2.0		
IIYMS H10 0.9~1.6	KSW53Y40G(C) H10 0.9~1.6	EN ISO 17632-A - T 42 2 P C 1 1.2~1.6	T42 2 P C 1 DIN EN ISO 17632-A 1.2~1.6

Type Approval Status

Classification Brand Name	Register of shipping & size(mm)			
	KR	ABS	LR	BV
Supercored71 / CBM8061/C1			3YS 0.9~1.6	
Supercored71H / C1	4YSMG(C) H10 1.2~1.4	4YSA H10 1.2~1.4	4YS H10 1.2~1.4	A, SA4YM HH 1.2~1.4
	3SMG(C)H10, 3YSMG(C) H10 1.6	3SA H10 1.6		A, SA3YM HH 1.6
Supercored71MAG / M21		3SAH10, 3YSA (75~80%Ar+Bal.CO ₂) 1.2~1.6	3S, 3YS H10 1.2~1.6	SA3M, SA3YM HH A3M, A3YM 1.2~1.6
Supercored71MAG / CBM8061 /M21			3YS 1.2~1.4	
Supercored81MAG / M21		5Y400SA H5 1.2	5Y40S H5 1.2	SA5Y40M HHH 1.2
Supercored81-K2 / C1	5Y40SG(C) H5, L3SG(C) H5 1.2~1.6	5Y400SA H5 1.2~1.6	5Y40S H5 1.2~1.6	SA5Y40M HHH 1.2~1.6
Supercored81-K2MAG / M21		5Y400SA H5 1.2	5Y40S H5 1.2	SA5Y40M HHH 1.2
Supershield 71-T8				
Supershield 11				
SC-81M / M21				
SW-2209 Cored / C1	AWS A5.22 E2209T1-1 1.2~1.6	AWS A5.22 E2209T1-1 (-46°C 27 J) 1.2	S31803 1.2	
SW-2209 Cored / M21			S31803 1.2	UP (KV -20°C ≥41 J) 1.2
SW-308L Cored / C1		AWS A5.22 E308LT1-1 (-120°C 29 J) 1.2~1.6	304L(-120°C) 1.2~1.6	UP (KV -120°C) 1.2~1.6
SW-308L Cored / M21				
SW-308LT / C1		AWS A5.22 E308LT1-1 (-196°C ≥27 J) 1.2		
SW-308LT / M21		AWS A5.22 E308LT1-4 (-196°C ≥27 J) (75%Ar+25%CO ₂) 1.2		
SW-309L Cored / C1	RW309LG (C) (-20°C ≥34 J) 1.2~1.6	AWS A5.22 E309LT1-1 1.2~1.6	SS/CMn 1.2~1.6	309L with KV at -20°C (-20°C ≥34 J) 1.2~1.6
SW-309L Cored / M21			SS/CMn, Dup/CMn 0.9~1.6	
SW-309MoL Cored / C1	RW309MoLG (C) 1.2~1.6	AWS A5.22 E309LMoT1-1 0.4~1.6	AWS A5.22 E309LMoT1-1 1.2~1.6	309Mo UP KV-20 1.2~1.6
SW-309MoL Cored / M21		AWS A5.22 E309LMoT1-4 0.4~1.6		
SW-316L Cored / C1	RW316LG (C) (-60°C ≥34 J) 1.2~1.6	AWS A5.22 E316LT1-1 0.9~1.6	316L 1.2~1.6	316L (-60°C) 1.2~1.6
SW-316L Cored / M21		AWS A5.22 E316LT1-4 (75~80%Ar+Bal.CO ₂) 0.9~1.6		
Supercored 308L / C1				

Register of shipping & size(mm)			
DNV-GL	NK	TÜV	DB
IVYSM H5 1.2~1.4	KSW54G(C) H10 1.2~1.4	EN ISO 17632-A - T 42 4 P C 1 1.2~1.6	DIN EN ISO 17632-A T 42 4 P C 1 1.2~1.6
IIYMS H5 1.6	KSW53G(C)H10 KAW53MG(C)H10 1.6		
IIYMS H10 1.2~1.6		EN ISO 17632-A - T 46 3 P M 1 1.2~1.6	DIN EN ISO 17632-A T 46 3 P M 1 1.2~1.6
VY40MS H5 1.2		EN ISO 17632-A - T 46 6 1Ni1 P M 2 H5 1.2	T 46 6 P M 2 H5 DIN EN ISO 17632-A 1.2
VY40MS (H5) VL 2-4L, VL 4-4L 1.2~1.6	KSWL3G(C)H5, KSW54Y40G(C)H5 (-60°C ≥47J, ≥34J (Butt)) 1.2~1.6		
VY40MS H5 1.2		EN ISO 17632-A - T 46 6 1.5Ni P M 2 1.2	T46 6 1.5Ni P M 2 DIN EN ISO 17632-A 1.2
	KW2209G(C) 1.2		
Duplex Stainless Steel 1.2			
VL 308L (-120°C) 1.2~1.6	KW308LG(C) 1.2~1.6	EN ISO 17633-A - T 19 9 L P C 1 2 0.9~1.6	T 19 9 L P C 2(1.4316) DIN EN ISO 17633-A 0.9~1.6
		EN ISO 17633-A - T 19 9 L P M 2 1 2 0.9~1.6	T 19 9 L P M 2(1.4316) DIN EN ISO 17633-A 0.9~1.6
VL 309L 1.2~1.6	KW309LG(C) 1.2~1.6	EN ISO 17633-A - T 23 12 L P C 1 2 0.9~1.6	T 23 12 L P C 2(1.4332) DIN EN ISO 17633-A 0.9~1.6
		EN ISO 17633-A - T 23 12 L P M 2 1 2 0.9~1.6	T 23 12 L P M 2(1.4332) DIN EN ISO 17633-A 0.9~1.6
VL 309MoL (-20°C) 1.2~1.6	KW309MoLG(C) 1.2~1.6		
VL 309MoL (-20°C) 1.2~1.6			
VL 316L 1.2~1.6	KW316LG(C) 1.2~1.6	EN ISO 17633-A - T 19 12 3 L P C 1 2 0.9~1.6	T 19 12 3 L P C 2(1.4430) DIN EN ISO 17633-A 0.9~1.6
		EN ISO 17633-A - T 19 12 3 L P M 2 1 2 0.9~1.6	T 19 12 3 L P M 2(1.4430) DIN EN ISO 17633-A 0.9~1.6
		EN ISO 17633-A - T 19 9 L R C 1 3 0.9~1.6	T 19 P L R C 3(1.4316) DIN EN ISO 17633-A 0.9~1.6

Type Approval Status

Classification Brand Name	Register of shipping & size(mm)			
	KR	ABS	LR	BV
Supercored 308L / M21				
Supercored 309L / C1				
Supercored 309L / M21			SS/CMn 0.9~1.6	309L 0.9~1.6
Supercored 309MoL / M21			SS/CMn 0.9~1.6	309LMo 0.9~1.6
Supercored 316L / C1				
Supercored 316L / M21			316L 0.9~1.6	316L 0.9~1.6
A-2/Superflux 800T				
A-2/S-900SP		AWS A5.23 F9A2-EA2-G AWS A5.23 F9P2-EA2-G 1.6~4.8		
H-12K/Superflux 787		4YM H5 AWS A5.17 F7A8-EH12K AWS A5.17 F7P8-EH12K 1.2~6.4		
H-14/S-460Y	5Y46MH5 1.2~6.4	5YQ460M H5, 5YQ500M H5, 4YQ500T (Max. thick. 22mm for Two run) 1.2~6.4	5Y46M H5 1.2~6.4	A5Y46M HHH 1.2~6.4
H-14/S-705EF / IRN/S-22	2SMR, 2YSMR 2.0~6.4	2,2Y 2.0~6.4	2A,2YA 2.0~6.4	A2M,A2YM 2.0~6.4
H-14/S-705EF / CW/CBM-G22	2SR,2YSR Max. thick.25mm 2.0~6.4	2,2Y 2.0~6.4	2A,2YA Max. thick. 25mm 2.0~6.4	A2M,A2YM 2.0~6.4
H-14/S-705EF / CW/SAW-10	2YSR Max. thick. 25mm 2.0~6.4	2Y 2.0~6.4		
H-14/S-705HF / CW/CBM-G22 multi-run	3YSR Max. thick. 25mm 2.0~6.4	3Y 2.0~6.4	3YA H10 2.0~6.4	A3YU, A3YM 2.0~6.4
H-14/S-705HF / IRN/BS-3W	3YSR 2.0~6.4	3Y 2.0~6.4	3YA 2.0~6.4	A3YU 2.0~6.4
H-14/S-707T	3T, 3YT, 4YM 1.2~6.4	4YM,3T,3YT 1.2~6.4	4YM,3T,3YT 1.2~6.4	A4YM, A3T,A3YT 1.2~6.4
2 X H-14/S-707T	3T, 3YT, 4YM 1.2~6.4	4YM,3T,3YT 1.2~6.4	4YM,3T,3YT 1.2~6.4	A4YM, A3T,A3YT 1.2~6.4
H-14/S-707T/CW / CBM-G22	3YSR Max. thick. 28mm 2.0~6.4	3Y Max. thick. 28mm 2.0~6.4	3Y Max. thick. 28mm 2.0~6.4	A3YU 2.0~6.4
H-14/S-737	3M,3YM 2.0~6.4	3M,3YM 2.0~6.4	3M,3YM 2.0~6.4	
H-14/S-777MX	2M,2YM 1.6~6.4	2M,2YM 1.6~6.4	2M,2YM 1.6~6.4	A2M,A2YM 1.6~6.4
2 X H-14/S-777MX		2M,2YM 1.6~6.4	2M,2YM 1.6~6.4	A2M,A2YM 1.6~6.4
H-14/S-777MXH	2T,2YT,3M,3YM 1.2~6.4	2T,2YT,3M,3YM 1.2~6.4	3M,3YM,2T,2YT 1.2~6.4	A2T,A2YT,A3M,A3YM 1.2~6.4
2XH-14/S-777MXH		3YM 1.2~3.2	3M,3YM 1.2~3.2	A3YM 1.2~3.2

Register of shipping & size(mm)			
DNV-GL	NK	TÜV	DB
		EN ISO 17633-A - T 19 9 L R M21 3 0.9~1.6	T 19 P L R M 3 (1.4316) DIN EN ISO 17633-A 0.9~1.6
		EN ISO 17633-A - T 23 12 L R C1 3 0.9~1.6	T 23 12 L R C 3 (1.4332) DIN EN ISO 17633-A 0.9~1.6
VL 309L (-20°C) 0.9-1.6		EN ISO 17633-A - T 23 12 L R M21 3 0.9~1.6	T 23 12 L R M 3 (1.4332) DIN EN ISO 17633-A 0.9~1.6
VL 309MoL (-20°C) 0.9-1.6			
		EN ISO 17633-A - T 19 12 3 L R C1 3 0.9~1.6	T 19 12 3 L R C 3 (1.4430) DIN EN ISO 17633-A 0.9~1.6
VL 316L (-20°C) 0.9-1.6		EN ISO 17633-A - T 19 12 3 L R M21 3 0.9~1.6	T 19 12 3 L R M 3 (1.4430) DIN EN ISO 17633-A 0.9~1.6
		EN 756 S2 Mo - (Wire) EN 760 SA FB1 - (Flux) 3.0-5.0	S2Mo DIN EN 756 (A-2) SA FB 1 DIN EN 760 (Superflux 800T) 3.0-5.0
VY46M (H5) 1.2-6.4	KAW5Y46MH5,KAW63Y47M H5 (-20°C)≥53J) 1.2-6.4		
IiYM 2.0-6.4	KAW2SMP,KAW52SMP 2.0-6.4		
IiYM t≤25mm 2.0-6.4	KAW52SP 2.0-6.4		
IiY t≤25mm 2.0-6.4	KAW52SP 2.0-6.4		
IIiYM t≤25mm 2.0-6.4	KAW53-SMP Max. thick. 25mm 2.0-6.4		
IIiYM 2.0-6.4	KAW53SP Max. thick. 25mm 2.0-6.4		
IVYM, IIiYT 1.2-6.4	KAW53T,KAW54M 1.2-6.4		
IVYM, IIiYT 1.2-6.4	KAW53T,KAW54M 1.2-6.4		
IIiYMT ≤28mm 2.0-6.4	KAW53SP Max. thick. 28mm 2.0-6.4		
IIiYM 2.0-6.4			
IiYM 1.6-6.4	KAW2M,KAW52M 1.6-6.4		
IiYM 1.6-6.4	KAW2M,KAW52M 1.6-6.4		
IiYT H10, IIiYM H10 1.2-6.4	KAW3M,KAW53M KAW2T,KAW52T 1.2-6.4		

Type Approval Status

Classification Brand Name	Register of shipping & size(mm)			
	KR	ABS	LR	BV
H-14/S-787TB	3YT,4Y40M (-60°C ≥41 J) 1.2-6.4	3T,3YT,5Y400M 1.2-6.4	3YT,5Y40M 1.2-6.4	A5Y40M,A3T,A3YT 1.2-6.4
2 X H-14/S-787TB		3T,3YT,5Y400M 1.2-6.4	3YT,5Y40M 1.2-6.4	
H-14/Superflux55ULT	4Y40M H5 (-60°C ≥41 J) 1.2-6.4	5Y400M H5, 4YT 1.2-6.4	4YT,5Y40M H5 1.2-6.4	A5Y40M HHH, A5YT 1.2-6.4
2 X H-14/Superflux55ULT	4YT 1.2-6.4	5Y400M H5, 4YT 1.2-6.4	4YT,5Y40M H5 1.2-6.4	A5Y40M HHH, A5YT 1.2-6.4
H-14/Superflux55ULT / CW		4YM 1.2-6.4	4YM, 4YMsr 1.2-6.4	A4YM 1.2-6.4
H-14/Superflux787	4YM 1.2-6.4	3M,4YM 1.6-6.4	4YM 1.6-6.4	A4YM 1.2-6.4
L-8/S-707	3TM,3YTM 1.6-6.4	3TM,3YTM 1.6-6.4	3T, 3YM, 3YT 1.6-6.4	A3TM,A3YTM 2.4-6.4
2 X L-8/S-707			3T, 3YM, 3YT 1.6-6.4	
L-8/S-707/ IRN/S-22	2SMR,2YSMR 2.4-6.4	2,2Y 2.4-6.4	2A,2YA 2.4-6.4	A2M,A2YM 2.4-6.4
L-8/S-727	2TM,2YTM 2.4-6.4	2TM,2YTM 2.4-6.4	2TM,2YTM 2.4-6.4	A2TM,A2YTM 2.4-6.4
L-8/S-707/ CW/CBM-G22	2YSR 2.0-6.4	2Y 2.0-6.4	2YA 2.0-6.4	A2YU 2.0-6.4
L-12/S-727		2TM,2YTM (Two-run tech : Max 5.0mm) 1.6-6.4	2YMH5 1.6-6.4	
M-12K/S-717	3M,3YM 2.4-6.4	3M,3YM 2.4-6.4	3YM 2.4-6.4	A3,A3YM 2.0-6.4
M-12K/Superflux 800T				
M-12K/S-800WT				
M-12K/S-900SP		AWS A5.17 F7A4-EM12K AWS A5.17 F7P4-EM12K 1.6-4.8		
A-2/S-900SP		AWS A5.23 F9A(P)2-EA2-G 1.6-4.8		
YS-2209/Superflux209	AWS A5.9 ER2209 (Wire) For Duplex Stainless Steel 2.4-3.2	AWS A5.9 ER2209 (Wire) (TS 690, EL25, -46°C≥27 J) 2.4-3.2		
YS-308L/Superflux 300S	RU308L TM (-196°C ≥27 J) 1.6-4.0			
YS-316L/Superflux300S	RU316L TM (-196°C ≥27 J) 1.6-4.0	AWS A5.9 ER316L (Wire) (-60°C ≥ 34 J) 1.6-5.0		UP (KV -60°C ≥ 27 J) 1.6-5.0
SA-08/S-Ni2		Manufacturer's Spec. (-196°C) 1.2-3.2	9NiM 1.2-3.2	AN90M 1.2-3.2

Register of shipping & size(mm)			
DNV-GL	NK	TÜV	DB
VY40M H10, NV4-4L IIIYT (35t), VYT (20t) 1.2-5.0	KAWL3TM, KAW54Y40M 1.2-6.4		S4 DIN EN 756 - (Wire) S A FB 1 DIN EN 760 - (Flux)
VY40M H10, NV4-4L IIIYT (35t), VYT (20t) 1.2-5.0			
VY40M H5, IVYT NV2-4L, NV4-4L 1.2-6.4	KAW54T, KAW54Y40M H5 (-60°C ≥ 41 J) 1.2-6.4	EN ISO 14171-A - S4 (Wire) EN ISO 14174 - S A FB 1 (Flux) 1.2-6.4	S4 DIN EN 756 - (Wire) S A FB 1 DIN EN 760 - (Flux) 1.2-6.4
VY40M H5, IVYT 1.2-6.4	KAW54T, KAW54Y40M (-60°C ≥ 41 J) 1.2-6.4		
IVYM 1.2-6.4			
IVYM 1.6-6.4	KAW54M 1.2-6.4		
IIITYM 2.4-6.4	KAW3TM, KAW53TM 2.4-6.4		
IIMY 2.4-6.4	KAW2M, KAW52M 2.4-6.4		
IITYM 2.4-6.4	KAW2TM, KAW52TM 2.4-6.4		
IIMY 2.0-6.4	KAW52SP 2.0-6.4		
IIIMY 2.0-6.4	KAW53M 2.0-6.4	EN ISO 14171-A - S2Si (Wire) EN ISO 14174 - S A AB 1 (Flux) 1.2-6.4	S2Si DIN EN 756 (M-12K) S A AB 1 DIN EN 760 (S-717) 1.2-6.4
		EN ISO 14171-A - S2Si (Wire) EN ISO 14174 - S A FB 1 (Flux) 1.2-6.4	S2Si DIN EN 756 (M-12K) S A FB 1 DIN EN 760 (Superflux 800T) 1.2-6.4
		EN ISO 14171-A - S2Si (Wire) EN ISO 14174 - S A FB 1 (Flux) 1.2-6.4	S2Si DIN EN 756 (M-12K) DIN EN 760-S A FB1 (S-800WT) 1.2-6.4
- Duplex Stainless Steel 2.4-3.2	Manufacturer's Specification 2.4-4.0		
-M VL 1.5Ni up to VL 9Ni 1.2-3.2			

ISO/TS & IATF Approvals



Certificate of Approval

This is to certify that the Management System of:

Hyundai Welding Co., Ltd.

100, Daesong-ro, Nam-gu, Pohang-si, Gyeongbuk 37863, Republic of Korea

has been approved by LRQA to the following standards:

ISO 9001:2015

Sang-Keun Yoo - Korea Operation Manager and NA Area Sales Manager

Issued by: Lloyd's Register Quality Assurance (Korea) Ltd.

for and on behalf of: Lloyd's Register Quality Assurance Limited

This certificate is valid only in association with the certificate schedule bearing the same number on which the locations applicable to this approval are listed.

Current issue date: 25 January 2019

Expiry date: 24 January 2022

Certificate identity number: 10165019

Original approval(s):

ISO 9001 – 7 February 1995

Approval number(s): ISO 9001 – 0065942

The scope of this approval is applicable to:

Design, manufacture of covered electrodes, solid wires & rods, flux cored wires, submerged arc wires and fluxes.



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Page 1 of 2

Certificate of Approval

This is to certify that the Management System of:

Hyundai Welding Co., Ltd.

100, Daesong-ro, Nam-gu, Pohang-si, Gyeongbuk 37863, Republic of Korea

has been approved by LRQA to the following standards:

ISO 14001:2015



Sang-Keun Yoo - Korea Operation Manager and NA Area Sales Manager

Issued by: Lloyd's Register Quality Assurance (Korea) Ltd.

for and on behalf of: Lloyd's Register Quality Assurance Limited

This certificate is valid only in association with the certificate schedule bearing the same number on which the locations applicable to this approval are listed.

Current issue date: 10 February 2019

Expiry date: 9 February 2022

Certificate identity number: 10167003

Original approval(s):

ISO 14001 – 10 February 2004

Approval number(s): ISO 14001 – 0069053

The scope of this approval is applicable to:

Design and manufacture of covered electrodes, solid wires & rods, flux cored wires, submerged arc wires and fluxes.



ISO/TS & IATF Approvals



CERTIFICATE OF APPROVAL

This is to certify that the Quality Management System of:

Hyundai Welding Co., Ltd.
100, Daesong-ro, Nam-gu, Pohang-si
Gyeongbuk, 37863, Korea

has been approved by Lloyd's Register Quality Assurance
to the following Quality Management System Standard:

IATF 16949:2016

The Quality Management System is applicable to:

Design and manufacture of solid wires & rods
and flux cored wires.

This certificate is valid only in association with the certificate schedule bearing the same number on which the locations applicable to this approval are listed.

Approval
Certificate No: SEO 0941752

Certification date: 12 March 2018

Certificate Expiry: 11 March 2021

A handwritten signature in black ink, likely of a representative from Lloyd's Register.

Issued by: LRQA (Korea) Ltd. for and on behalf of
Lloyd's Register Quality Assurance Limited



IATF Certificate No: 0294002

17th Floor, Singsoong Bldg. 67, Yeouinaru-ro, Yeongdeungpo-gu, Seoul, Korea
For and on behalf of LRQA Ltd 1 Trinity Park, Bickenhill Lane, Birmingham, B37 7ES, United Kingdom
This approval is carried out in accordance with the LRQA assessment and certification procedures and monitored by LRQA.
Issue Number: 01

Find Your Product By Application

1 Flux cored wire

Mild and high tensile steel	Minimum yield strength	50kgf/mm ² (490N/mm ²)	SF-71, SF-71LF, SC-71LH, Supercored 71, Supercored 71H, SC-71Ni2, SF-71MC, Supercored 71MAG, SF-70MX, Supercored 70MXH
		60kgf/mm ² (590N/mm ²)	Supercored 81, Supercored 81MAG, SC-EG2, Supercored 81K2, Supercored 81K2MAG, SC-81LT, SC-81Ni2, SC-81Ni2M, SC-460, SC-91K2, SC-91LT
		80kgf/mm ² (790N/mm ²)	Supercored 110, Supercored 120
Heat resisting and molten Steel	Chemical composition requirement for base metal	0.5Mo	SC-80D2, SC-81A1
		0.5Mo-1.25Cr	Supercored 1CM, SC-81B2
		1.0Mo-2.25Cr	SC-91B3
For low temperature steels	Temperature requirement (°C)	-30°C Charpy-V	Supercored 81, Supercored 71MAG, SC-71LHM, Supercored 70NS
		-40°C Charpy-V	SC-71HJ, Supercored 70B(basic), Supercored 81-K2, SC-81LT
		-60°C Charpy-V	SC-71Ni2, SC-81Ni2, SC-81Ni2M, Supercored 81MAG, Supercored 81-K2MAG
Weather resistant steel	Tensile strength requirement	50kgf/mm ² (490N/mm ²)	SF-70W
		60kgf/mm ² (590N/mm ²)	SF-80W
Seamless	Temperature requirement (°C)	-20°C Charpy-V	SL-71LH
		-40°C Charpy-V	SL-81LT
		-60°C Charpy-V	SL-71Ni2, SL-81Ni2, SL-81Ni2M

SMW

SAW

GMW

GTAW

FCW

Non-FERROUS

APPENDIX

This information is provided for a reference purpose only. For more details, please contact us.

Find Your Product By Application

2 Covered electrode

Mild steel and high tensile steel	Needed tensile strength at minimum	40kgf/mm ² (390N/mm ²)	S-4301.I, S-4303.V, S-6010.D, S-6011.D, S-4303.T, S-6013.LF, S-6013.V, S-7014.F, S-6027.LF
		50kgf/mm ² (490N/mm ²)	S-7016.H, S-7016.HR, S-7016.LF, S-7016.M, S-7016.G, S-7016.O, S-7016.LS, S-76LTH, S-7018.G, S-7018.1, S-7018.1H, S-7028.F, S-7014.F, S-7024.F, S-7028.F, S-7048.V
		60kgf/mm ² (590N/mm ²)	S-8016.G, S-9016.G, S-8018.G, S-9018.M
		70kgf/mm ² (690N/mm ²)	S-10016.G, S-10018.D2
		75kgf/mm ² (740N/mm ²)	S-11016.G, S-11018.M
Steel sheet for high resistance and high temperature	Chemical composition of needed basic material	0.5Mo	S7010.A1, S-7016.A1, S-7018.A1
		0.5Cr-0.5Mo	S-8016.B1
		1.25Cr-0.5Mo	S-8016.B2, S-8018.B2, S-8018.B2R
		0.5Cr-1.0Mo	S-8016.B5
		2.25Cr-1.0Mo	S-9016.B3, S-9018.B3, S-9018.B3R
		5.0Cr-0.5Mo	S-8016.B6
		9.0Cr-1.0Mo	S-9015.B9, S-9016.B9
Steel sheet at low temperature	Needed temperature (°C)	-45°C Charpy-V	S-7018.1, S-7018.1H, S-8016.C3, S-8018.C3
		-51°C Charpy-V	S-9018.M, S-11018.M
		-60°C Charpy-V	S-7016.LS, S-76LTH, S-8016.C1, S-8016.C2, S-8018.C1
Weather resistant steel	Needed tensile strength	50kgf/mm ² (490N/mm ²)	S-7018.W
		60kgf/mm ² (590N/mm ²)	S-8018.W
Hard-facing steel	Needed diameter	Brinell hardness(H.B) 240	S-240A.R, S-260A.B, S-13MN.B
		Brinell hardness(H.B) 350	S-350A.R, S-350B.B
		Brinell hardness(H.B) 400	S-450B.B
		Brinell hardness(H.B) 500	S-500B.B
		Brinell hardness(H.B) 600	S-600B.B
		Brinell hardness(H.B) 700	S-700B.B, S-711
Alloy steel	For cast iron	Ni type	S-NCI, S-NFC
		Fe type	S-FCF
	Steel for 9%Ni	ENiCrFe-4 type	SR-134
	Special alloy	Ni alloy type	SR-182, SR-133, SR-625

This information is provided for a reference purpose only. For more details, please contact us.

3 Saw wire and flux

Mild steel and high tensile steel	Minimum yield strength	50kgf/mm ² (490N/mm ²)	S-707 X L-8, S-707T X H-14, S-717 X M-12K, S-727 X L-8, S-777MX X H-14, S-705EF X H-14, Superflux787 X H-14 (H-12K), Superflux55ULT X H-14
		60kgf/mm ² (590N/mm ²)	S-777MXH X A-3, S-800MX X A-3, S-800SP X A-2, Superflux600 X A-3, S-460Y X H-14
	Needed temperature (°C)	-18°C Charpy-V	S-777MXT X H-14
		-29°C Charpy-V	S-727 X L-8, S-777MXH X H-14
		-40°C Charpy-V	S-800SP X M-12K, S-900SP X M-12K, S-707 X L-8
		-51°C Charpy-V	S-717 X M-12K, S-707T X H-14, Superflux600 X H-14
		-62°C Charpy-V	Superflux800T X M-12K, S-800WT X M-12K, S-787TT X H-14 (H-12K), S-787TB X H-14, Superflux787 X H-14 (H-12K), S-460Y X H-14, Superflux55ULT X H-14

SMW

SAW

GMW

GTAW

FCW

Non-FERROUS

APPENDIX

This information is provided for a reference purpose only. For more details, please contact us.

Find Your Product By Industry

1 Automotive

Hyundai Welding Consumables for the Automotive Industry

- Production and supply of products to comply with customer's environments and application
- Excellent wire feeding for automated robotic welding and premium solid wire for maximizing welding performance
- Development of high-quality wire for GA grade steel to get the excellent porosity performance and low slag generation.

1) Featured products

Chassis frames	SM-70	MIG/MAG wire
	SM-70S	MIG/MAG wire
	SC-70Z	Metal cored wire(GA steel)
Exhaust pipe	SW-309LNS Cored	Metal cored wire(Stainless steel)
	SF-409Ti	Metal cored wire(Stainless steel)

2) Other products

Stick electrodes	
Flux cored wire	SF-430Nb
Metal cored wire	SF-430, SF-436, SC-439Ti Cored
SAW Wire & Flux	
MIG/MAG wire	SM-430LNb, SM-70EN
TIG wire	ST-430LNb
Ni-Alloy	
Others	

2 Heavy Equipment

Hyundai Welding Consumables for the Heavy Equipment Industry

- Premium quality assurance designed for high ampere automatic welding
- Maximize productivity with developed PAK feeding system
- A wide range of wires following the recent trend of high tensile strength steel

1) Featured products

Construction equipment	SM-70G	MIG/MAG wire
	SM-70EN	MIG/MAG wire
	SM-80G	MIG/MAG wire
Industrial equipment	SM-100	MIG/MAG wire
	SM-110	MIG/MAG wire

2) Other products

Stick electrodes	
Flux cored wire	Supercored 70NS
Metal cored wire	SC-70ML, SC-80CM, SC-90M
SAW Wire & Flux	
MIG/MAG wire	SM-70, SM-70G, SM-70GS, SM-55H, SM-80G
TIG wire	
Ni-Alloy	
Others	

3) Equipment

Featured products	HD AUTO+ SERIES
Other products	HIEGW SERIES

SMW

SAW

GMAW

GTAW

FCAW

Non-FERROUS

APPENDIX

Find Your Product By Industry

3 Shipbuilding

Hyundai Welding Consumables for the Shipbuilding Industry

- Excellent performance and less spatter in all position welding with stable arc
- Good resistance against crack and defects in extreme situation and construction.
- Eco-friendly Low Fume material development to meet customer requirement

1) Featured products

Chemical tankers	SW-316L Cored	Flux cored wire(Stainless steel)
	SW-309MoL Cored	Flux cored wire(Stainless steel)
LPG Tankers	Supercored 81-K2	Flux cored wire
	SC-80K2	Semi-metal cored wire
	SC-71Ni2	Flux cored wire
Container vessels	SF-71	Flux cored wire
	SC-71LH	Flux cored wire
	SF-70MX	Semi-metal cored wire
	Supercored 71	Flux cored wire

2) Other products

Stick electrodes	S-7018.1H, S-76LTH, S-308L.16N, S-316L.16N, S-7016.H, S-7016.HR, S-7016.LS, S-7018.1, S-7018.G, S-7018.GH, S-309L.16, S-309MoL.16, S-317L.16
Flux cored wire	SC-71HJ
Metal cored wire	Supercored 71H, Supercored 71MAG, SC-71MJ, SC-71SR, SC-71MSR, SF-71MC, SC-71LHM, Supercored 70MXH, SF-80MX, SC-91K2, Supercored 110, Supercored 81K2MAG, Supercored 70NS, SC-70ML, SC-80M, SC-90M, SC-110M
SAW Wire & Flux	Superflux55ULT × H-14, S-707 × L-8, S-707T × H-14, S-787TB × H-14, S-705EF × H-14, S-705HF × H-14, S-460Y × H-14
MIG/MAG wire	SM-70, SM-70G, SM-308L, SM-309L, SM-316L
TIG wire	ST-50.3, ST-50.6, ST-1N, ST-308L, ST-309L, ST-316L
Ni-Alloy	
Others	

3) Equipment

Featured products	HD AUTO+ SERIES
Other products	PONY SERIES, PHANTOM SERIES, LIBERO 600M, BETA SERIES, ALPHA SERIES, HIEGW SYSTEM, NEO SAW SERIES

4 Offshore structures

Hyundai Welding Consumables for Offshore Structures

- High impact toughness at cryogenic(-196°C) and CTOD toughness
- Diffusible hydrogen level control and cracking improvement by Seamless wire

1) Featured products

Offshore platform Jack up Rig Drillship Submersible LNG Vessels & FPSO	ST-1N	TIG wire
	SMT-625	MIG/TIG wire
	YS-2209 & Superflux209	SAW Wire & Flux(Duplex)
	SW-625	Flux cored wire(Ni- alloy)
	Supercored 81-K2	Flux cored wire
	SC-81LT	Flux cored wire
	SC-81Ni2	Flux cored wire
	SC-81Ni2M	Flux cored wire
	SL-81LT	Seamless Flux cored wire
	SL-81Ni2	Seamless Flux cored wire
	SL-81Ni2M	Seamless Flux cored wire

2) Other products

Stick electrodes	S-7018.1H, S-76LTH, S-308LT.16, S-316LT.16, S-7018.1, S-7016.LS, S-8016.C1, S-8016.C2, S-8016.C3, S-308L.16N, S-309L.16, S-316L.16N, S-309MoL.16, S-317L.16
Metal cored wire	SC-70ML, Supercored 70NS, SC-80M, SC-90M, SC-110M
SAW Wire & Flux	Superflux55ULT × H-14, Superflux787 × H-14, S-460Y × H-14
MIG/MAG wire	SM-80G, SM-80CM, SM-100, SM-110
TIG wire	ST-50.6, ST-50G, ST-80B2, ST-308L, ST-309L, ST-316L
Ni-Alloy	SMT-686
Others	

3) Equipment

Featured products	HD AUTO+ SERIES
Other products	PONY SERIES, PHANTOM SERIES, ZEUS SERIES, HERA SERIES, LIBERO 600M, NEO SAW SERIES

Find Your Product By Industry

5 Energy & Power Plants

Hyundai Welding Consumables for Energy and Power Plants

- Development of heat resistance consumables designed for various heat treatment
- Improvement for crack resistance by controlling X-Factor and diffusible hydrogen content

1) Featured products

Thermal & Hydroelectric generation	B-2 & S-800CM	SAW Wire & Flux
	ST-91B9	TIG Wire
	S-9018.B3R	Stick electrodes
Wind power	M-12K & Superflux800T	SAW Wire & Flux
	M-12K & S-717	SAW Wire & Flux
	Supercored 81-K2MAG	Flux cored wire
Nuclear Power	SF-71MSR	Flux cored wire
	S-7016.H	Stick electrodes
	S-308L.16	Stick electrodes(Stainless steel)
Other alternative power	H-12K & Superflux787	SAW Wire & Flux
	SC-80D2	Metal cored wire
Petro-Chemical plants	YSB-309LNb & S-300EM	SAW wire & flux(Stainless steel)
	SA-625 & Superflux300	SAW wire & flux(Ni-alloy)
	SR-625	Stick electrodes(Ni-alloy)
LNG storage Tank	S-Ni-2 & SA-08	SAW wire & flux(Ni-alloy)
	SR-134	Stick electrodes(Ni-alloy)
	SR-08	Stick electrodes(Ni-alloy)

2) Other products

Stick electrodes	S-8018.B2R, S-9018.B3R, S-9015.B92, S-9016.B92, S-9015.B9, S-308L.16N, S-309L.16, S-316L.16N, S-347.16, S-8018.G, S-9016.G, S-10016.G, S-11016.G, S-9018.M, S-11018.M, S-7016.A1, S-7018.A1, S-8016.B1, S-8016.B2, S-8018.B2, S-9016.B3, S-9018.B3, S-8016.B5, S-310.16, S-310.15, S-309MoL.16, S-312.16, S-317L.16, S-7018.W, S-8018.W
Flux cored wire	SC-81A1
Metal cored wire	SC-81B2, SC-91B3, Supercored 70NS, SC-70ML, Supershield EG-72T, Supershield EG-82T
SAW Wire & Flux	Superflux800T × M-12K, S-800WT × M-12K, S-717 × M-12K, S-800CM × B-2, S-777MXT × A-2(B-2), S-787TB × H-14
MIG/MAG wire	SM-70G, SM80G, SM-100, SM-109, SM-110, SM-80CM, SMT-625, SM-316L
TIG wire	ST-308L, ST-309L, ST-316L, ST-80B2
Ni-Alloy	SA-08 × S-Ni2
Others	Superflux300S × YS-308L, Superflux300S × YS-309L, Superflux300S × YS-316L

3) Equipment

Featured products	PONY SERIES, HD AUTO+ SERIES
Other products	ZEUS SERIES, HERA SERIES, BETA SERIES, LIBERO 600M, PHANTOM SERIES, ALPHA SERIES

6 Steel Structures

Hyundai Welding Consumables for Steel Structures

- Excellent performance and less spatter in all position welding with stable arc
- Excellent anti-porosity against a rusty and primed plate
- Excellent crack-resistance for high tensile TMCP plate
- Development products of different processes due to high strength trend

1) Featured products

General steel structure	SF-70MX	Semi-metal cored wire
	SF-71	Flux cored wire
High tensile steel structure	SC-91	Flux cored wire
	SC-91K2 Cored	Flux cored wire
	SM-100	MIG/MAG wire
	SC-110M Cored	Flux cored wire

2) Other products

Stick electrodes	S-6013.LF, S-7016.H, S-7016.HR, S-7018.G, S-7024.F, S-7018.1H, S-7018.1, S-308L.16N, S-309L.16, S-316L.16N, S-4301.I, S-4303.V, S-4303.T, S-6010.D, S-6011.D, S-6013.V, S-6027.LF, S-7014.F, S-7018.GH, S-7028.F, S-7048.V, S-8016.G, S-8018.G, S-9016.G, S-10016.G, S-11016.G, S-9018.M, S-11018.M, S-7018.W, S-8018.W, S-308Mo.16, S-309MoL.16, S-312.16, S-317.16
Flux cored wire	Supercored 70NS
Metal cored wire	SC-70ML, SC-70T Cored, SC-80D2, Supershield 11, SC-80M, SC-90M, SC-55 Cored, SC-55F Cored, Supercored 81, SC-91, SC-90, SC-81K2, SC-91K2, SC-80CM, SC-90M
SAW Wire & Flux	Superflux600 × H-14(A-3), S-777MX × H-14, S-777MXH × H-14(A-3), S-777MXT × H-14
MIG/MAG wire	SM-70, SM-70G, SM-70S, SM-70EN, SM-70GS, SM-55H, SM-80G, SM-80CM, SM-100, SM-110, SM-55H, SM-80G, SM-80CM, SM-100, SM-110
TIG wire	
Ni-Alloy	
Others	

3) Equipment

Featured products	PONY SERIES, HD AUTO+ SERIES
Other products	PONY SERIES, PHANTOM SERIES, ZEUS SERIES, HERA SERIES, HYPLA SERIES

Find Your Product By Industry

7 Steel Pipes

Hyundai Welding Consumables for Steel Pipes

- Strength moisture-proof with the control of hydrogen content and vacuum packing
- Development of pipe welding material to satisfy customer's requirement
- High product quality with an excellent reputation from customers worldwide

1) Featured products

Pipe mill	A-2 & S-800SP	SAW wire & Flux
	M-12K & S-800SP	SAW wire & Flux
	A-2 & S-900SP	SAW wire & Flux
	M-12K & S-900SP	SAW wire & Flux
	SC-71MSR	Flux cored wire
Pipeline installation	Supercored 81MAG	Flux cored wire
	SC-91P	Flux cored wire

2) Other products

Stick electrodes	S-6010.D, S-6011.D, S-7016.O, S-308L.16N, S-309L.16, S-316L.16N, S-347.16
Flux cored wire	SF-71MC
Metal cored wire	SC-71SR, SC-70T Cored
SAW Wire & Flux	Superflux787 × H-12K, S-777MX × H-14, S-777MXT × H-14, S-800SP × M-12K(A-2), S-900SP × M-12K(A-2), S-787TT × H-14(H-12K), S-787TB × H-14
MIG/MAG wire	SM-80CM, SM-308L, SM-309L, SM-316L
TIG wire	ST-80B2, ST-308L, ST-309L, ST-316L
Ni-Alloy	
Others	

3) Equipment

Featured products	HD AUTO+ 600P, PIPEMATIC SYSTEM
Other products	LIBERO 600M

8 Repair & Maintenance

Hyundai Welding Consumables for Repair & Maintenance Industry

- Maximize wear resistance and impact resistance by forming compound carbide
- Providing high temperature wear resistance specially designed for continuous casting rolls
- Providing a variety range of welding materials for Open-Arc, SAW or Gas Shield Welding.

1) Featured products

Continuous casting rolls	SC-414S	Flux cored wire
	SC-423S	Flux cored wire
	SC-420S	Flux cored wire
	S-717	SAW flux
	S-400HF	SAW flux
Mining & other equipment	Supershield CRC	Flux cored wire
	Supershield CRCW	Flux cored wire
	SC-600HM	Flux cored wire

2) Other products

Stick electrodes	
Flux cored wire	Supershield 430-0
Metal cored wire	Supershield 410NiMo-0
SAW Wire & Flux	
MIG/MAG wire	
TIG wire	
Ni-Alloy	
Others	

3) Equipment

Featured products	
Other products	HIEGW SERIES

SMW

SAW

GMW

GTAW

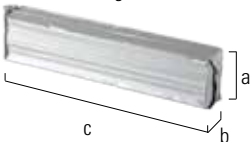
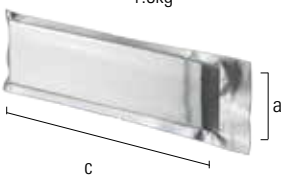
FCW

Non-FERROUS

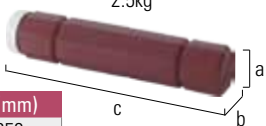
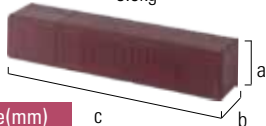
APPENDIX

HYUNDAI Standard Packaging

1 Covered Electrodes (1/2)

Type	Packet		Carton																		
STANDARD	5kg 	<table><tr><th colspan="2">Packet Size(mm)</th></tr><tr><td>a</td><td>78</td></tr><tr><td>b</td><td>40~65</td></tr><tr><td>c</td><td>304~554</td></tr></table>	Packet Size(mm)		a	78	b	40~65	c	304~554	20kg  <table><tr><th colspan="2">Carton Size(mm)</th></tr><tr><td>d</td><td>82</td></tr><tr><td>e</td><td>180~275</td></tr><tr><td>f</td><td>312~562</td></tr></table>	Carton Size(mm)		d	82	e	180~275	f	312~562		
	Packet Size(mm)																				
a	78																				
b	40~65																				
c	304~554																				
Carton Size(mm)																					
d	82																				
e	180~275																				
f	312~562																				
ALUMINUM VACUUM PACK	5kg 																				
	1.5kg 	<table><tr><th colspan="2">Carton Size(mm)</th></tr><tr><td>a</td><td>150</td></tr><tr><td>c</td><td>450~550</td></tr></table>	Carton Size(mm)		a	150	c	450~550	15kg  <table><tr><th colspan="2">Carton Size(mm)</th></tr><tr><td>d</td><td>142</td></tr><tr><td>e</td><td>175</td></tr><tr><td>f</td><td>420~520</td></tr></table>	Carton Size(mm)		d	142	e	175	f	420~520				
Carton Size(mm)																					
a	150																				
c	450~550																				
Carton Size(mm)																					
d	142																				
e	175																				
f	420~520																				
Pallet																					
1,000kg 		<table><tr><th colspan="3">Pallet Size(mm)</th></tr><tr><td></td><td>$l \leq 450$</td><td>$l > 450$</td></tr><tr><td>A</td><td>400</td><td>400</td></tr><tr><td>B</td><td>130, 160</td><td>130, 160</td></tr><tr><td>C</td><td>1,150</td><td>1,130</td></tr><tr><td>D</td><td>930</td><td>980</td></tr></table>		Pallet Size(mm)				$l \leq 450$	$l > 450$	A	400	400	B	130, 160	130, 160	C	1,150	1,130	D	930	980
Pallet Size(mm)																					
	$l \leq 450$	$l > 450$																			
A	400	400																			
B	130, 160	130, 160																			
C	1,150	1,130																			
D	930	980																			

2 Covered Electrodes (2/2)

Type	Packet	Carton																																							
PVC BOX (HEXAGONAL)	2.5kg <table><tr><th colspan="3">Packet Size(mm)</th></tr><tr><td>l</td><td>300mm</td><td>350mm</td></tr><tr><td>a</td><td>80</td><td>75</td></tr><tr><td>b</td><td>80</td><td>75</td></tr><tr><td>c</td><td>330</td><td>385</td></tr></table>	Packet Size(mm)			l	300mm	350mm	a	80	75	b	80	75	c	330	385	10~20kg 																								
Packet Size(mm)																																									
l	300mm	350mm																																							
a	80	75																																							
b	80	75																																							
c	330	385																																							
TIN CAN	4.5kg <table><tr><th colspan="3">Packet Size(mm)</th></tr><tr><td>l</td><td>300mm</td><td>350mm</td></tr><tr><td>a</td><td>75</td><td>75</td></tr><tr><td>b</td><td>75</td><td>75</td></tr><tr><td>c</td><td>365</td><td>415</td></tr></table>	Packet Size(mm)			l	300mm	350mm	a	75	75	b	75	75	c	365	415																									
Packet Size(mm)																																									
l	300mm	350mm																																							
a	75	75																																							
b	75	75																																							
c	365	415																																							
PVC BOX (SQUARE)	5.0kg <table><tr><th colspan="3">Packet Size(mm)</th></tr><tr><td>l</td><td>300mm</td><td>350mm</td></tr><tr><td>a</td><td>85</td><td>75</td></tr><tr><td>b</td><td>85</td><td>75</td></tr><tr><td>c</td><td>350</td><td>360</td></tr></table>	Packet Size(mm)			l	300mm	350mm	a	85	75	b	85	75	c	350	360	<table><tr><th colspan="4">Carton Size(mm)</th></tr><tr><td>Packet</td><td>2.5 (PVC)</td><td>4.5 (Can)</td><td>5.0 (PVC)</td></tr><tr><td>Carton</td><td>10Kg</td><td>18Kg</td><td>20Kg</td></tr><tr><td>d</td><td>80</td><td>85</td><td>80~85</td></tr><tr><td>e</td><td>310~330</td><td>317</td><td>310~345</td></tr><tr><td>f</td><td>360~405</td><td>383~433</td><td>325~375</td></tr></table>	Carton Size(mm)				Packet	2.5 (PVC)	4.5 (Can)	5.0 (PVC)	Carton	10Kg	18Kg	20Kg	d	80	85	80~85	e	310~330	317	310~345	f	360~405	383~433	325~375
Packet Size(mm)																																									
l	300mm	350mm																																							
a	85	75																																							
b	85	75																																							
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Carton Size(mm)																																									
Packet	2.5 (PVC)	4.5 (Can)	5.0 (PVC)																																						
Carton	10Kg	18Kg	20Kg																																						
d	80	85	80~85																																						
e	310~330	317	310~345																																						
f	360~405	383~433	325~375																																						

Pallet

900kg

Pallet Size(mm)

<i>l</i>	300mm	350mm
A	860	800
B	130,160	130,160
C	1,070	1,210
D	1,010	950

SWAW

SAW

GMAW

GTAW

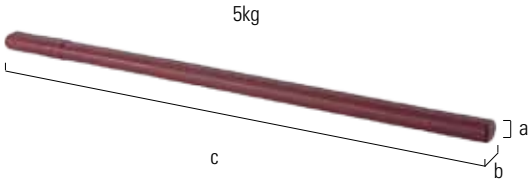
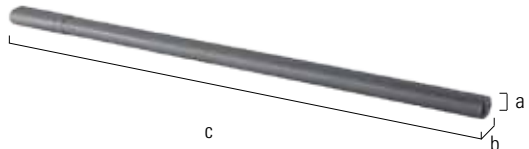
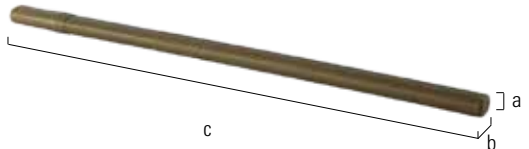
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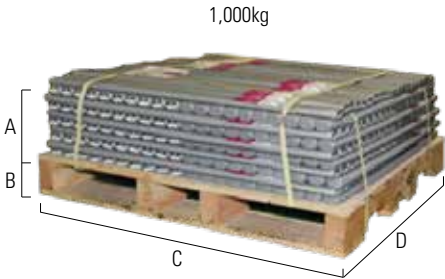
Non-FERROUS

APPENDIX

HYUNDAI Standard Packaging

3 Tig Rods

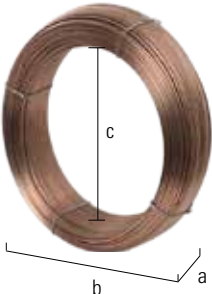
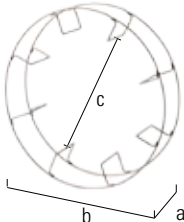
Type	PVC Box									
Standard	 5kg Diagram showing dimensions: a (rod diameter), b (rod end diameter), and c (rod length).	<table><tr><th colspan="2">Tube Size(mm)</th></tr><tr><td>a</td><td>31</td></tr><tr><td>b</td><td>48</td></tr><tr><td>c</td><td>1,010</td></tr></table>	Tube Size(mm)		a	31	b	48	c	1,010
Tube Size(mm)										
a	31									
b	48									
c	1,010									
Stainless	 5kg Diagram showing dimensions: a (rod diameter), b (rod end diameter), and c (rod length).									
Special Alloy	 5kg Diagram showing dimensions: a (rod diameter), b (rod end diameter), and c (rod length).									

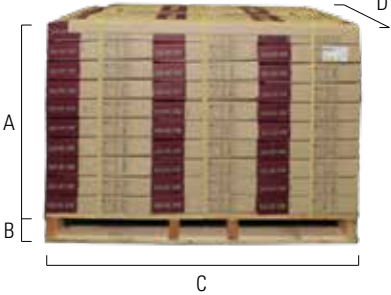
Pallet											
 1,000kg Diagram showing dimensions: A (height), B (width), C (length), and D (depth).	<table><tr><th colspan="2">Pallet Size(mm)</th></tr><tr><td>A</td><td>280</td></tr><tr><td>B</td><td>130, 160</td></tr><tr><td>C</td><td>1,070</td></tr><tr><td>D</td><td>1,070</td></tr></table>	Pallet Size(mm)		A	280	B	130, 160	C	1,070	D	1,070
Pallet Size(mm)											
A	280										
B	130, 160										
C	1,070										
D	1,070										

HYUNDAI Standard Packaging

5

Submerged Wire

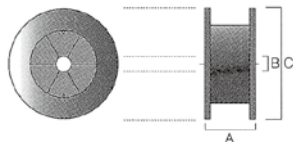
Type	Packet	Carton																																																
Coil Type	 <table><tr><th colspan="4">Coil Size(mm)</th></tr><tr><th></th><th>a</th><th>b</th><th>c</th></tr><tr><td>25kg</td><td>75/100</td><td>410/420</td><td>305/315</td></tr><tr><td>30kg</td><td>95</td><td>400</td><td>305</td></tr><tr><td>75kg</td><td>90/100</td><td>740</td><td>630</td></tr><tr><td>100kg</td><td>90/100</td><td>760</td><td>630</td></tr><tr><td>150kg</td><td>90</td><td>790</td><td>630</td></tr><tr><td>300kg</td><td>210</td><td>820</td><td>630</td></tr><tr><td>500kg</td><td>210</td><td>910</td><td>630</td></tr><tr><td>1,000kg</td><td>210</td><td>1,140</td><td>630</td></tr></table>	Coil Size(mm)					a	b	c	25kg	75/100	410/420	305/315	30kg	95	400	305	75kg	90/100	740	630	100kg	90/100	760	630	150kg	90	790	630	300kg	210	820	630	500kg	210	910	630	1,000kg	210	1,140	630	  <table><tr><th colspan="2">Box Size(mm)</th></tr><tr><td>d</td><td>80</td></tr><tr><td>e</td><td>430</td></tr><tr><td>f</td><td>430</td></tr></table>	Box Size(mm)		d	80	e	430	f	430
Coil Size(mm)																																																		
	a	b	c																																															
25kg	75/100	410/420	305/315																																															
30kg	95	400	305																																															
75kg	90/100	740	630																																															
100kg	90/100	760	630																																															
150kg	90	790	630																																															
300kg	210	820	630																																															
500kg	210	910	630																																															
1,000kg	210	1,140	630																																															
Box Size(mm)																																																		
d	80																																																	
e	430																																																	
f	430																																																	
Basket Spool	 <table><tr><th colspan="2">Spool Size(mm)</th></tr><tr><td>a</td><td>103</td></tr><tr><td>b</td><td>413~419</td></tr><tr><td>c</td><td>297~303</td></tr></table>	Spool Size(mm)		a	103	b	413~419	c	297~303																																									
Spool Size(mm)																																																		
a	103																																																	
b	413~419																																																	
c	297~303																																																	
Drum	Please refer to "Wire Drums" chapter on the next page.																																																	

Pallet											
25kg coil	1,200kg  <table> <tr> <th colspan="2">Pallet Size(mm)</th></tr> <tr> <td>A</td><td>840</td></tr> <tr> <td>B</td><td>130, 160</td></tr> <tr> <td>C</td><td>1,320</td></tr> <tr> <td>D</td><td>860</td></tr> </table>	Pallet Size(mm)		A	840	B	130, 160	C	1,320	D	860
Pallet Size(mm)											
A	840										
B	130, 160										
C	1,320										
D	860										

6 Wire Spool Details (Plastic Spool / Basket Spool)

Plastic Spool

Spool Design



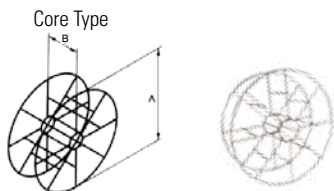
Spool Size(mm)

USAGE	A	B	C
FCW / Solid Wire 5kg	55	52	199~200
FCW 6.8 kg	72	52	203~204
FCW 12.5kg	100~102	52~53	279~280
FCW 15kg / Solid Wire 15~20kg	100~102	52~53	269~270
FCW 20kg	100~102	52~53	279~280

Material: HIPS (HIGH IMPACT POLYSTYRENE)

Basket Spool

Core Type

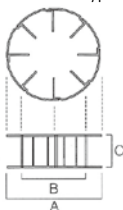


Spool Size(mm)

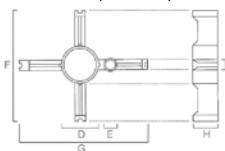
USAGE	A	B
FCW 15kg / Solid wire 15~20kg	298~300	99~100

Coreless Type

Coreless Type



Basket Spool Adaptor



Spool Size(mm)

USAGE	A	B	C	D	E	F	G	H	I
FCW 15kg / Solid wire 15~20kg	298~300	180~182	98	55	13	180	220	97	18
Submerged Wire 25kg	413~419	297~303	103	-	-	-	-	-	-

* Wire Length

Diameter (mm)	Weight (kg)	Length (m)
Solid Wire		
0.8	20	5,470
0.9		4,285
1.0		3,445
1.2		2,370
1.4		1,730
1.6		1,320
FCW		
1.2	15	2,080
1.4		1,520
1.6		1,155
Submerged Wire		
2.0	25	1,045
2.4		720
3.2		400
4.0		255
4.8		175
5.0		165
6.4		100

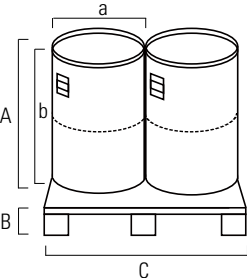
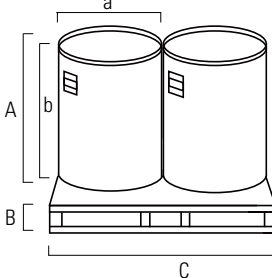
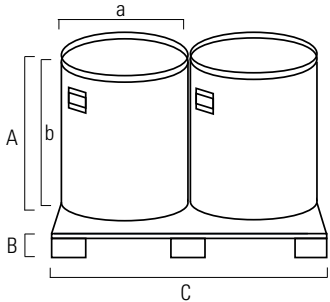
HYUNDAI Standard Packaging

7 Wire Drums

Wire Drum Pak Brands

HYUNDAI Drum Solutions		
BALL PAC	MAX PAK	ECO PLUS
		

Wire Drum and Pallet Size Details

Drum			
Size	Type 510	Type 570	Type 660
a	510	570	660
b	810,870	575,810	810,870
b (Half)	500,590		
  			
Pallet			
Size	Type 510	Type 570	Type 660
A	820,880	590,820	820,880
B	130,160	130,160	130,160
C	1,070	1,150	1,340
D	550	580	670

8 Submerged Flux

Package Types

Package Type			
TIN CAN	PE BAG	PAPER BAG	
			
Package Size			
Size	TIN CAN	PE BAG	PAPER BAG
a	235	70	75
b	235	365	415
c	375	655	650
Remarks	VACUUM PACK		

Pallet Size Details

A 3D perspective diagram of a pallet loaded with tin cans. The cans are arranged in a rectangular block. Dimension A is the height of the stack. Dimension B is the width of the stack. Dimension C is the length of the stack. Dimension D is the depth of the stack.

A 3D perspective diagram of a pallet loaded with white PE bags. The bags are arranged in a rectangular block. Dimension A is the height of the stack. Dimension B is the width of the stack. Dimension C is the length of the stack. Dimension D is the depth of the stack.

A 3D perspective diagram of a pallet loaded with red and yellow paper bags. The bags are arranged in a rectangular block. Dimension A is the height of the stack. Dimension B is the width of the stack. Dimension C is the length of the stack. Dimension D is the depth of the stack.

Pallet

Size	TIN CAN	PE BAG	PAPER BAG
A	750	560	650
B	130	160	160
C	1,170	1,210	1,210
D	930	970	970

SWAW

SAW

GMWAW

GTAW

FCWAW

Non-FERROUS

APPENDIX

HYUNDAI Drum Solutions

HYUNDAI BALL PAC®



HYUNDAI BALL PAC® is a new and improved version of our original Pail pack. Our patented 'marble' system, acts as a 'non-static' resistance on top of the wire. The marble add weight on the wire to ensure that only one strand, at a time, is picked up. With the shape and weight of the 'marbles', the wire pulls up and out of the Ball Pac consistently and without the normal static resistance found with other drum systems. Our wire is pulled out with minimum resistance and seamless feedability is the end result.

For more details about HYUNDAI BALL PAC®, please refer to the following chapter.

HYUNDAI MAX PAK®



Easy to check the remaining wire as no drum is installed inside the pak. Designed as a pressing plate by step method which minimizes the wire feeding resistance, also adopted a practical design to prevent tangling during wire feeding. Likewise by removing the drum and using a light-weighted pressing plate, the light weighted pak could be launched.

Therefore it is easy to carry and handle. It will be more likely to find out its convenience with advantages as this item made the best use of our ball pak type, which our company feels proud of.

HYUNDAI RING PAK®



The newly developed RING PAK® can effectively prevent wire from any tangling in spite of insufficient winding quality. In a feedability comparison test with previous models, it shows predominant feedability and weldability.

As a result of minimized resistance in feedings, it guarantees Superior feedability, Excellent seam tracking, consistent penetration and the straight in bead appearance.

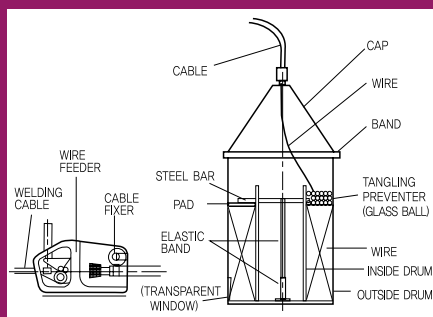




HOW TO USE

IMPORTANT

- Use all the balls packed inside.
- Only use the balls for their intended purpose.
- Do not put balls in mouth or roll them on the floor.
- Be careful not to drop balls on the floor, serious injuries can result.



• Before use – When installing



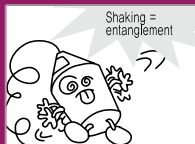
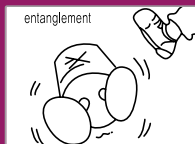
CAUTION

1. STORAGE
2. TRANSFER
3. USE CAP
4. CABLE ESTABLISH
5. CLEANING

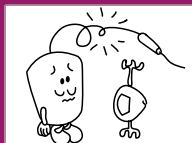
① STORAGE



② TRANSFER



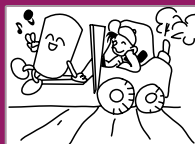
③ USE CAP



④ CABLE ESTABLISH



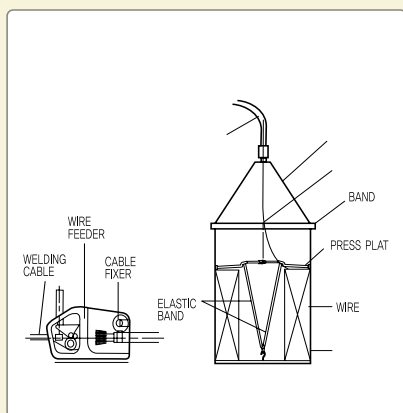
⑤ CLEANING



HYUNDAI Drum Solutions



How TO USE



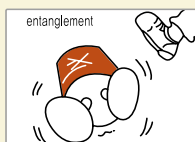
• Before use – When installing



CAUTION

1. STORAGE
2. TRANSFER
3. USE CAP
4. CABLE ESTABLISH
5. CLEANING

② TRANSFER



① STORAGE



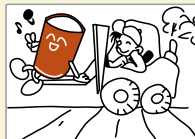
③ USE CAP



④ CABLE ESTABLISH

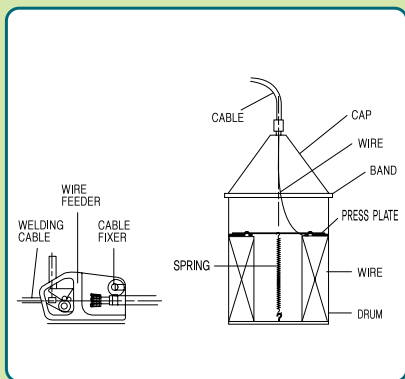


⑤ CLEANING





HOW TO USE

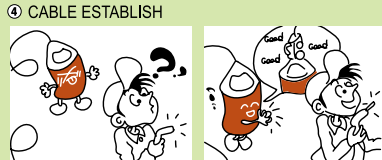
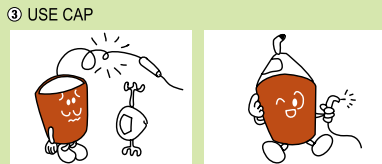
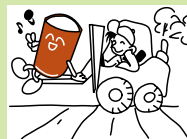
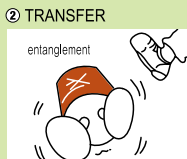
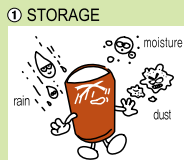


• Before use – When installing



CAUTION

1. STORAGE
2. TRANSFER
3. USE CAP
4. CABLE ESTABLISH
5. CLEANING



HYUNDAI BALL PAC®

HYUNDAI BALL PAC® is a new and improved version of our original Pail Pack. Our patented 'marble' system, acts as a 'non-static' resistance on top of the wire, The marbles add weight on the wire to ensure that only one strand, at a time, is picked up. With the shape and weight of the 'marbles', the wire pulls up and out of the Ball Pac consistently and without the normal static resistance found with other systems. Our wire is pulled out with minimum resistance and seamless feedability is the end result.

Hyundai hard wires are 'pre-tensioned' before being put into the Ball Pac. Meaning, our wire has little to no cast and helix when coming out of the Ball Pac and the 'straightness' of the wire will give more accurate and consistent starts and weld tracking. This is most ideal for robotic applications. As the wire has no cast, you can decrease the tip diameter by one size ("Except in the case of .052"). This will ensure that the wire is in constant contact with the tip (better current transfer) and will increase the accuracy of the weld.

Another major factor in the quality and consistency of Hyundai hard wire is the method of coppercoating the wire. Hyundai Welding is one of the few companies in the world, who are currently using the Electronic Coating process. With this State-of-the-Art coating process, the user will experience the following benefits

- 1) Better Feedability : due to the 'even' coating of copper, feedability is more consistent. Resulting in lower feed resistance.
- 2) Copper Flaking : since wire is coated electronically, the adherence of the copper on the wire is 100% as the coating is evenly applied thus, rendering 'copper-flaking' obsolete. No more clogged or damaged liners.
- 3) Current Transfer : the current transfer will be more consistent due to the 'evenness' of the copper coating
- 4) Less Fume : with the even and consistent copper coating, there are less fumes than conventional chemically-coated wires on the market today.

1 Characteristics of Product

- 1) Excellent feeding.
Minimizing friction as it possesses a device developed for the prevention of twisted and tangled wire, thus, resulting in a smooth feeding action and stable arc, which facilitates welding.
- 2) Makes good tracking on a welding seam.
Wire is set to be elastically twisted in the pail, so wire is pulled out straight, without rotation of the pail.

3) Improved welding efficiency.

The large-packaged wire can save time in change wire, which is effective, particularly, for robotic and other automatic welding.

4) Pressure device system, deformation in “stacked” state with anti-tangling pressure device system, deformation of the wound wire is greatly minimized or, as in most cases, has now become obsolete.

2 Type of Product

Packing Weight	Classification	Solid Wire/FCW
50kg(110lbs), 100kg(220lbs) 150kg(330lbs), 200kg(440lbs) 250kg(551lbs), 300kg(661lbs) 350kg(772lbs), 400kg(882lbs) 420kg(926lbs), 500kg(1,102lbs)		0.9ø(.035in), 1.0ø(.039in) 1.2ø(.045in), 1.4ø(.052in) 1.6ø(1/16in)

3 Size of Feeder

Classification		Drum	510 Type	660 Type
CAP	Outer dia. mm(in)		510(20.1)	660(26)
	Height mm(in)		300(11.8)	500(19.7)
FLEXIBLE CABLE	Outer dia. mm(in)		11(0.43)	11(0.43)
	Length(m)		1,2,3,4,5	1,2,3,4,5
CABLE FIXER			FLEXIBLE CABLE FIXING	

4 Caution

- 1) Keep in dry and moisture-free location.
- 2) Move on a pallet when moving individually, keep it standing up right, using the ring attached to container with the lid closed.
- 3) Severe impact can deform wire shape and cause poor feeding.
- 4) Laying down or tilting can entangle wire in container, which hinders usage.
- 5) Flexible cable needs periodic cleaning.
- 6) Make sure you use all the balls found inside.
- 7) Do not spill the glass balls on the floor to prevent from falling down.

Safety Warnings



WARNING

- Be sure to follow the safety practices stated in the following in order to protect welders, operators and accompanied workers from a serious accident resulting in injury or death.

- Be sure to follow the safety practices stated in the following when you use welding consumables.
- Be sure to follow the safety practices stated in the instruction manual when you use welding equipment.



WARNING



- Electric shock can kill.

- Do not touch live electrical parts. (A covered electrode held with an electrode holder and a wire in welding are electrically live.)
- Wear dry, insulated gloves. Do not wear teared and wet gloves.
- Use an electric shock preventing device (open-circuit-voltage-reducing device) when welders or operators work in confined or high-level spaces. Use also a lifeline when a welder or an operator conducts welding at a high-level area.
- Follow the safety practices stated in the instruction of the welding machine before you use. Do not use a welding machine case or cover of which is removed. Welding cables must be a size adequate for the capacity expected. Welding cables must be maintained, and a damaged cable must be repaired or replaced one.



WARNING



- Fumes and gases generated in welding can be dangerous to your health.
- Welding in confined spaces can be dangerous for suffocation because of oxygen deficient atmospheres.

- Keep your head out of the source of gases to prevent from directly breathing high density fumes or gases.
- Use local exhaust ventilation, or wear respirators in order to prevent you from breathing fumes and toxic gases which cause toxication, poor health and suffocation by oxygen deficient atmospheres.
- Use general ventilation for welding in the workshop. Particularly in welding in confined spaces, be sure to use adequate ventilation, or wear respirators at the presence of a trained supervisor.
- Do not weld where operations of degreasing, cleaning, spraying, and painting are present nearby. Welding work close to these operations may cause a generation of harmful gases.
- Use adequate ventilation or respirators with special attention in welding plated and coated steel.
- Use respirators, eye safety glasses and safety leather gloves when handling welding fluxes in order to prevent you from the flux dust.



WARNING



- Arc rays can injure eyes and burn skin.

- Wear hand shields with an adequate grade of shade in welding and supervising the welding work.
- Select the correct grade shade for filter lenses and filter plates suitable for exact welding work by referring to the standard of JIS T8141.

- Wear protectors suitable for preventing contact with arc rays, such as safety leather gloves for welding, long sleeve shirts, foot covers, leather aprons, etc.
- Use, as needed shade curtains for welding by surrounding the welding areas in order to prevent accompanied workers from the arc rays.



WARNING



- The tips of the welding wires and filler wires can injure eyes, face, etc.

- Do not lose your hold on the wire when taking off the tip of the wire.
- Do not point the welding torch towards your face when checking the wire feeding condition.



WARNING



- Falling down and dropping welding consumables can injure you.

- Wear safety shoes, and pay your attention not to drop welding consumables on your body when you carry and handle them. Keep your posture correct not to cause a crick in your back while handling them.
- Pile up welding consumables so that falling down and dropping cannot take place while storing and carrying them.



WARNING



- Fire and explosion can take place.

- Never weld in areas adjacent to highly inflammable materials. Remove consumables so that spatter cannot ignite them. If combustibles cannot be removed, cover them with a nonflammable material.
- Do not weld a vessel or PiPe which contains combustibles or being sealed.
- Do not Put a hot weldment close to combustibles right after welding finished.
- When welding ceiling, floors, walls, etc, remove combustibles at the other side of them.
- Any part of welding wire, with exception of wire extended at the tip of the torch, must be free from touching on the electrical circuit of the base metal side.
- Fasten the cable joints and seal them in a insulation tape. The cable for the base metal side should be connected closer to the part of welding.
- Be ready to cope with a possible accident by equipping fire-extinguishing equipment adjacent to the welding areas.



WARNING



- Flying spatters and slags can injure eyes and cause burn skins.
- High temperature heat in welding can cause burn skins.

- Wear safety glasses, safety leather gloves for welding, long sleeve shirts, foot covers, leather aprons, etc.
- Do not touch weldments while hot.

Storage and Handling

SMAW

1 Storage and handling Standard of Welding Electrode

When releasing the thoroughly dried welding materials, the proper storage place is needed to prevent it from the moisture absorption, so it is necessary for worker's convenience to place the drying cabinet which is consistently under the temperature of 100~120°C.

The moisture absorption of welding materials highly depends on the climate condition. So everytime when releasing the dried materials, it is an ideal way to select the limited working time and checking the temperature and humidity. However, practically it is almost impossible to do it due to the working condition of the site. Therefore, to resolve this problem, it is essential to select the standard setting of the worst condition.

Recently, in case of low hydrogen type electrode, we set up the moisture absorption limit under 0.6% and the standard considering every condition of workability as follows;

- 1) Put it in a drying road immediately after replacing the package.
- 2) Store it in a holding over right after the redrying.
- 3) Using a portable drying machine before distribution in the actual site
- 4) Forecast the total quantity of demand for work(remaining electrodes should be retrieved and using again after redrying)

2 Drying welding electrode and its moisture content

- 1) When packing the mild steel welding electrode, moisture content has to be managed as approximately 1.0%.
- 2) When packing the Low-hydrogen welding electrode after high temperature drying, moisture content has to be 0~0.5%.
- 3) The moisture absorption degree of Mild and Low Hydrogen welding electrode.
 - a. Mild-steel welding electrode absorbs approximately 3% of moisture in 8 hours of exposure in the atmosphere(30°C relative humidity 80%)
 - b. Low-hydrogen welding electrode absorbs approximately 0.6% of moisture after completely dried in 5hours in the atmosphere. (30°C relative humidity 80%)
- 4) Drying conditions.
 - a. When redrying the welding electrode, I has to follow the proper drying (60mins) time and temperature and drying time should not be shorter than 30mins.
 - b. When the temperature exceed the maximum marginal temperature(depending on type of electrode), it lower the workability due to the crack and alteration of coating materials.
 - c. Low-hydrogen electrode has to be dried in the temperature of 300°C for 1 hour and Mild-steel electrode doesn't need to be re-dry when storing in the warmed storage.

3 Redrying and temperature maintenance of shielded metal arc welding electrode

Redrying and temperature maintenance of welding electrode (AWS A5.1-91 Appendix Table A2)

AWS Classification	Redrying	Temperature Maintenance
E6010,E6011	-	-
E6012, E6013, E6019, E6022, E6020, E6027, E7014, E7024, E7027	120~150°C 1 hour	12~24°C
E7015, E7016, E7018, E7028, E7048, E7018M	260~427°C 1 to 2 hours	30~140°C

Redrying condition of welding electrode

Steel type	Covering material type	Product name	Limited moisture absorption ratio (%)	Dry Temp. (°C)	Dry Time (min.)
Mild Steel	Ilmenite	S-4301.I	2.5	70~100	30~60
	Lime titania	S-4303.V, S-4303.T	2.0		
	High cellulose	S-6010.D, S-6011.D	5.0		
	High oxidized titania	S-6013.LF, S-6013.V, S-7014.F, S-7024.F	3.0		
	Iron oxidized steel	S-6027.LF	2.0		
High Tensile Steel	Low hydrogen	S-7016.H, S-7016.LF, S-7016.M, S-7016.G, S-7016.O, S-7048.V	0.5	300~350	30~60
		S-7016.HR, S-8016.G, S-9016.G, S-10016.G, S-11016.G	0.5	350~400	60
	Iron powder low hydrogen	S-7018.G, S-7018.1, S-7028.F, S-8018.G, S-9018.M, S-11018.M, S-7018.W, S-8018.G	0.5	300~350	60
Weather Proof Steel	Iron powder low hydrogen	S-7018.W, S-8018.W	0.5	350~400	60
Low-temperature Service Steel	Low hydrogen	S-7016.LS, S-76LTH, S-8016.C1, S-8016.C2, S-8016.C3	0.5	350~400	60
	Iron powder low hydrogen	S-7018.1, S-7018.1H, S-78LTH, S-8018.C1, S-8018.C3			
Low Alloy, Heat Resist Steel	High cellulose	S-7010.A1	5.0	70~100	30~60
	Low hydrogen	S-7016.A1, S-8016.B1, S-8016.B2, S-9016.B3, S-8016.B5, S-8016.B6, S-9015.B9, S-9016.B9, S-9015.B92, S-9016.B92	0.5	350~400	60
	Iron powder low hydrogen	S-7018.A1, S-8018.B2, S-9018.B3, S-8018.B2R, S-9018.B3R			
Hard Facing Steel	Titania	S-240A.R, S-350B.B	2.0	70~100	30~60
	Low hydrogen	S-260A.B, S-350B.B, S-450B.B, S-500B.B, S-600B.B, S-700B.B, S-711, S-13MN.B	0.5	350~400	60
Stainless Steel	Lime titania	S-308(L).16N, S-309(L).16N, S-309Mo(L).16, S-316(L).16N, S-347.16, S-310.16, S-312.16, S-308L.17, S-316L.17, S-307.16, S-317.16, S-308LT.16, S-316LT.16, S-22019.16	1.0	300~350	30~60
Cast Iron	Graephite	S-NCI, S-NFC, S-FCF	1.5	70~100	30~60
Special Alloy	Low hydrogen	SR-134, SR-182, SR-133, SR-625	0.5	350~400	60

SMW

SAW

GMAW

GTAW

FCAW

Non-FERROUS

APPENDIX

Storage and Handling

SAW

1 Storage and handling

Hyundai Welding Submerged Arc Welding (SAW) Flux are basically manufactured from calcinated minerals which have been heated at high temperatures (400~1000°C) which gives excellent storage properties. The Hyundai Fluxes have a moisture content with a nominal level of max. 0.10% determined at 1000°C.

It is of great importance for the quality of the weld metal that moisture content is kept as low as possible.

Hyundai has set the following guidelines for handling to avoid these incidents:

- 1) Unopened cans/bags must be stored under warm and dry conditions. It is important that these conditions are maintained continuously.
- 2) Unopened cans/bags should not be exposed to direct moisture such as rain or snow.
- 3) Dry the flux at 300~350°C(572~662°F) for 60minutes before use.
- 4) Remaining flux from opened cans/bags or flux hopper should be stored at a temperature of 150±25°C.

If the fluxes have become wet, it could be possible to return the fluxes to their original state by redrying.

2 Redrying

When handled and stored according to the directions given earlier, redrying of the flux can restore its original condition of moisture content should the flux pick up moisture due to unfavorable handling and storage.

Redrying is recommended to perform as follows: (Agglomerate Fluxes)

Recycle (Times)	Redrying (325±25°C)	Recommend to use (New flux : Redried flux)
1st	1 hour	-
2nd	2 hours	1 : 1
3rd	3 hours	1 : 1
4th	4 hours	1 : 1

Redried flux which is no immediately used should be stored at 150±25°C.

3 Recycling

Oil and moisture must be removed from the compressed air used in the recycling system. Foreign materials such as mill scale, dross etc. should be removed by a suitable method e. g: sieving and magnetic separation. Non consumed flux, collected from the weld, shall be cleaned from slag, mill scale, and dross etc.

* Generally, Recycling is recommended less than five times.

4 Redrying condition of welding flux

Steel type	Flux type	Product name	Limited moisture absorption ratio (%)	Dry Temp. (°C)	Dry time (min)
Flux Submerged	Agglomerated	S-707, S-707T, S-717, S-727, S-737, S-707TP, S-705EF, S-705HF, S-777MX, S-777MXH, S-777MXT, S-800MX, Superflux 800T, S-800WT, S-800SP, S-900SP, S-787TB, S-787TT, Superflux 55ULT, Superflux 55LP, S-460Y, S-800CM, S-400HF, Superflux 300S, Superflux 787, S-Ni2, Superflux 600, Superflux 800, S-800P, S-100	0.1	250~300	120

Storage and Handling

FCW

1 How to Store FCW

To prevent contamination on the surface of the FCW wire the spool must be covered and in case of rough handling, a crack may occur in the surface. In case of long period storage after opening the package pay attention that any crack may occur in the surface of the wire, in case of re-use try to keep any oil, grease substance from the wire surface to avoid absorption.

2 FCW Absorb prevention management

Generally to improve anti-corrosive effects of the Flux Cored Wire the surface is treated by bluing or any other surface treatment process and to improve long-term storage effects it is packaged by anti-rust volatile plastic.

As part of the welding material management process, it must comply with the following instructions to get the best welding consumable quality.

1) Storage and handling

Appropriate conditions, i.e., wrapped in a Spool or Coil standard package in a place with a temperature not exceeding $30\pm 10^{\circ}\text{C}$ and humidity less than 50~70% can prevent from any damage produced by humidity and contamination. Especially when the diffusion of the deposited metal can be guaranteed it has to be wrapped in vacuum packed or any other appropriate method.

- (1) Welding material in its first packaging must be stored on a wood stand in a dry and well-ventilated place with at least 10cm or more away from the wall and the floor.
- (2) Welding material should be stored classifying it in order of specification, product name, and OD.
- (3) To avoid any external damage, the welding material should be treated with care.

2) Redrying

Generally because the wire surface and interior of the FCW absorbs the metal powder it may cause porosity in the weld metal, which can be prevented by redrying the welding material.

The redrying time is determined depending on the package specifications. Redrying at 150°C for at least 5 hours those products in a coil, wire basket or masonite spool, 50°C for at least 48 hours those in a plastic spool. Always retire the plastic bag in the redrying process.

3) Cautions

- (1) The welder has to recollect the necessary amount of welding material for use to avoid maximum exposure.
- (2) When finished the welding work the FCW must be protected from moisture.
- (3) In case of using the FCW as welding material in welding work after rested 4 hours or more please comply one of the following methods to prevent moisture absorption.
 - Remove the FCW from the feeding device and keep it in a plastic bag.
 - Remove the FCW from the feeding device and store it in a dryer oven at $30\pm 10^{\circ}\text{C}$, maximum humidity of 60%.
 - It is not necessary to remove the FCW from the feeding device 4 hours before performing again weld-work (In case of rain or high humidity of 1 hour or less)

SWAW

SAW

GMMAW

GTAW

FCAW

Non-FERROUS

APPENDIX

1ST EDITION	1989. 9.
2ND EDITION	1998. 11.
3RD EDITION	1999. 1.
4TH EDITION	2001. 8.
5TH EDITION	2003. 2.
6TH EDITION	2004. 9.
7TH EDITION	2005. 8.
8TH EDITION	2006. 12.
9TH EDITION	2008. 1.
10TH EDITION	2009. 1.
11TH EDITION	2010. 4.
12TH EDITION	2011. 6.
13TH EDITION	2013. 5.
13TH EDITION (REVISED)	2013. 8.
14TH EDITION	2014. 7.
14TH EDITION (REVISED)	2016. 2.
15TH EDITION	2019. 3.

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