SOREX WELDING CO.,LTD.

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Stick Electrodes (SMAW)

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Stick Electrodes (SMAW)

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SFC-2209B	A5.22 E2209T1-1	ISO 17633-A T 22 9 3 N L P C1 2	T17853 E2209T1-1	199
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SMG-6	A5.18 ER70S-6	ISO 14341-A G 42 3 C1/M21 3Si1	T8110 ER50-6	63
SMG-8	A5.18 ER70S-G	ISO 14341-A G 42 3 C1/M21 Z	T8110 ER50-G	64
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SMG-308H STG-308H	A5.9 ER308H	ISO 14343-A G/W 19 9 H	YB/T5092 H08Cr21Ni10Si	206
SMG-309L STG-309L	A5.9 ER309L	ISO 14343-A G/W 23 12 L	YB/T5092 H03Cr24Ni13Si	206
SMG-309MoL STG-309MoL	A5.9 ER309LMo	ISO 14343-A G/W 23 12 2 L	YB/T5092 H03Cr24Ni13Mo2	206
SMG-309LSi STG-309LSi	A5.9 ER309LSi	ISO 14343-A G/W 23 12 L Si	YB/T5092 H03Cr24Ni13Si1	206
SMG-310 STG-310	A5.9 ER310	ISO 14343-A G/W 25 20	YB/T5092 H12Cr26Ni21Si	206

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SMG-316L STG-316L	A5.9 ER316L	ISO 14343-A G/W 19 12 3 L	YB/T5092 H03Cr19 Ni12Mo2Si	206
SMG-316LSi STG-316LSi	A5.9 ER316LSi	ISO 14343-A G/W 19 12 3 L Si	YB/T5092 H03Cr19 Ni12Mo2Si1	206
SMG-317L STG-317L	A5.9 ER317L	ISO 14343-A G/W 18 15 3 L	YB/T5092 H03Cr19Ni14Mo3	206
SMG-347 STG-347	A5.9 ER347	ISO 14343-A G/W 19 9 Nb	YB/T5092 H08Cr20Ni10Nb	206
SMG-409Cb	A5.9 ER409Cb	--	--	206
SMG-410 STG-410	A5.9 ER410	ISO 14343-A G/W 13	YB/T5092 H12Cr13	206
SMG-410NM STG-410NM	A5.9 ER410NiMo	ISO 14343-A G/W 13 4	YB/T5092 H06Cr12Ni4Mo	206
SMG-420 STG-420	A5.9 ER420	--	--	206
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SMG-439Ti STG-439Ti	A5.9 ER439	--	--	206
SMG-630 STG-630	A5.9 ER630	--	YB/T5092 H05Cr17Ni4CuNb	206
SMG-2209 STG-2209	A5.9 ER2209	ISO 14343-A G/W 22 9 3 NL	YB/T5092 H03Cr22Ni8Mo3N	206
SMG-2594 STG-2594	A5.9 ER2594	ISO 14343-A G/W 25 9 4 NL	--	206
For Nickel and Nickel Alloy				
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SMG-625 STG-625	A5.14 ERNiCrMo-3	ISO 18274 S Ni 6625	T15620 ERNiCrMo-3	280
SMG-276 STG-276	A5.14 ERNiCrMo-4	ISO 18274 S Ni 6276	T15620 ERNiCrMo-4	280
SMG-622 STG-622	A5.14 ERNiCrMo-10	ISO 18274 S Ni 6022	--	280
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For 490N/mm² High Tensile Steel				
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SF-65 SW-M12K	A5.17 F7A2-EM12K	ISO 14171-A S 42 3 AB S2Si	T5293 F5A3-H08MnA	71
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SF-66 SW-M12K	A5.17 F7A4/P4-EM12K	ISO 14171-A S 42 5 FB S2Si	T5293 F5A4/P4-H08MnA	72
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SF-30 SW-316/316L	A5.39 ER316/316L	ISO 14343-A S 19 12 3 L	--	210
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For Stainless Steel Strip Electrodes(SAW)				
SFB-S300 SB-308L	A5.39 EQ308L	--	--	211
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For Hardfacing				
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Company profile

Enterprise Spirit

Ambition, Innovation and Execution are a core spirit of Sorex. Quality satisfacation is a theoretical belief to foster a postive attitude throughout the process. Go through 40s-year experience in the production and development; the company has geared with its professional capability to challenge and meet significant requirements in the worldwide.

Quality Policy

Professional Quality, Staff Participation, Customer Satisfaction and Improvement Sustainability are basic principles in the quality policy. Mechanical, Material and Chemical relevant majors in school are a primary wanted in the employment. Quality system in the process is necessary to be equipped with International Standards as ISO 9001, 14001, 45001, and Global Shipping Class. Those are a promise to customers, that of offering hi-end satisfaction and quality.

Business Belief

Diligence, Practice, Innovation and Excellent Quality are a business belief in the management. Take control carefully in the production and process; practice the company's belief and policy as a must. Meet the customers' requirements as the basis and go beyond the customers' expectation as the top principle we pursue. Market growth, hi-quality offering, and reasonable prices are we do together with.

Environment-Friendly

At Sorex, we are concerned about human health and environment-friendly as a core of business management and operation. Set up Internal dust-system collection equipment and sewage-treatment solution, that of qualifying for International Organization Standards as ISO 14001 and 45001 grades. Maintaining an 11,600 m2 green ground at Sorex is to make an environmental greening phenomenon.

Applications for Market segments


Shipbuilding


Energy/ power plant

Shipbuilding

Features:

SOREX WELDING provides electrodes and wire with low fume, suitable for zinc primer, anti-cracks, and sound impact toughness at low temperature. To meet shipbuilding vessel demand, SOREX also approved by various naval classification certificates (ABS, BV, CCS, CR, DNV-GL, KR, LR, NK, RINA).

Welding electrodes recommended:

SL-58, SLH-58, SS-308L, SS-309L, SS-316L, SFC-71, SFC-71J, SFC-75, SFC-70C, SFC-308L, SFC-309L, SFC-309MoL, SFC-316L, SFC-317L, SFC-2209, SMG-6, SF-65*SW-M12K, SF-66*SW-M12K

Reference:

Project name	Products adopted
CSSC-Yang Ming Marine Transport Corp. 14000TEU container ship	SFC-71
CSSC-Semi Submersible working vessel	SFC-71
L&T MFF- Cluster 8 project	SFC-71

Energy/ power plant

Features:

In order to meet various power plant demands, Sorex Welding offer low hydrogen, low impurities, high anti-cracks, high temperature resistance composition electrodes and welding wires.

For Power Plant (coal, heavy oil, Natural Gas):

SR-88B2, SR-98B3, SR-86B6, SR-86B8, SR-96B9, SW-88W2, SS-308H, SS-310,SS-309MoL, SS-317L, SS-410NM, SFC-81B2, SFC-91B3, SFC-81W2, SFC-309MoL, SFC-317L, SFC-410NM, STG-80B2, STG-90B3, STG-80B6, STG-90B9, STG-410NM

For Nuclear Power Plant:

SL-58, SR-88B2, SS-308L, SS-316L, STG-52, STG-308L, STG-316L

Reference:

Project name	Products adopted
Taiwan Power Company-Linkou Thermal Power plant expansion plan, Main Generator Turnkey project	SL-50, SS-308L, SFC-71, SFC-81W2, SFC-308L, SFC-309MoL, SFC-316L, STG-50, STG-52, STG-308, STG-316, STG-276, STG-625
Thong Siau Plant	SW-88W2, SFC-81W2
Main Generator Turnkey Project & Pressure Vessel Project	SFC-71, SMG-8, SF-65*SW-M12K
Xingda Power Plant-Coal unloading system improvement Project	SFC-71, SFC-309L
Xingda Power Plant-Boiler No. 1, 2 improvement & SCR Implant Project	SW-78W1


Steel Structure
Ocean Engineering

Steel Structure

Features:

SOREX WELDING provides welding consumables with high deposition rate, excellent pit resistance, superior crack resistance and good weldability. Products apply to domestic and overseas bridge and building by high tensile steel series.

Welding electrodes recommended:

SM-03, SM-13, SM-10, SL-50, SL-56, SL-60, SN-98G, SW-78W1, SW-88W2, SFC-71, SFC-70C, SFC-81N1i, SFC-81W2, SFC-91Ni2, SMG-8, SMG-60, SF-65*SW-M12K, SF-75*SW-M12K, SF-68*SW-60G, SF-78*SW-60G, SFC-721, SF-60*SWE-60G

Reference:

Project name	Products adopted
Farglory group-The One (O1) building project constructed by CSSC.	SFC-71, SFC-81Ni1, SF-65*SW-M12K, SF-68*SW-60G
CYSCO-Kaohsiung Library	SFC-71, SFC-81Ni1
Huanhei Expressway Taipei Urban-Taipei County side Sluice road to Huajiang Bridge project by CSSC	SFC-71
Taichung City Government New Building project by JHO	SFC-81Ni1
Taiyuan Airport MRT by CSSC, CYSCO	SL-50, SL-60, SS-309L, SFC-71, SFC-70C, SFC-81Ni1, SFC-308L, SF-65*SW-M12K, SF-68*SW-60G
Far Eastern Memorial Hospital Phase 2 project by Tung Ho Steel Enterprise Corp.	SL-50D
Taipei Xinzhuang Fuduxin-Central office building by Tung Ho Steel Enterprise Corp.	SL-50D, SFC-71, SFC-70C, SF-65*SW-M12K, SF-68*SW-60G
National Road No. 1 Wugu to Yangmei section steel structure bridge expansion by Evergreen Steel Corp.	SFC-71, SFC-70C, SF-65*SW-M12K
NPAC-Weiwuying Kaohsiung by CYSCO	SFC-71
Kaohsiung Exhibition Center by Evergreen Steel Corp.	SFC-71, SFC-70C
Taipei Performing Arts Center by CAMPI	SFC-71
Taozhu building by Evergreen Steel Corp.	SL-50D, SL-60, SFC-71, SFC-81Ni1, SFC-110
Southern Branch of the National Palace Museum by Evergreen Steel	SL-50D, SFC-71

Ocean Engineering

Features:

Provide the welding consumables with moisture resistance, low hydrogen content, low temperature impact value, high resistance to cracking, strong wind, excellent weldability of marine structures to meet the welding requirement of offshore drilling platform, drilling tower welding.

Welding electrodes recommended:

SLH-58, SN-98G, SL-118M, SFC-71J, SFC-91Ni2, SFC-110


Pipeline


Maintenance

Pipeline

Features:

Provide the welding consumables of low-phosphorus, low hydrogen content, high impact performance, low spatter, deep penetration, strong wind resistance, excellent controlling ability of low-temperature pipe welding with self-shielding wire, particular used for API X70, API X80 low temperature pipeline Steel.

Welding electrodes recommended:

SC-10, AFL-X70-O, AFR-X80-O

Reference:

Project name	Products adopted
CPC-Taichung Port LNG storage pipes project Phase 2	STG-308L
CPC-Linyuan Plant-6th naphtha cracking	SFC-71, SL-50, STG-56, SFC-308H SS-309, SS-310
China Petroleum Corp project	AFL-X70-O, AFR-X80-O
CPC corporation, Taiwan Rifining Business Division Dalin Plant D-HDS project	STG-50, SL-50
CPC corporation, Taiwan RFCC project	STG-316L, SS-316L
CPC corporation, Taiwan Rifining Business Division Dalin Plant Sulfur Recovery Unit 10th construction project	STG-50, STG-309L, SS-308 SS-309L, STG-308

Maintenance

Features:

Provide hard facing welding consumables of repair and maintenance purpose which can be applied to high temperature abrasion resistance, impact resistance, corrosion resistance, high hardness and special alloy composition to meet the requirement from steel mills, Ore field, cement plant, machinery equipment and other industries.

Welding electrodes recommended:

SH-45, SH-45R, SH-80, SH-80R, SH-90, SH-90HS, SH-90HC, SH-90HN, SH-MN, SFH-45G, SFH-58G, SFH-58GM, SFH-59G, SFH-61GM, SFH-63G, SFH-67NMG, SFH-61-O, SFH-67-O, SFH-70-O, SFH-MNG, SFH-22S*SF-82, SFH-42S*SF-80, SFH-53S*SF-80

Reference:

Project name	Products adopted
CC roller rebuild by CSC	SFH-42S*SF-80, SFH-22S *SF-82, SFH-53S*SF-80
CC roller rebuild by Dragon steel	SFH-42S*SF-80

Heavy Equipment

Features:

SOREX WELDING electrode and wire design could provide high deposition rate, high current tolerance, superior crack resistance and good weldability. SOREX WELDING could fulfill customer´s heavy equipment demands.

Welding electrodes recommended:

SL-58, SLH-58, SL-56, SL-60, SFC-70C, SFC-71, SFC-81Ni1, SFC-81Ni2, SMG-8, SMG-60

Green Energy

Features:

SOREX WELDING electrode and wire design could provide low hydrogen, high deposition rate and impact toughness at low temperature. To fulfill offshore wind requirement, SOREX not only approved by various naval classification certificates (ABS, BV, CCS, CR, DNV-GL, KR, LR, NK, RINA PRS, JIS) but also approved by CPR-CE MARK.

Welding electrodes recommended:

SL-58, SLH-58, SS-309L, SFC-71, SFC-71J, SFC-71M, SFC-81Ni1, SFC-309L, SFC-81M, SFC-81K2, SF-65*SW-M12K, SF-66*SW-H12K, SF-66*SW-60G, SMG-60N, SMG-60

Automotive

Features:

SOREX WELDING provide welding consumables of excellent wire feeding ability, low spatter, high welding efficiency of the solid and cored metal wire, to meet the welding needs of automobile structure, exhaust system, car silencer, etc.

Welding electrodes recommended:

SFC-71M, SFC-409Ti, SFC-409Cb, SFC-439Ti, SMG-6, SMG-439Ti

Manufacturing

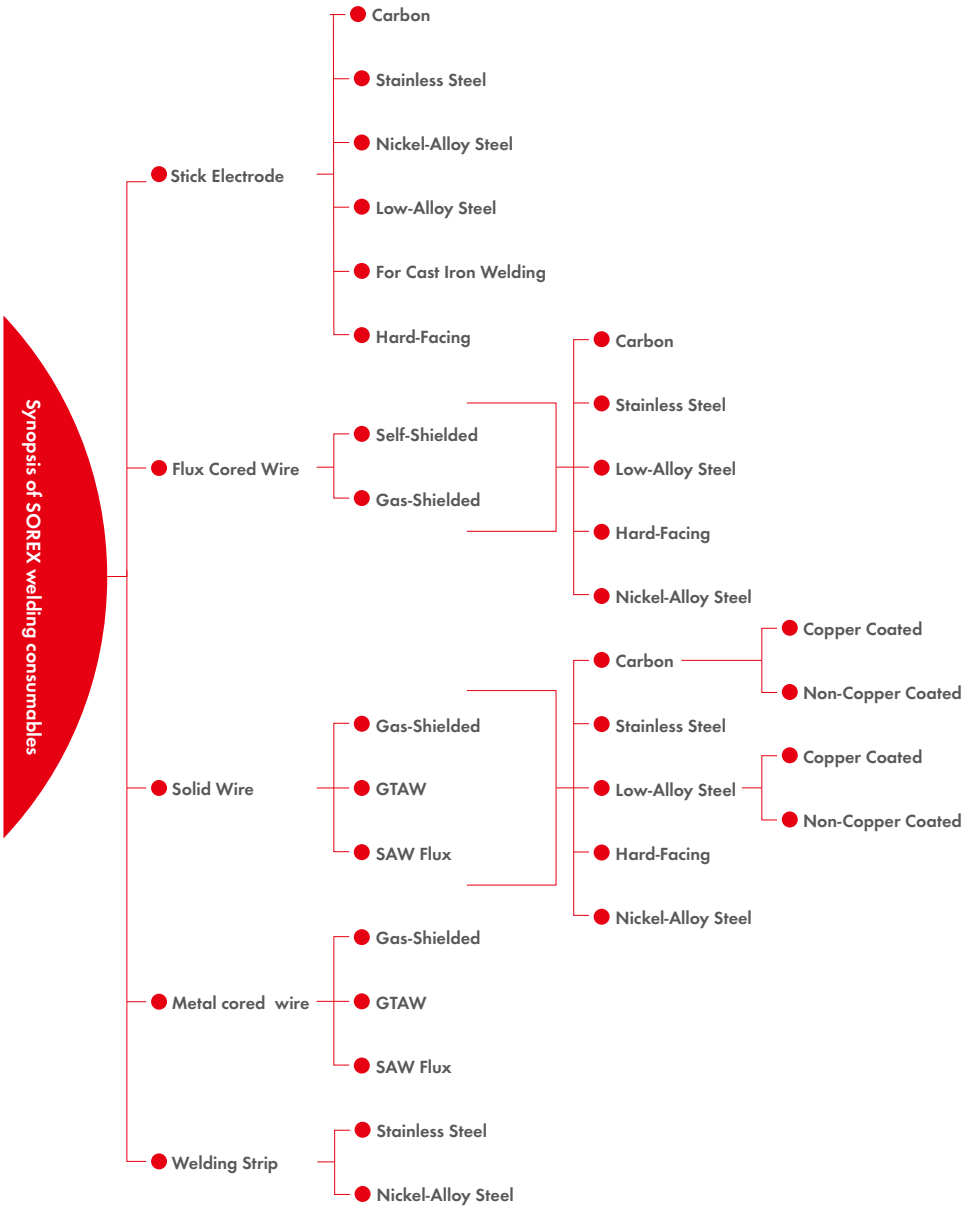
Features:

Provide anti-high temperature oxidation, corrosion resistance, high tensile strength, high impact ductile electrode and wire to meet the welding requirement from food machinery, boilers and pressure vessels, industrial equipment.

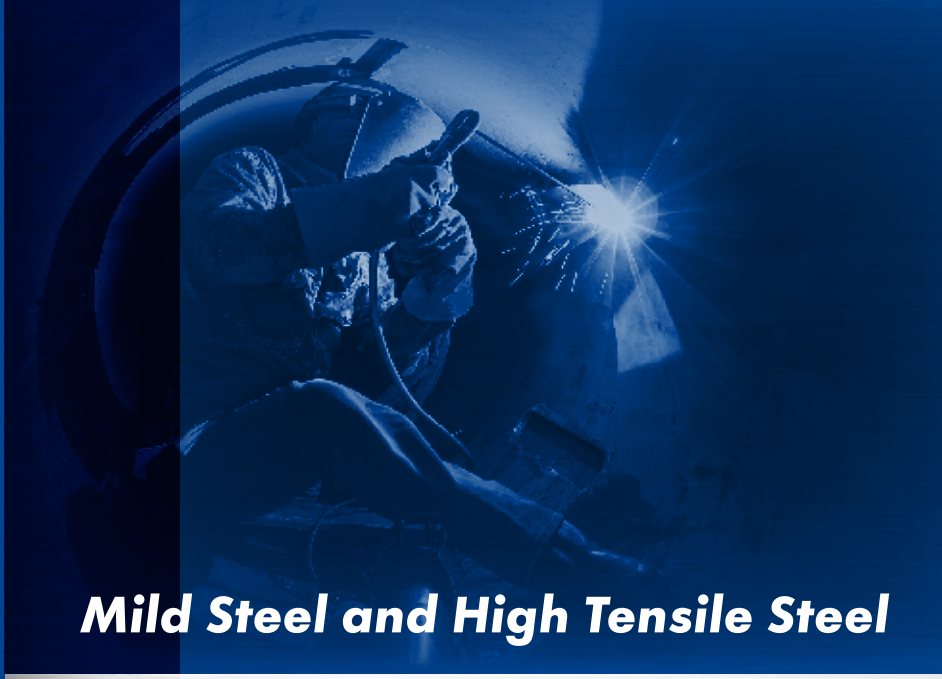
Welding electrodes recommended:

SL-50, SL-58, SR-88B2, SR-98B3, SN-88C1, SN-88C2, SN-88C3, SS-308L, SS-309L, SS-316L, SS-310, SFC-71, SFC-81B2, SFC-91B3, SFC-81Ni2, SFC-81K2, STG-50, STG-80B2, STG-90B3, STG-308L, STG-309L, STG-316L, STG-310, SMG-8, SMG-308L, SMG-309L, SMG-316L, SMG-310, SFC-2209, SFC-2594

Welding consumables


Synopsis of SOREX welding consumables
Stick Electrode
Carbon
Stainless Steel
Nickel-Alloy Steel
Low-Alloy Steel
For Cast Iron Welding
Hard-Facing
Flux Cored Wire
Self-Shielded
Gas-Shielded
Carbon
Stainless Steel
Low-Alloy Steel
Hard-Facing
Nickel-Alloy Steel
Solid Wire
Gas-Shielded
GTAW
SAW Flux
Carbon
Copper Coated
Non-Copper Coated
Stainless Steel
Low-Alloy Steel
Copper Coated
Non-Copper Coated
Hard-Facing
Nickel-Alloy Steel
Metal cored wire
Gas-Shielded
GTAW
SAW Flux
Welding Strip
Stainless Steel
Nickel-Alloy Steel

MEMO



Mild Steel and High Tensile Steel

Base metal introduction

A steel is type of Carbon 0.02%~2%. Usually compound with Manganese and Silicon element.

Mild Steel and 490 N/mm^2 high tensile steel were common use for welding categories. Choose appropriate steel and following welding consumables supplier's suggestion to meet construction specification demands in standard line.

Welding method and Specifications

Welding could carry out the joint issue between steel plates. Therefore the base metal would be diffused from once or multiple times heat treatment. The welding efficiency would be effected with following reasons:

◆ 1.Carbon equivalent from base metal:

In order to keep low diffusible from heat affected zone (HAZ), please make ensure specification from base metal, welding method and process. We usually use two types of formula for Carbon equivalent indications:

Ceq (JIS) = C + 1/6Mn + 1/24Si + 1/40Ni + 1/5Cr + 1/4Mo + 1/14V (%)

CE (IIW) = C + Mn/6 + (Ni+Cu)/15 + (Cr+Mo+V)/5 (%)

In the cooling process after welding, the hardness of the HAZ is limited austenite grains. But the HAZ hardness value would be increased on Medium-High carbon steel, High tensile steel or Low alloy steel metal.

In accordance with International Welding Society, the hardness value over than HV350 might be caused crack.

◆ 2.Workpiece constraint and restraint:

The welding metal expansion and contraction by temperature. Lean workpiece would be getting more value than thick one. This phenomenon so called constraint and restraint.

Constraint (K) = constraint degree (K0) x workpiece thickness (t) (kg/mm *mm)

K=constraint degree

T= workpiece thickness

Constraint value, joint design and welding method were related with workpiece thickness. The value getting higher might caused crack.

3.Diffusible hydrogen effect:

Hydrogen content had been caused by flux, base metal surface and surrounding circumstance moisture. When hydrogen keep maintain and growing would be caused crack issue.

4.Temperature management:

The workpiece temperature, interpass welding temperature, input control or PWHT management main target is stress relieving. Due to that, temperature control recommend to follow up design and construction specification, WPS and welding classification standard.

5.Rare element effect:

In order to avoid crack or porosity defect, we recommend keep P, S, Cu, B, O element content as low as possible. Those element would be affected welding bead quality from base metal.

POPULAR PRODUCTS OFFERINGS: COVERED ELETRODES (SMAW)

Profiles

In accordance tensile stretch level, engineering design and workpieces type, choice different welding method and consumables. Ex. Classification by 70Ksi or 80Ksi tensile strength suggest for construction industry. But welding method would use SMAW, FCAW, GMAW, SAW, EGW and ESW option.

Electrode identification by a steel rod covered flux means covered electrode. AWS and JIS classification for Carbon Steel Electrodes a following:

Specification \ Type of Covering			Classification	High titania sodium	Iron oxide titanina potassium	High titania potasium	High Cellulose type	Low-hydrogen	Low-hydrogen iron powder	Iron powder titania	Special type
			AWS A5.1	–	E6019	E6013	E6010 E6011	E7016 E7048	E7018	E7024	–
			JIS Z3211	E4303	E4319	E4313	E4310 E4311	E4916 E4948	E4918	E4924	E4340
Weld result		Anti-crack		○	○	△	○	⓪	⓪	△	○
		Porosity defect		○	○	△	△	⓪	⓪	△	○
		Impact result		○	○	△	△	⓪	⓪	△	○
Management	Welding position	Flat		⓪	⓪	⓪	△	○	○	⓪	⓪
		Horizontal fillet		⓪	⓪	⓪	△	○	○	⓪	⓪
		Vertical-up		⓪	⓪	⓪	○	⓪	⓪	—	⓪
		Vertical-down		△	—	△	⓪	⓪ ※1	⓪	—	△
		Overhead		⓪	⓪	⓪	○	⓪	⓪	—	⓪
	Groove weld outlook	Flat		⓪	○	⓪	△	△	△	⓪	⓪
		Horizontal fillet		⓪	○	⓪	△	△	△	⓪	⓪
		Vertical / Overhead		⓪	○	⓪	○	⓪	⓪	—	⓪
		Excellent penetration		○	⓪	△	⓪	○	○	△	○
		Spatter		○	○	⓪	△	○	○	⓪	○
		Slag removable		⓪	○	⓪	⓪	△	△	⓪	⓪
		continuous arc welding		⓪	—	⓪	⓪	—	—	⓪	⓪

Note:

⓪ : Very well ○ : Well △ : Bad — : Not available

※1: Special for vertical down welding position (AWS A5.1 E7048)

Working instruction

◆ (1)Storage & handing:

①Storage must be dry to perform properly. In order to avoid moisture absorb, DO NOT storing with excessive moisture (≥80%R.H) and higher temperature (≥30°C) ambient.

②Non-low hydrogen type proper absorb moisture easily than Low Hydrogen electrode. Due to that, restores the electrodes is more important.

③Low hydrogen electrodes to be re-dried should be removed from the can and spread out in the oven because each electrode must reach the drying temperature. Store electrodes from the open containers in heat cabinet at 100~150°C. Remove few electrodes from the container to avoid prolonged exposure high humidity. Please follow up re-drying indication as attachment.

◆ (2)Caution:

①Minimize the possibility of oxidation, humidity, oil and rust appear on workpieces. Because of hydrogen content increased would be caused defect, make sure for clean ambient before welding.

②In order to avoid porosity or crack defect by moisturize, please ensure short arc welding for low hydrogen electrode.

③Based on low hydrogen electrode welding, the relative position of the weld bead and flame/arc keeping 1~2cm, welding technique can be of two types – forehand and back hand. Use forehand welding to push welding arc eliminate porosity defect.

④In order to maintain weld metal quality, the weaving volume is usually limited to 3 times the electrode core diameter.

⑤Windproof measures requirement, when wind flow exceeding 3m/s from out door. Air entrainment nitrogen in welding bead. Porosity and low impact resistant might be caused by the absorption of nitrogen.

⑥WPS does not allow excess heat input, that would be caused bigger grain and low impact resistance.

SM-03

AWS –
EN ISO 2560-A E 35 2 RB 1 2
GB T5117 E4303

COVERED ELECTRODES FOR MILD STEEL

DESCRIPTION & APPLICATIONS :

- SM-03 is a high titania electrode type, suitable for thin or medium thickness base metal (16mm or less) on high welding speed.
- With stable arc, less spatter and nice bead appearance. Excellent re-start welding arc and good slag removability.
- It is used for shipbuilding, vehicle, bridges and steel structures.

NOTE ON USAGE :

- It is recommended to dry the electrodes at 80~100°C for 30~60 minutes prior to use.
- Proper welding current is recommended to get good X-Ray soundness.

WELDING POSITION :

TYPICAL CHEMICAL COMPOSITION OF WELD METAL (wt%) :

C	Mn	Si	P	S
0.082	0.39	0.18	0.018	0.009

TYPICAL MECHANICAL PROPERTIES OF WELD METAL :

YP $N/mm^2(Kgf/mm^2)$	TS $N/mm^2(Kgf/mm^2)$	EL %	IV 0°C J(Kgf-m)
421(43)	474(48.4)	30	87(8.9)

SIZE AND RECOMMENDED CURRENT RANGE : AC or DC(±)

Diameter (mm)		3.2	4.0	5.0
Length (mm)		350	450	450
Amp.	F	100-140	140-180	180-240
	V & OH	70-110	100-160	140-200

SM-10

AWS A5.1 E6019
EN ISO 2560-A E 35 2 RA 1 2
GB T5117 E4301

COVERED ELECTRODES FOR MILD STEEL

DESCRIPTION & APPLICATIONS :

- SM-10 is an ilmenite type electrode can be used for all-positional welding.
- The excellent X-Ray soundness and mechanical properties, as well as the good bead appearance and less spatter can be observed. Less spatter , stable arc and provides easy weld pool control.
- It is used for ship body, vehicle frames, oil tank and steel structures.

NOTE ON USAGE :

- Proper welding current is recommended to get good X-Ray soundness.
- Clean up the base metal to be free from contamination. Rebake the electrodes at 80~100°C for 30~60 minutes prior to use.

WELDING POSITION :

TYPICAL CHEMICAL COMPOSITION OF WELD METAL (wt%) :

C	Mn	Si	P	S
0.07	0.46	0.11	0.021	0.008

TYPICAL MECHANICAL PROPERTIES OF WELD METAL :

YP $N/mm^2(Kgf/mm^2)$	TS $N/mm^2(Kgf/mm^2)$	EL %	IV -20°C J(Kgf-m)
424(43.3)	467(47.7)	27	62(6.3)

SIZE AND RECOMMENDED CURRENT RANGE : AC or DC(±)

Diameter (mm)		3.2	4.0	5.0
Length (mm)		350	450	450
Amp.	F	80-130	130-180	170-240
	V & OH	60-120	110-160	140-200

SC-10

AWS A5.1 E6010
EN ISO 2560-A E 38 3 C 2 1
GB T5117 E4310

COVERED ELECTRODES FOR MILD STEEL

DESCRIPTION & APPLICATIONS :

- SC-10 is a high cellulose all-positional electrode type.
- Designed for deep penetration on root and filler layers of butt or fillet welding. It has stable arc, fast congealing weld and good slag removability.
- It is used for welding mild steel in pipeline, pressure vessels, storage tank and outdoor welding.

NOTE ON USAGE :

- Keep away heat and high humid ambient. Rebake the electrodes at 70~80°C for 30~60 minutes prior to use.
- Recommended with low current welding, when moving range of the electrodes should be controlled within 2.5 times of the electrode' s diameter while welding with weave method.

WELDING POSITION :

TYPICAL CHEMICAL COMPOSITION OF WELD METAL (wt%) :

C	Mn	Si	P	S
0.12	0.48	0.2	0.014	0.007

TYPICAL MECHANICAL PROPERTIES OF WELD METAL :

YP $N/mm^2(Kgf/mm^2)$	TS $N/mm^2(Kgf/mm^2)$	EL %	IV -30°C J(Kgf-m)
425(43.4)	495(50.5)	28	36(3.7)

SIZE AND RECOMMENDED CURRENT RANGE : DC(+)

Diameter (mm)		3.2	4.0	5.0
Length (mm)		350	350	350
Amp.	F	80-120	110-170	150-200
	V & OH	70-110	90-150	–

SC-11

AWS A5.1 E6011
EN ISO 2560-A E 38 3 C 1 1
GB T5117 E4311

COVERED ELECTRODES FOR MILD STEEL

DESCRIPTION & APPLICATIONS :

- SC-11 is a high cellulose all-positional electrodes designed for deep penetration on root and filler layers of butt. Less spatter and good slag removability.
- Excellent on rusty or oil dust steel surface welding, but without defect of porosity or slag undercut.
- It is suitable for high pressure pipeline, storage tank or narrow groove type welding.

NOTE ON USAGE :

- Keep away heat and high humid ambient. Rebake the electrodes at 70~80°C for 30~60 minutes prior to use.
- Recommended with low current welding, when moving range of the electrodes should be controlled within 2.5 times of the electrode's diameter while welding with weave method.

WELDING POSITION :

TYPICAL CHEMICAL COMPOSITION OF WELD METAL (wt%) :

C	Mn	Si	P	S
0.142	0.26	0.23	0.015	0.009

TYPICAL MECHANICAL PROPERTIES OF WELD METAL :

YP $N/mm^2(Kgf/mm^2)$	TS $N/mm^2(Kgf/mm^2)$	EL %	IV -30°C J(Kgf-m)
428(43.7)	498(50.8)	27	50(5.1)

SIZE AND RECOMMENDED CURRENT RANGE : AC or DC(+)

Diameter (mm)		3.2	4.0	5.0
Length (mm)		350	350	350
Amp.	F	80-120	110-170	150-200
	V & OH	70-110	90-150	-

SM-13

AWS A5.1 E6013
EN ISO 2560-A E 38 0 R 1 2
GB T5117 E4313

COVERED ELECTRODES FOR MILD STEEL

DESCRIPTION & APPLICATIONS :

- SM-13 is a high titania electrode with stable arc, good penetration. It sutable for thin thickness base metal.
- Good on arc and re-start arc welding. Nice bead appearance, less spatter and slag removable easily.
- It is used for vehicle sheet, thin steel sheet and other ornamental works.

NOTE ON USAGE :

- Dry the electrodes at 80~100°C for 30~60 minutes prior to use.
- Proper welding current is recommended to get good X-ray soundness.

WELDING POSITION :

TYPICAL CHEMICAL COMPOSITION OF WELD METAL (wt%) :

C	Mn	Si	P	S
0.058	0.29	0.2	0.021	0.009

TYPICAL MECHANICAL PROPERTIES OF WELD METAL :

YP $N/mm^2(Kgf/mm^2)$	TS $N/mm^2(Kgf/mm^2)$	EL %	IV 0°C J(Kgf-m)
422(43.1)	468(47.8)	26	65(6.6)

SIZE AND RECOMMENDED CURRENT RANGE : AC or DC(±)

Diameter (mm)		3.2	4.0	5.0
Length (mm)		350	450	450
Amp.	F	90-130	130-160	160-220
	V & OH	80-100	110-150	140-200

SM-26

AWS -
EN -
GB -

COVERED ELECTRODES FOR MILD STEEL

DESCRIPTION & APPLICATIONS :

- SM-26 is a iron power, titania and high titanium sodium electrode.
- Designed for all-positional welding. The welding can be done with high deposition rate, excellent anti-crack. Suitable for thin and medium thickness base metal or fillet welding.
- With stable arc, less spatter, as well as the good bead appearance and slag removability.
- It is used for ship building, vehicle, bridge and steel structures, etc.

NOTE ON USAGE :

- Rebake the electrodes at 80~100°C for 30~60 minutes prior to use.
- Proper welding current is recommended for getting good X-Ray soundness and mechanical properties.

WELDING POSITION :

TYPICAL CHEMICAL COMPOSITION OF WELD METAL (wt%) :

C	Mn	Si	P	S
0.06	0.35	0.17	0.018	0.009

TYPICAL MECHANICAL PROPERTIES OF WELD METAL :

YP $N/mm^2(Kgf/mm^2)$	TS $N/mm^2(Kgf/mm^2)$	EL %	IV 0°C J(Kgf-m)
422(43.1)	483(49.3)	29	81(8.3)

SIZE AND RECOMMENDED CURRENT RANGE : AC or DC(±)

Diameter (mm)		3.2	4.0	5.0
Length (mm)		350	450	450
Amp.	F	100-140	140-180	180-240
	V & OH	70-110	100-160	140-200

SGCP

AWS –
EN –
GB –

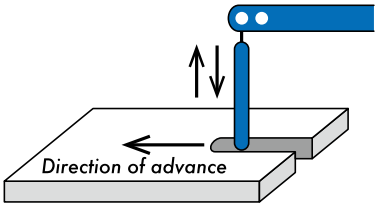
FOR SLOT NAD CUTOFF USES

DESCRIPTION & APPLICATIONS :

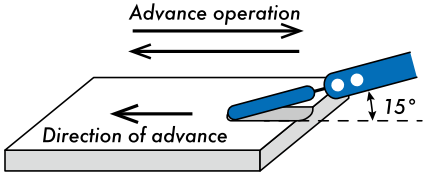
- SGCP is suitable for steel structure gouging use. Because of the strong arc spray and gas jet to displace molten metal.
- It can melt and cut various metals, such as stainless steel, cast iron, copper and its alloys. It provides as more safe way for gouging than the general gas.

NOTE ON USAGE :

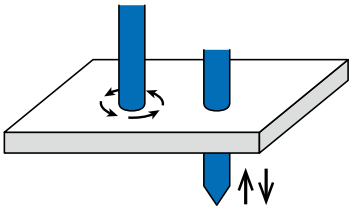
- When cut-off: The arc is truck with an electrode which is held at a 60-80 degrees from the vertical plane in line with proposed direction of gouging.(ref. chart A)
- When perforate : Take the weaving motion method and keep the gouging in the required direction for penetrate. (ref. chart B)
- When slot: Manipulate the electrode at the degree of 10 – 30 with work piece. This forward and backward motion is repeated as the electrode is guided along the line to complete the gouge. (ref. chart C)



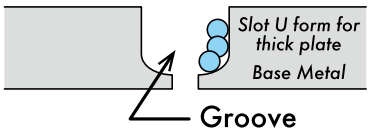
When cut-off(A)



When slot(C)



When perforate(B)



When slot(C)

SIZE AND RECOMMENDED CURRENT RANGE : AC or DC(+)

Diameter (mm)	3.2	4.0	5.0
Amp.	160-180	200-240	250-350

SL-24

AWS A5.1 E7024
EN –
GB –

COVERED ELECTRODES FOR 490N/mm^2 HIGH TENSIL STEEL

DESCRIPTION & APPLICATIONS :

- SL-24 is an iron powder electrode developed especially for flat, fillet and gravity welding.
- Less spatter, high deposition rate as well as 160%. It is used for single pass of fillet welding on H-beam and T-beam.

NOTE ON USAGE :

- Rebake the electrodes at 200˚C for 60 minutes before use.
- Recommended use appropriate long size for semi-auto gravity welding.

WELDING POSITION :

TYPICAL CHEMICAL COMPOSITION OF WELD METAL (wt%) :

C	Mn	Si	P	S
0.09	0.75	0.33	0.018	0.009

TYPICAL MECHANICAL PROPERTIES OF WELD METAL :

YP N/mm^2(Kgf/mm^2)	TS N/mm^2(Kgf/mm^2)	EL %	IV -20˚C J(Kgf-m)
500(51.0)	570(58.2)	24	30(3.1)

SIZE AND RECOMMENDED CURRENT RANGE : AC or DC(+)

Diameter (mm)		3.2	4.0	5.0
Length (mm)		350	450	550
Amp.	Flat & H-Fillet	130-170	160-200	220-260

SL-241

AWS A5.1 E7024
EN –
GB –

COVERED ELECTRODES FOR 490N/mm^2 HIGH TENSIL STEEL

DESCRIPTION & APPLICATIONS :

- SL-241 is for 490/mm^2 high tensile steel level electrodes. Designed for all-positional welding with high deposition rate. Suitable for thin and medium thickness base metal and H-fillet welding.
- Stable arc, less spatter, nice welding bead and slag removable easily. It is used for vehicle and general steel structure segments.

NOTE ON USAGE :

- Rebake the electrode at 80~100°C for 30~60 minutes prior to use.

WELDING POSITION :

TYPICAL CHEMICAL COMPOSITION OF WELD METAL (wt%) :

C	Mn	Si	P	S
0.08	0.45	0.25	0.016	0.006

TYPICAL MECHANICAL PROPERTIES OF WELD METAL :

YP N/mm^2(Kgf/mm^2)	TS N/mm^2(Kgf/mm^2)	EL %	IV -20°C J(Kgf-m)
470	535	26	40(4.1)

SIZE AND RECOMMENDED CURRENT RANGE : AC or DC(+)

Diameter (mm)		3.2	4.0	5.0
Length (mm)		350	450	450
Amp.	F	100-140	140-180	180-240
	V & OH	70-110	100-160	140-200

SL-50

AWS A5.1 E7016
EN ISO 2560-A E 42 3 B 1 2
GB T5117 E5016

COVERED ELECTRODES FOR 490N/mm^2 HIGH TENSIL STEEL

DESCRIPTION & APPLICATIONS :

- SL-50 is a low hydrogen electrode designed for 490N/mm^2 grade high tensile steel. Suitable for low alloy steels, medium-high carbon steels, heavy steel plates, cast steels.
- The welding can be done with stable arc and good X-Ray soundness. It is suitable for ship buildings, bridge and steel structures segments.

NOTE ON USAGE :

- Rebake the electrodes at 300~350°C for 1hr and keep at 100~150°C before daily use.
- Take the backstep method to prevent blowholes at the arc starting.
- Keep the arc as short as possible.

WELDING POSITION :

TYPICAL CHEMICAL COMPOSITION OF WELD METAL (wt%) :

C	Mn	Si	P	S
0.08	1.00	0.45	0.016	0.009

TYPICAL MECHANICAL PROPERTIES OF WELD METAL :

YP N/mm^2(Kgf/mm^2)	TS N/mm^2(Kgf/mm^2)	EL %	IV -30°C J(Kgf-m)
496(51)	564(58)	28	90(9.2)

SIZE AND RECOMMENDED CURRENT RANGE : AC or DC(+)

Diameter (mm)		3.2	4.0	5.0
Length (mm)		350	400/450	400/450
Amp.	F	90-130	130-180	180-240
	V & OH	90-120	110-160	160-200

SL-50D

AWS A5.1 E7048
EN ISO 2560-A E 42 3 B 3 1
GB T5117 E5016

COVERED ELECTRODES FOR 490N/mm^2 HIGH TENSIL STEEL

DESCRIPTION & APPLICATIONS :

- SL-50D is an iron powder low hydrogen electrode developed especially for vertical down stick welding.
- It is suitable for the ship buildings, bridge and steel structures segments.

NOTE ON USAGE :

- Rebake the electrodes at 300~350°C for 30-60 minutes and keep 100~150°C before daily use.
- When vertical down welding must be maintained with the angle of electrode: 40-85 degrees. DO NOT take weaving motion method.

WELDING POSITION :

TYPICAL CHEMICAL COMPOSITION OF WELD METAL (wt%) :

C	Mn	Si	P	S
0.09	0.86	0.40	0.016	0.005

TYPICAL MECHANICAL PROPERTIES OF WELD METAL :

YP N/mm^2(Kgf/mm^2)	TS N/mm^2(Kgf/mm^2)	EL %	IV -30°C J(Kgf-m)
490(50.0)	560(57.1)	29	62(6.3)

SIZE AND RECOMMENDED CURRENT RANGE : AC or DC(+)

Diameter (mm)		3.2	4.0	5.0
Length (mm)		350	450	450
Amp.	Vertical Down	110-160	140-210	220-270

SL-50DR

AWS A5.1 E7016
EN ISO 2560-A E 42 3 B 1 2
GB T5117 E5016

COVERED ELECTRODES FOR 490N/mm^2 HIGH TENSIL STEEL

DESCRIPTION & APPLICATIONS :

- SL-50DR is a low hydrogen type electrode for welding 490N/mm^2 grade high tensile steel.
- Stable arc, less spatter, nice welding bead and slag removable easily. It is used for vehicle and general steel structure segments.

NOTE ON USAGE :

- Rebake the electrode at 80~100˚C for 30~60 minutes prior to use.

WELDING POSITION :

TYPICAL CHEMICAL COMPOSITION OF WELD METAL (wt%) :

C	Mn	Si	P	S
0.08	0.40	0.27	0.014	0.007

TYPICAL MECHANICAL PROPERTIES OF WELD METAL :

YP N/mm^2(Kgf/mm^2)	TS N/mm^2(Kgf/mm^2)	EL %	IV -30˚C J(Kgf-m)
481(49)	554(56.5)	24	40(4.1)

SIZE AND RECOMMENDED CURRENT RANGE : AC or DC(+)

Diameter (mm)		3.2	4.0	5.0
Length (mm)		350	450	450
Amp.	F	100-140	140-180	180-240
	V & OH	70-110	100-160	140-200

SL-56

AWS A5.1 E7028
EN ISO 2560-A E 42 2 B 5 4
GB T5117 E5028

COVERED ELECTRODES FOR 490N/mm^2 HIGH TENSIL STEEL

DESCRIPTION & APPLICATIONS :

- SL-56 is an iron powder low hydrogen and 490N/mm^2 high tensile steel electrode. Suitable for flat, H-fillet and gravity welding.
- With high deposition rage as well as 127%. A premium, multiple deoxidized, could be weld on rust or dirt steel surface. It is suitable for welding in ship building, bridges and vehicle segments.

NOTE ON USAGE :

- Dry the electrode at 200~250°C for 30~60 minutes before use.

WELDING POSITION :

TYPICAL CHEMICAL COMPOSITION OF WELD METAL (wt%) :

C	Mn	Si	P	S
0.09	1.22	0.21	0.026	0.009

TYPICAL MECHANICAL PROPERTIES OF WELD METAL :

YP N/mm^2(Kgf/mm^2)	TS N/mm^2(Kgf/mm^2)	EL %	IV -20°C J(Kgf-m)
518(52.9)	570(58.2)	25	48(4.9)

SIZE AND RECOMMENDED CURRENT RANGE : AC or DC(+)

Diameter (mm)		3.2	4.0	5.0
Length (mm)		350	450	550
Amp.	F & H-Fillet	120-160	160-200	200-240

SL-58

AWS A5.1 E7018
EN ISO 2560-A E 42 3 B 3 2
GB T5117 E5018

COVERED ELECTRODES FOR 490N/mm^2 HIGH TENSIL STEEL

DESCRIPTION & APPLICATIONS :

- SL-58 is an iron powder low hydrogen electrode for the welding 490N/mm^2 grade high.
- It is especially suitable for steel structures, petroleum chemical industry, power plants and storage tank.

NOTE ON USAGE :

- Rebake the electrodes at 300~350°C for60 minutes and keep at 100~150°C before daily use.
- Take the backstep method to prevent blowholes at the arc starting.

WELDING POSITION :

TYPICAL CHEMICAL COMPOSITION OF WELD METAL (wt%) :

C	Mn	Si	P	S
0.07	1.20	0.47	0.016	0.009

TYPICAL MECHANICAL PROPERTIES OF WELD METAL :

YP N/mm^2(Kgf/mm^2)	TS N/mm^2(Kgf/mm^2)	EL %	IV -30°C/-40°C J(Kgf-m)
518(52.9)	604(61.6)	28	80(8.2)/58(5.9)

SIZE AND RECOMMENDED CURRENT RANGE : AC or DC(+)

Diameter (mm)		3.2	4.0	5.0
Length (mm)		350	400	400
Amp.	F	90-130	130-180	180-240
	V & OH	80-120	110-160	–

SL-58M

AWS A5.1 E7018M
EN ISO 2560-A E 42 3 B 3 2
GB T5117 E5018M

COVERED ELECTRODES FOR 490N/mm^2 HIGH TENSIL STEEL

DESCRIPTION & APPLICATIONS :

- SL-58M is an all-position iron powder low hydrogen electrode specially formulated to meet more stringent requirements of military specification MIL-E-0022200/10 for mechanical properties.
- Suitable for steel structures, storage tank, power plant and petroleum chemical industry.

NOTE ON USAGE :

- Rebake the electrodes at 300~350°C for60 minutes before use.
- Take the backstep method to prevent blowholes at the arc starting.

WELDING POSITION :

TYPICAL CHEMICAL COMPOSITION OF WELD METAL (wt%) :

C	Mn	Si	P	S
0.09	1.32	0.40	0.010	0.008

TYPICAL MECHANICAL PROPERTIES OF WELD METAL :

YP N/mm^2(Kgf/mm^2)	TS N/mm^2(Kgf/mm^2)	EL %	IV -30°C J(Kgf-m)
495(50.5)	565(57.7)	30	92(9.4)

SIZE AND RECOMMENDED CURRENT RANGE : DC(+)

Diameter (mm)		3.2	4.0	5.0
Length (mm)		350	350	350
Amp.	F	90-130	130-180	180-220
	V & OH	80-120	110-150	–

SLH-58

AWS A5.1 E7018-1 H4
EN ISO 2560-A E 46 4 B 3 2 H5
GB T5117 E5018

COVERED ELECTRODES FOR 490N/mm^2 HIGH TENSIL STEEL

DESCRIPTION & APPLICATIONS :

- SLH-58 is an iron powder low diffusible hydrogen electrodes. With excellent mechanical properties and impact toughness at low temperature (-45°C)
- It is suitable for steel structure, storage tank, power plant and petroleum chemical industry.

NOTE ON USAGE :

- Rebake electrodes at 300~350°C for 60 minutes and keep at 100~150°C before daily use.
- Take the backstep method to prevent blowholes at the arc starting.

WELDING POSITION :

TYPICAL CHEMICAL COMPOSITION OF WELD METAL (wt%) :

C	Mn	Si	P	S
0.062	1.25	0.49	0.018	0.009

TYPICAL MECHANICAL PROPERTIES OF WELD METAL :

YP N/mm^2(Kgf/mm^2)	TS N/mm^2(Kgf/mm^2)	EL %	IV -45°C J(Kgf-m)
525(53.6)	585(59.7)	29	80(8.2)

SIZE AND RECOMMENDED CURRENT RANGE : AC or DC(+)

Diameter (mm)		3.2	4.0	5.0
Length (mm)		350	400	400
Amp.	F	90-130	130-180	180-220
	V & OH	80-120	110-160	–

Mild steel & High Tensile Steel: Flux Cored Wire

Profiles

Flux cored wire was so called tubular wire, could be apply on auto or semi-auto welding procedure. In accordance America Welding Society (AWD) classification as following chart:

Covered type / Character		Classification	Gas Shield			Self Shield
			With Slag 酸性銲藥	With Slag Basic type	METAL CORED	With Slag
		AWS A5.20	E70T-1C E71T-1C E71T-1M	E71T-5C E71T-5M	AWS 5.18 E70C-6C E70C-6M	E70T-4 E70T-7 E71T-8 E71T-11 E71T-GS
		AWS A5.36	E70T1-C1A0-CS1 E71T1-C1A0-CS1 E71T1-M21A0-CS1	E71T5-C1A2-CS1 E71T5- M21A2-CS1	E70T15-C1A4-CS1 E70T15-M21A4-CS1	E70T4-AZ-CS3 E70T7-AZ-CS3 E71T8-A2-CS3 E71T11-AZ-G E71TGS-AZ-G
Weldability	Spatter		ⓞ	○	○	△
	Slag removable		ⓞ	○	—	△
	溶滴狀態		ⓞ	○	○	△
	Smoke		○	○	ⓞ	△
Mechanical result	Weld Bead Inspection		○	ⓞ	ⓞ	△
	Welding Speed		○	○	ⓞ	○
	Welding efficiency		○	○	ⓞ	○

Note:
ⓞ : Good ○ : Fair △ : Poor — : Not acceptable

Working instruction

◆ (1)FCAW Storage & Handling:

①FCAW had been packed by plastic spool /basket wire forms, coil and pail pack (drum packing). To maintain the integrity of these products, electrodes must be protected from the atmosphere. All flux cored electrodes, regardless of package, should be protected from condensation. TO ensure that condensation does not form on the product, it is recommended that the electrode be stored in an environment that is kept above the dew point temperature for a given relative humidity.

②Most of tubular wire type of overlapping, but seems likely more absorb moisture easily than seamless wire. In case of exposed to damp moisture conditions or extremes in temperature, it is recommended to use aluminum foil packing.

③In order to avoid humidity where surface condensation occur porosity issue. When not in use, wire should be placed in original packaging and sealed as best as possible.

◆ **(2)Caution:**

①Because flux-cored wire is softer than solid wire, knurled drive rolls provide a good “bite” on the wire without compressing and deforming it – which could happen if standard roll are used.

②Horizontal and overhead position recommend forehand welding would be appearance perfect welding bead. But please also make sure the welding condition to avoid poor penetration.

③For vertical down and filler metal welding position, recommend use single pass moving or little waving for button layer.

④FCAW easily caused porosity than MIG wire welding due to working piece in bad clearance. Make sure groove clean and recommend using iron powder type products (E70T-1C) for application.

⑤The welding condition with MIX GAS shielding is more sensitive above working piece clearance. Therefore, appropriate AMP and VOLT need to be avoided welding arc length getting too long.

⑥Fore metal cored wire recommends using 80%Ar+20%CO_2 gas shielding by spray arc welding. Add pulse mode for welding management would get better bead quality.

SFC-71

AWS A5.20 E71T-1C/1M
EN ISO 17632-A T46 2 P C1/M21 1
GB T10045 E501T-1/1M

FLUX CORE WIRES FOR 490N/mm² HIGH TENSILE STEEL

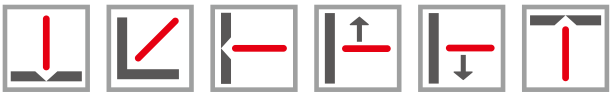
DESCRIPTION & APPLICATIONS :

- SFC-71 is a 490N/mm² grade titania flux cored wire.
- It performs very little fume, stable arc, less spatter, good slag removable, good weld bead appearance and excellent toughness.
- It is widely used for ship building, storge vessels, structural fabrication, machinery and piping, etc.

NOTE ON USAGE :

- Use CO_2 shielding gas with flow rate 15~25 l/min. Once use for Mix shielding gas with 75~80%Ar + 20~25%CO_2 would be taken excellent management.

WELDING POSITION :



TYPICAL CHEMICAL COMPOSITION OF WELD METAL (wt%) : (Shielding Gas : 100% CO_2)

C	Mn	Si	P	S
0.051	1.36	0.48	0.012	0.009

TYPICAL MECHANICAL PROPERTIES OF WELD METAL : (Shielding Gas : 100% CO_2)

YP N/mm²(Kgf/mm²)	TS N/mm²(Kgf/mm²)	EL %	IV -20°C J(Kgf-m)
510(52.0)	573(58.5)	28	92(9.4)

SIZE AND RECOMMENDED CURRENT RANGE : DC(+)

Parameters \ Diameter (mm)	1.2		1.4		1.6	
	F	Vertical-up	F	Vertical-up	F	Vertical-up
Voltage(Volt)	22-36	22-28	22-38	21-29	24-40	22-30
Current (Amp)	150-300	150-220	180-350	150-230	200-400	160-250
Stickout(m/m)	10-15		15-20		15-30	
Flow Rate(l/min)	15-25		15-25		15-25	

SFC-70C

AWS A5.20 E70T-1C
EN ISO 17632-A T42 2 P C1 3
GB T10045 E500T-1

FLUX CORE WIRES FOR 490N/mm² HIGH TENSILE STEEL

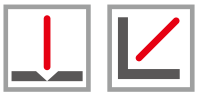
DESCRIPTION & APPLICATIONS :

- SFC-70C is a 490N/mm² grade metal cored wire.
- Designed for high speed horizontal fillet welding on primed plate (inorganic primer coated) with excellent pit resistance.
- It performs good penetration, slag removal, good X-Ray soundness and excellent impact value.
- It is widely used for flat and horizontal fillet welding in ship building, bridges, vechicle, machinery and structural fabrication etc.

NOTE ON USAGE :

- Use CO_2 shielding gas with flow rate 15~25 l/min. Once use for Mix shielding gas with 75~80%Ar + 20~25%CO_2 would be taken excellent management.

WELDING POSITION :



TYPICAL CHEMICAL COMPOSITION OF WELD METAL (wt%) : (Shielding Gas : 100% CO_2)

C	Mn	Si	P	S
0.042	1.30	0.42	0.010	0.005

TYPICAL MECHANICAL PROPERTIES OF WELD METAL : (Shielding Gas : 100% CO_2)

YP N/mm²(Kgf/mm²)	TS N/mm²(Kgf/mm²)	EL %	IV -20°C J(Kgf-m)
515(52.6)	570(58.1)	27	100(10.2)

SIZE AND RECOMMENDED CURRENT RANGE : DC(+)

Parameters \ Diameter (mm)	1.2		1.4		1.6	
	F	Vertical-up	F	Vertical-up	F	Vertical-up
Voltage(Volt)	22-34	22-36	22-38	21-38	24-40	22-40
Current (Amp)	150-300	180-300	180-350	200-350	200-400	270-400
Stickout(m/m)	15-25		20-30		20-30	
Flow Rate(l/min)	15-25		20-25		20-25	

SFC-71Ni

AWS A5.20 E71T-1C/M-J
EN ISO 17632-A T42 4 P C1/M21
GB T10045 E501T-1L/1ML

FLUX CORE WIRES FOR 490N/mm² HIGH TENSILE STEEL

DESCRIPTION & APPLICATIONS :

- SFC-71Ni is a 490N/mm² grade flux cored wire designed to be used with CO_2 shielding gas.
- It performs very little fume, with stable arc, low spatter level, good slag removal and excellent toughness at -40°C.
- It is widely for ship building, low temperature serving storage tanks etc.

NOTE ON USAGE :

- Use CO_2 shielding gas with flow rate 15~25 l/min. Once use for Mix shielding gas with 75~80%Ar + 20~25%CO_2 would be taken excellent management.

WELDING POSITION :

TYPICAL CHEMICAL COMPOSITION OF WELD METAL (wt%) : (Shielding Gas : 100% CO_2)

C	Mn	Si	P	S	Ni
0.048	1.05	0.37	0.010	0.006	0.35

TYPICAL MECHANICAL PROPERTIES OF WELD METAL : (Shielding Gas : 100% CO_2)

YP N/mm²(Kgf/mm²)	TS N/mm²(Kgf/mm²)	EL %	IV -40°C J(Kgf-m)
492(50.2)	550(56.1)	28	74(7.6)

SIZE AND RECOMMENDED CURRENT RANGE : DC(+)

Parameters \ Diameter (mm)	1.2		1.4		1.6	
	F	Vertical-up	F	Vertical-up	F	Vertical-up
Voltage(Volt)	23-36	23-28	23-38	22-29	23-40	22-30
Current (Amp)	150-300	150-220	180-350	150-230	200-380	160-250
Stickout(m/m)	15-25		20-30		20-30	
Flow Rate(l/min)	15-25		20-25		20-25	

SFC-71J

AWS A5.20 E71T-1C/M-J
EN ISO 17632-A T46 4 P C1/M21 1 H5
GB T10045 E501T-1L/1ML

FLUX CORE WIRES FOR 490N/mm² HIGH TENSILE STEEL

DESCRIPTION & APPLICATIONS :

- SFC-71J is a 490N/mm² grade flux cored wire designed to be used with CO_2 shielding gas.
- It is very well on all-positional management. And performance very little fume, stable arc, less spatter, nice bead appearance, good slag removal and excellent toughness at -40°C.
- It is widely used for ship building, low temperature serving storage tanks, pipings etc.

NOTE ON USAGE :

- Use CO_2 shielding gas with flow rate 15~25 l/min. Once use for Mix shielding gas with 75~80%Ar + 20~25%CO_2 would be taken excellent management.

WELDING POSITION :

TYPICAL CHEMICAL COMPOSITION OF WELD METAL (wt%) : (Shielding Gas : 100% CO_2)

C	Mn	Si	P	S
0.045	1.20	0.42	0.012	0.006

TYPICAL MECHANICAL PROPERTIES OF WELD METAL : (Shielding Gas : 100% CO_2)

YP N/mm²(Kgf/mm²)	TS N/mm²(Kgf/mm²)	EL %	IV -40°C J(Kgf-m)
520(53.1)	570(58.1)	29	90(9.2)

SIZE AND RECOMMENDED CURRENT RANGE : DC(+)

Parameters \ Diameter (mm)	1.2		1.4		1.6	
	F	Vertical-up	F	Vertical-up	F	Vertical-up
Voltage(Volt)	23-36	23-28	23-38	22-29	23-40	22-30
Current (Amp)	150-300	150-220	180-350	150-230	200-400	160-250
Stickout(m/m)	10-15		15-20		15-30	
Flow Rate(l/min)	15-25		15-25		15-25	

SFC-71M

AWS A5.18 E70C-6C/6M
EN ISO 17632-A T46 6M C1/M21
GB –

FLUX CORE WIRES FOR 490N/mm² HIGH TENSILE STEEL

DESCRIPTION & APPLICATIONS :

- SFC-71M is a 490N/mm² grade metal cored wire.
- With good welding management, very little fume, less spatter and nice bead appearance, good X-Ray soundness and excellent toughness.
- It is widely used for ship building, storage tanks, machinery, bridges, steel structure and piping etc.

NOTE ON USAGE :

- Use CO_2 shielding gas with flow rate 15~25 l/min. Once use for Mix shielding gas with 75~80%Ar + 20~25%CO_2 would be taken excellent management.

WELDING POSITION :

TYPICAL CHEMICAL COMPOSITION OF WELD METAL (wt%) : (Shielding Gas : 80%Ar + 20%CO_2)

C	Mn	Si	P	S
0.051	1.43	0.45	0.010	0.006

TYPICAL MECHANICAL PROPERTIES OF WELD METAL : (Shielding Gas : 80%Ar + 20%CO_2)

YP N/mm²(Kgf/mm²)	TS N/mm²(Kgf/mm²)	EL %	IV -40°C J(Kgf-m)
480(49.0)	540(55.1)	26	77

SIZE AND RECOMMENDED CURRENT RANGE : DC(+)

Parameters \ Diameter (mm)	1.2	1.4	1.6
	F	F	F
Voltage(Volt)	24-33	26-35	28-38
Current (Amp)	150-300	180-350	200-400
Stickout(m/m)	10-15	15-20	15-30
Flow Rate(l/min)	15-25	15-25	15-25

SFC-75

AWS A5.20 E71T-5C/5M
EN ISO 17632-A T42 3 B C1/M21 1
GB T10045 E501T-5/5M

FLUX CORE WIRES FOR 490N/mm² HIGH TENSILE STEEL

DESCRIPTION & APPLICATIONS :

- SFC-75 is a 490N/mm² grade flux cored wire designed to be used with CO_2 or Ar/CO_2 gas misture.
- All-positional management with less fumes, stable arc, less spatter, nice welding bead appearance slag removal, good X-Ray soundness and excellent toughness at -30˚C.
- It is widely used for shipbuilding, storage vessel, machinery, bridges, steel structure and piping etc.

NOTE ON USAGE :

- Use CO_2 shielding gas with flow rate 15~25 l/min. Once use for Mix shielding gas with 75~80%Ar + 20~25%CO_2 would be taken excellent management.

WELDING POSITION :

TYPICAL CHEMICAL COMPOSITION OF WELD METAL (wt%) : (Shielding Gas : 100% CO_2)

C	Mn	Si	P	S
0.045	1.3	0.45	0.021	0.013

TYPICAL MECHANICAL PROPERTIES OF WELD METAL : (Shielding Gas : 100% CO_2)

YP N/mm²(Kgf/mm²)	TS N/mm²(Kgf/mm²)	EL %	IV -30˚C J(Kgf-m)
495(50.5)	550(56.1)	28	93(9.5)

SIZE AND RECOMMENDED CURRENT RANGE : DC(+)

Parameters \ Diameter (mm)	1.2		1.4		1.6	
	F	Vertical-up	F	Vertical-up	F	Vertical-up
Voltage(Volt)	25-36	25-28	28-38	25-29	30-40	26-30
Current (Amp)	150-300	150-220	180-350	150-230	200-400	160-250
Stickout(m/m)	10-15		15-20		15-30	
Flow Rate(l/min)	15-25		15-25		15-25	

SFC-04

AWS A5.20 E70T-4
EN ISO 17632-A T42 Z W N 3
GB T10045 E500T-4

FLUX CORE WIRES FOR 490N/mm² HIGH TENSILE STEEL

DESCRIPTION & APPLICATIONS :

- SFC-04 is a self-shielded flux cored wire designed for on site fabrications wich welder could use it outdoor at the applications with longer stick-out than normal fcaw if wind is not high.
- Excellent performance in desulfuration reduces porosity effectively, with nice bead appearance and slag removal easily.
- It is commonly used for steel structure, steel frames with groove and fillet welding.

NOTE ON USAGE :

- Use DC(+) polarity.

WELDING POSITION :

TYPICAL CHEMICAL COMPOSITION OF WELD METAL (wt%) :

C	Mn	Si	P	S	Al
0.22	0.65	0.35	0.010	0.003	1.70

TYPICAL MECHANICAL PROPERTIES OF WELD METAL :

YP N/mm²(Kgf/mm²)	TS N/mm²(Kgf/mm²)	EL %
458(46.3)	575(58.7)	23

SIZE AND RECOMMENDED CURRENT RANGE : DC(+)

Parameters \ Diameter (mm)	2.0	2.4
Voltage(Volt)	25-35	25-39
Current (Amp)	200-350	200-400
Stickout(m/m)	30-50	30-50

SFC-07

AWS A5.20 E70T-7
EN ISO 17632-A T42 Z W N 3
GB T10045 E500T-7

FLUX CORE WIRES FOR 490N/mm² HIGH TENSILE STEEL

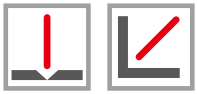
DESCRIPTION & APPLICATIONS :

- SFC-07 is a self-shield flux cored wire.
- Excellent performance in good penetration, fluidity of deposition rate, nice welding bead apperance and slag removal easily. DO NOT for impact usage.
- Suitable for mild steel and high tensile steel plates welding.

NOTE ON USAGE :

- Use DC (-) polarity.

WELDING POSITION :



TYPICAL CHEMICAL COMPOSITION OF WELD METAL (wt%) :

C	Mn	Si	P	S	Al
0.23	0.38	0.1	0.008	0.003	1.80

TYPICAL MECHANICAL PROPERTIES OF WELD METAL :

YP N/mm²(Kgf/mm²)	TS N/mm²(Kgf/mm²)	EL %
486(49.6)	582(59.4)	23

SIZE AND RECOMMENDED CURRENT RANGE : DC(-)

Parameters \ Diameter (mm)	1.6	2.0	2.4
Voltage(Volt)	22-27	23-30	27-32
Current (Amp)	150-300	250-450	250-550
Stickout(m/m)	30-40	30-40	35-50

SFC-18

AWS A5.20 E71T-8
EN ISO 17632-A T42 3 Y N 1
GB T10045 E501T-8

FLUX CORE WIRES FOR 490N/mm² HIGH TENSILE STEEL

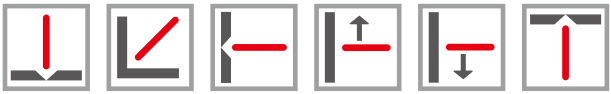
DESCRIPTION & APPLICATIONS :

- SFC-18 is an all-positional self-shielded flux cored wire.
- Good penetration, high deposition rate, fluidity of deposit metal, good welding bead appearance, slag removal easily and anti-crack with all-positional welding.
- It is suitable for structual welding outdoors, such as steel structures, chimney, pipes, etc.

NOTE ON USAGE :

- Use DC (-) polarity.

WELDING POSITION :



TYPICAL CHEMICAL COMPOSITION OF WELD METAL (wt%) :

C	Mn	Si	P	S	Al
0.15	0.60	0.13	0.007	0.004	0.70

TYPICAL MECHANICAL PROPERTIES OF WELD METAL :

YP N/mm²(Kgf/mm²)	TS N/mm²(Kgf/mm²)	EL %	IV -30°C J(Kgf-m)
442(45.1)	553(56.4)	24	47

SIZE AND RECOMMENDED CURRENT RANGE : DC(-)

Parameters \ Diameter (mm)	2.0
Voltage(Volt)	18-25
Current (Amp)	150-350
Stickout(m/m)	30-40

SFC-71B

AWS A5.20 E71T-11
EN ISO 17632-A T42 Z Y N 1
GB T10045 E501T-11

FLUX CORE WIRES FOR 490N/mm² HIGH TENSILE STEEL

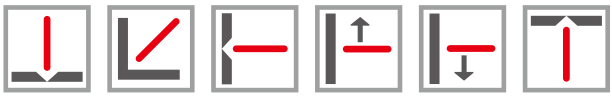
DESCRIPTION & APPLICATIONS :

- SFC-71B is a self-shielded flux cored wire designed for 490Mpa grade with all-positional welding.
- Very easy for carrying, could be used for single or multiple pass weld, with stable arc and less spatter.
- Suitable for thin-gauge galvanized and mild steel welding.

NOTE ON USAGE :

- PWHT at 200°C×12hr.

WELDING POSITION :



TYPICAL CHEMICAL COMPOSITION OF WELD METAL (wt%) :

C	Mn	Si	P	S	Al
0.090	0.69	0.44	0.008	0.003	1.30

TYPICAL MECHANICAL PROPERTIES OF WELD METAL :

YP N/mm²(Kgf/mm²)	TS N/mm²(Kgf/mm²)	EL %
420(42.9)	570(58.2)	25

SIZE AND RECOMMENDED CURRENT RANGE : DC(-)

Parameters \ Diameter (mm)	0.8	0.9	1.0	1.2	1.6
Voltage(Volt)	17-19	17-20	18-23	18-24	18-24
Current (Amp)	100-150	100-160	120-230	140-250	160-260
Stickout(m/m)	10-15	10-15	10-15	10-15	10-15

SFC-71G

AWS A5.20 E71T-GS
EN ISO 17632-A T42 Z V N 1
GB T10045 E501T-G

FLUX CORE WIRES FOR 490N/mm² HIGH TENSILE STEEL

DESCRIPTION & APPLICATIONS :

- SFC-71G is a self-shielded flux cored wire designed for single pass with DC(-) usage.
- Good penetration, high deposition rate, good X-Ray soundness, slag removal easily and nice welding bead appearance.
- Suitable for machinery, steel structure welding and heavy steel structure maintenances.

NOTE ON USAGE :

- Use DC (-) polarity.

WELDING POSITION :

TYPICAL CHEMICAL COMPOSITION OF WELD METAL (wt%) :

C	Mn	Si	P	S	Al
0.20	1.20	0.20	0.009	0.004	2.50

TYPICAL MECHANICAL PROPERTIES OF WELD METAL :

YP N/mm²(Kgf/mm²)	TS N/mm²(Kgf/mm²)	EL %
504(51.4)	576(58.7)	24

SIZE AND RECOMMENDED CURRENT RANGE : DC(-)

Parameters \ Diameter (mm)	0.8	0.9	1.0	1.2	1.6
Voltage(Volt)	17-19	17-20	18-23	18-24	18-24
Current (Amp)	100-150	100-160	120-230	140-250	160-260
Stickout(m/m)	10-15	10-15	10-15	10-15	10-15

Mild steel & High Tensile Steel: Solid Wire

Profiles

- (1)In general, solid wire included both MIG (Metal Inert Gas) & MAG(Metal Active Gas) wire. MIG wire usually use Ar, He or Ar/He mix for gas shielding. MAG wire usually use O_2 or CO_2 as shielding gases.

  Meanwhile, for gas shield Ar/O_2 or Ar/CO_2 would be specified as following:

  MIG WIRE: Non O_2 or CO_2 elements.

  MAG WIRE: Major shielding gas percentage were inert gas with O_2 minor than 2% or CO_2 minor than 5%.

  For example: MIG(98%Ar+2%O_2); MAG(97%Ar+3%O_2)

- (2)For TIG Rod usually use gas shielding by 100%Ar. Due to that, the welding bead appearance seems likely perfect and getting less spatter, stable arc during welding process. But welding speed would be slow, usually use for groove button layer. Sometimes use for high quality requirement condition.

- (3)From AWS classification, metal cored had ben specified as solid wire but require mechanical test also. The testing result in accordance with AWS A5.18 standard.

- (4)AWS A5.18 standard would be examples as following:

Types	Introduction
ER70S-2	1.A premium, multiple deoxidized (Al:0.05~0.15%). 2.Could be weld on rust or dirt steel surface. 3.Deoxidized wire containing titanium and zirconium for high tensile stretch quality. 4.Recommended for root pass welding in pipeline industry.
ER70S-3	GMAW application on Car assembling and engineering machine segments.
ER70S-4	1.Deoxidized result better than ER70S-3 wire, containing silicon (0.65~0.85%). 2.Non-requirement for inspection value. 3.Application on bicycle assembling segments.

Types	Introduction
ER70S-6	1.Recommended for flat welding on sheet working pieces and slightly rusty steel joint. 2.Shielding Gas could use CO_2 or MIX GAS (Ar+CO_2). 3.Typical application on Shipbuilding, Steel construction and car assembling segments.
ER70S-7	1.High speed welding with excellent wetting action and more puddle fluidity. 2.Shielding Gas could use CO_2 or MIX GAS (Ar+CO_2).
ER70S-G	1.MIG WIRE manufactured by JIS YGW-11 material. For welding applies with high electric current and thick plates. Deoxidized wire containing titanium and zirconium for less spatter result. 2.Shielding Gas could use CO_2 or MIX GAS (Ar+CO_2). 3.Typical application on Shipbuilding, Steel construction and car assembling segments.

Working instruction

◆ (1)Storage & handing:

①MIG wire had been packed by plastic spool /basket wire forms and pail pack. To maintain the integrity of these products, electrodes must be protected from the atmosphere. All flux cored electrodes, regardless of package, should be protected from condensation. TO ensure that condensation does not form on the product, it is recommended that the electrode be stored in an environment that is kept above the dew point temperature for a given relative humidity.

②In case of exposed to damp moisture conditions or extremes in temperature, it is recommended to use aluminum foil packing.

◆ (2)Caution:

①For welding process management in good condition, please ensure Ar/CO_2 MIX GAS as appropriate percentage.

②MIX gas shielding had more efficiency on welding speed, less spatter good welding management and good weld metal quality than CO_2 gas shielding.

③Gas flow recommendation by 20-25 l/min. In order to prevent from porosity defect, do not make excess gas flow and use windproof measures.

④If current less than 250Amp use 15-20mm stick out. Current over than 250Amp, use 20-25mm stick out.

⑤For TIG welding process, Argon shielding gas with 99.997% high purity is recommended with 12-18 l/min gas flow.

⑥Before TIG welding process, acetone is popular solvent for degreasing metal surfaces. It would reduce porosity defect.

⑦Tungsten electrodes are used mainly for direct current welding, which contains with Thoriated by 1-2%. The ideal electrode shape for welding thin steel, which helps the tungsten maintain its sharpened edge after grinding.

⑧When carbon steel TIG rods applies on filler welding or overlayer welding beads, the hardness degree normally over than HV300. Therefore parts of base metal be aware of preheat, heat input control and PWHT processing for stress relief.

SMG-4

AWS A5.18 ER70S-4
EN ISO 14341-A G 42 3 C1/M21 3Si1
GB T8110 ER50-4

MIG WIRE FOR 490N/mm² HIGH TENSILE STEEL

DESCRIPTION & APPLICATIONS :

- SMG-4 is a high tensile steel wire for 490N/mm² grade steel. It is suitable for thin steel plates and all-positional welding.
- If is for welding of general fabrication, ship building, vehicle, structural work and bridges joint welding.

NOTE ON USAGE :

- Use shielding gas with flow rate 15~25 l/min.
- Wire-stick-out must be kept between 15~25mm.
- Keep nozzle and tips clean before usage.

WELDING POSITION :

TYPICAL CHEMICAL COMPOSITION OF WELD METAL (wt%) : (Shielding Gas : 100% CO_2)

C	Mn	Si	P	S
0.082	1.40	0.82	0.012	0.009

TYPICAL MECHANICAL PROPERTIES OF WELD METAL : (Shielding Gas : 100% CO_2)

YP N/mm²(Kgf/mm²)	TS N/mm²(Kgf/mm²)	EL %	IV -20°C/-30°C J(Kgf-m)
470(48.0)	540(55.1)	28	104(10.6)/62(6.3)

SIZE AND RECOMMENDED CURRENT RANGE : DC(+)

Diameter(mm)	0.8	0.9	1.0	1.2	1.6
Current (Amp)	50-180	50-200	80-250	100-350	250-500

SMG-6

AWS A5.18 ER70S-6
EN ISO 14341-A G 42 3 C1/M21 3Si1
GB T8110 ER50-6

MIG WIRE FOR 490N/mm² HIGH TENSILE STEEL

DESCRIPTION & APPLICATIONS :

- SMG-6 is a premium, multiple deoxidized solid wire. It is suitable for thin steel sheet with 490N/mm² grade welding.
- It is for all-positional welding on ship building, vehicle, structural work and general fabrication.

NOTE ON USAGE :

- Use shielding gas with flow rate 20~25 l/min.
- Wire-stick-out must be kept between 15~25mm.
- Keep nozzle and tips clean before usage.

WELDING POSITION :

TYPICAL CHEMICAL COMPOSITION OF WELD METAL (wt%) : (Shielding Gas : 100% CO_2)

C	Mn	Si	P	S
0.08	1.53	0.88	0.012	0.008

TYPICAL MECHANICAL PROPERTIES OF WELD METAL : (Shielding Gas : 100% CO_2)

YP N/mm²(Kgf/mm²)	TS N/mm²(Kgf/mm²)	EL %	IV -30°C/-45°C J(Kgf-m)
450(45.9)	550(56.1)	30	100(10.2)/60(6.1)

SIZE AND RECOMMENDED CURRENT RANGE : DC(+)

Diameter(mm)	0.8	0.9	1.0	1.2	1.6
Current (Amp)	50-180	50-200	80-250	100-350	200-500

SMG-8

AWS A5.18 ER70S-G
EN ISO 14341-A G 42 3 C1/M21 Z
GB T8110 ER50-G

MIG WIRE FOR 490N/mm^2 HIGH TENSILE STEEL

DESCRIPTION & APPLICATIONS :

- SMG-8 is a solid wire for 490N/mm^2 high tensile steel. Contains with titanium element and suitable with high current and thick plate welding.
- It is for welding ship building, vehicle, steel structure and bridge.

NOTE ON USAGE :

- Use shielding gas with flow rate 20~25 l/min.
- Wire-stick-out must be kept between 15~25mm.
- Keep nozzle and tips clean before usage.

WELDING POSITION :

TYPICAL CHEMICAL COMPOSITION OF WELD METAL (wt%) : (Shielding Gas : 100% CO_2)

C	Mn	Si	P	S	Ti
0.07	1.48	0.75	0.015	0.008	0.16

TYPICAL MECHANICAL PROPERTIES OF WELD METAL : (Shielding Gas : 100% CO_2)

YP N/mm^2(Kgf/mm^2)	TS N/mm^2(Kgf/mm^2)	EL %	IV -30°C J(Kgf-m)
465(47.4)	570(58.1)	31	55(5.6)

SIZE AND RECOMMENDED CURRENT RANGE : DC(+)

Diameter(mm)	1.0	1.2	1.4	1.6
Current (Amp)	50-220	100-350	150-450	250-550

SMG-52

AWS A5.18 ER70S-2
EN ISO 14341-A G 42 3 C1/M21 2Ti
GB –

MIG WIRE FOR 490N/mm² HIGH TENSILE STEEL

DESCRIPTION & APPLICATIONS :

- SMG-52 is a solid wire for 490N/mm² high tensile steel. Adding on the slight aluminum(Al), titanium(Ti) and zirconium(Zr) metallic elements, the weldability is great on mechanical properties.
- Suitable for pressure vessels, petro and chemical industry for root pass welding.

NOTE ON USAGE :

- Use shielding gas with flow rate 20~25 l/min.
- Wire-stick-out must be kept between 15~25mm.
- Keep nozzle and tips clean before usage.

WELDING POSITION :

TYPICAL CHEMICAL COMPOSITION OF WELD METAL (wt%) : (Shielding Gas : 100% CO_2)

C	Mn	Si	P	S	Al	Ti	Zr
0.038	1.21	0.51	0.015	0.008	0.06	0.08	0.04

TYPICAL MECHANICAL PROPERTIES OF WELD METAL : (Shielding Gas : 100% CO_2)

YP N/mm²(Kgf/mm²)	TS N/mm²(Kgf/mm²)	EL %	IV -30°C J(Kgf-m)
474(48.4)	545(55.6)	29	90(9.2)

SIZE AND RECOMMENDED CURRENT RANGE : DC(+)

Diameter(mm)	0.8	0.9	1.0	1.2	1.6
Current (Amp)	50-180	50-200	80-250	100-350	250-500

STG-50

AWS A5.18 ER70S-G
EN ISO 636-A W 42 3 Z
GB T8110 ER50-G

TIG RODS FOR 490N/mm^2 HIGH TENSILE STEEL

DESCRIPTION & APPLICATIONS :

- STG-50 is a tig rod for 490N/mm^2 grade steel.
- It is used for ship building, pressure vessel, vehicles, petro chemical, pipes of nuclear plant and other high pressure equipment.

NOTE ON USAGE :

- Use 99.997% Ar as shielding gas and control the gas flow properly, 100~200Amp with 7~12 l/min; 200~300Amp; 12~15 l/min.
- Recommended E.S.O. 5mm and arc length is 1~3mm for better bead appearance.

WELDING POSITION :

TYPICAL CHEMICAL COMPOSITION OF WELD METAL (wt%) : (Shielding Gas : Ar)

C	Mn	Si	P	S
0.07	1.51	0.78	0.013	0.006

TYPICAL MECHANICAL PROPERTIES OF WELD METAL : (Shielding Gas : Ar)

YP N/mm^2(Kgf/mm^2)	TS N/mm^2(Kgf/mm^2)	EL %	IV -30°C /-45°C J(Kgf-m)
470(48.0)	550(56.1)	30	220(22.4)/150(15.3)

SIZE AND RECOMMENDED CURRENT RANGE : DC(-)

Diameter(mm)	1.2	1.6	2.0	2.4	3.2	4.0
Current (Amp)	60-80	70-90	90-120	100-140	160-250	180-280

STG-52

AWS A5.18 ER70S-2
EN ISO 636-A W 42 3 2Ti
GB T8110 ER50-2

TIG RODS FOR 490N/mm² HIGH TENSILE STEEL

DESCRIPTION & APPLICATIONS :

- STG-52 is a tig rod for 490N/mm² grade steel.
- Adding on the slight aluminum(Al), titanium(Ti) and zirconium(Zr) metallic elements, it exhibits excellent deoxidation effects and mechanical properties.

NOTE ON USAGE :

- Use 99.997% Ar as shielding gas and control the gas flow properly, 100~200Amp with 7~12 l/min; 200~300Amp; 12~15 l/min.
- Recommended E.S.O. 5mm and arc length is 1~3mm for better bead appearance.
- Proper wind protection measures are required during welding to prevent porosity caused by wind interference.

WELDING POSITION :

TYPICAL CHEMICAL COMPOSITION OF WELD METAL (wt%) : (Shielding Gas : Ar)

C	Mn	Si	P	S	Al	Ti	Zr
0.038	1.18	0.49	0.013	0.008	0.07	0.09	0.05

TYPICAL MECHANICAL PROPERTIES OF WELD METAL : (Shielding Gas : Ar)

YP N/mm²(Kgf/mm²)	TS N/mm²(Kgf/mm²)	EL %	IV -30°C J(Kgf-m)
480(49.0)	561(56.1)	29	120(12.2)

SIZE AND RECOMMENDED CURRENT RANGE : DC(-)

Diameter(mm)	1.2	1.6	2.0	2.4	3.2	4.0
Current (Amp)	60-80	70-90	90-120	100-140	160-250	180-280

STG-56

AWS A5.18 ER70S-6
EN ISO 636-A W 42 3 3Si1
GB T8110 ER50-6

TIG RODS FOR 490N/mm² HIGH TENSILE STEEL

DESCRIPTION & APPLICATIONS :

- STG-56 is a tig rod for 490N/mm² grade steel. Especially for the first backing welding of pipie.
- It is used for ship building, pressure vessel, vehicles, petro chemical, pipes of nuclear plant and other high pressure equipment.

NOTE ON USAGE :

- Use 99.997% Ar as shielding gas and control the gas flow properly, 100~200Amp with 7~12 l/min; 200~300Amp; 12~15 l/min.
- Recommended E.S.O. 5mm and arc length is 1~3mm for better bead appearance.
- In order to avoid porosity defect, proper protection from wind during welding.

WELDING POSITION :

TYPICAL CHEMICAL COMPOSITION OF WELD METAL (wt%) : (Shielding Gas : Ar)

C	Mn	Si	P	S
0.09	1.44	0.88	0.014	0.009

TYPICAL MECHANICAL PROPERTIES OF WELD METAL : (Shielding Gas : Ar)

YP N/mm²(Kgf/mm²)	TS N/mm²(Kgf/mm²)	EL %	IV -30°C/-45°C J(Kgf-m)
461(47.0)	570(58.2)	28	240(24.5)/160(16.3)

SIZE AND RECOMMENDED CURRENT RANGE : DC(-)

Diameter(mm)	1.2	1.6	2.0	2.4	3.2	4.0
Current (Amp)	60-80	70-90	90-120	100-140	160-250	180-280

Mild steel & High Tensile Steel: Submerged Arc Welding

Profiles

For carbon steel submerged arc welding contains FLUX and welding wire. For welding process with both flux and wire from long range flat or horizontal welding.

In accordance with AWS A5.17 for classification of solid electrodes, composite electrodes, and flux-electrode combinations. In general, solid wire had been divided as Low-Manganese electrodes, Medium-Manganese electrodes and Hgih-Manganese electrodes. For Flux had been specified with tensile stretch grade, impact value, heat treatment or blend of crushed slag requirements.

There are two flux types: fused flux and unfused flux (bonded flux and agglomerated flux).

Fused materials are queened in water, granulized and sieved to get fused flux finally, recommended welding current by low and medium level (≦1000A). Unfused fluxes are then made into particles with certain granular size. Products recommended for medium or high current welding (≥600A).

Welding conditions		Welding beads appearance
Stick-out length	Long	Poor penetrate & Pre-humping
	Short	Well penetrate & No hump
Current	Large	Poor penetrate & Pre-humping
	Small	Well penetrate & No hump
Amp	Large	Poor penetrate with large bead high
	Small	Well penetrate with narrow bead width
Welding direction	Forward	Well penetrate & Pre-humping
	Backward	Poor penetrate & no hump
Welding speed	Fast	Poor penetrate, no hump and narrow bead width
	Slow	Well penetrate, Pre-humping and large bead width

Working instruction

(1)Storage management:

①To maintain the integrity of these products, electrodes must be protected from the atmosphere. All welding wires, regardless of package, should be protected from condensation.

②Submerged arc welding flux recommended re-drying. Sintering temperature is 350°C×1hr but fused flux is 200~300°C× 1hr.

③Unfused flux could be reused but need blended with virgin flux.

(2)Caution:

①When groove welding recommend semi-automatic wire feeding for root passing.

②Appropriate flux covered for submerged arc welding could avoid porosity or pitting from welding bead.

③If working plate thickness over than 50mm, recommended welding width more than 2/3 from pre welding bead width. It helps to reduce delayed cracking. Therefore, preheat and post welding heat treatment need to be realized exactly.

④When welding thick plates over 50 mm, preheating and post-weld heating procedures must be implemented to avoid rapid cooling rates and excessive diffusible hydrogen in the weld, which can lead to cracking.

SF-38xSW-M12K

AWS A5.17 F7A2-EM12K
EN ISO 14171-A S 38 2 AB S2Si
GB T5293 F5A3-H08MnA

SUBMERGED ARC WELDING WIRE AND FLUX FOR 490N/mm² HIGH TENSILE STEEL

DESCRIPTION & APPLICATIONS :

- Nice welding beac appearance, good slag removal and recommended for single or dual pass welding.
- Suitable for steel frames, H beam and general steel structure.

NOTE ON USAGE :

- SF-38 is an acid type flux. Re-dry the flux at 350˚C for 1hr prior to use.
- Lower current is recommended for welding first pass.
- Appropriate new flux is required to add with the recycling used flux for maintain the welding quality.

TYPICAL CHEMICAL COMPOSITION OF WELD METAL :

C	Mn	Si	P	S
0.06	1.20	0.61	0.021	0.010

TYPICAL MECHANICAL PROPERTIES OF WELD METAL :

YP N/mm²(Kgf/mm²)	TS N/mm²(Kgf/mm²)
415(42.3)	525(53.6)
EL %	**IV -20˚C/-30˚C J(Kgf-m)**
31	49(5.0)/32(3.3)

SF-65xSW-M12K

AWS A5.17 F7A2-EM12K
EN ISO 14171-A S 42 3 AB S2Si
GB T5293 F5A3-H08MnA

SUBMERGED ARC WELDING WIRE AND FLUX FOR 490N/mm² HIGH TENSILE STEEL

DESCRIPTION & APPLICATIONS :

- Suitable for thickness plates in deep groove applications. It is designed for multi-pass welds.
- Typical applications include pressure vessels, ship building, bridge and steel structures.

NOTE ON USAGE :

- SF-65 is a neutral flux and need to be re-dry at 350˚C for 1hr prior to use.
- Lower current is recommended for welding first pass.
- Appropriate new flux is required to add with the recycling used flux for maintain the welding quality.

TYPICAL CHEMICAL COMPOSITION OF WELD METAL :

C	Mn	Si	P	S
0.07	1.50	0.60	0.018	0.006

TYPICAL MECHANICAL PROPERTIES OF WELD METAL :

YP N/mm²(Kgf/mm²)	TS N/mm²(Kgf/mm²)
460(46.9)	560(57.1)
EL %	**IV -30˚C J(Kgf-m)**
30	55(5.6)

SF-65xSW-H14

AWS A5.17 F7A2-EH14
EN ISO 14171-A S 42 3 AB S4
GB T5293 F5A3-H10Mn2

SUBMERGED ARC WELDING WIRE AND FLUX FOR 490N/mm² HIGH TENSILE STEEL

DESCRIPTION & APPLICATIONS :

- Suitable for thickness plates in deep groove applications. It is designed for multi-pass welds.
- Typical applications include pressure vessels, ship building, bridge and steel structures.

NOTE ON USAGE :

- SF-65 is a neutral flux and need to be re-dry at 350˚C for 1hr prior to use.
- Lower current is recommended for welding first pass.
- Appropriate new flux is required to add with the recycling used flux for maintain the welding quality.

TYPICAL CHEMICAL COMPOSITION OF WELD METAL :

C	Mn	Si	P	S
0.05	1.80	0.60	0.016	0.008

TYPICAL MECHANICAL PROPERTIES OF WELD METAL :

YP N/mm²(Kgf/mm²)	TS N/mm²(Kgf/mm²)
500(51.0)	585(59.7)
EL %	**IV -30˚C/-40˚C J(Kgf-m)**
28	67(6.8)/48(4.9)

SF-66xSW-M12K

AWS A5.17 F7A4/P4-EM12K
EN ISO 14171-A S 42 5 FB S2Si
GB T5293 F5A4/P4-H08MnA

SUBMERGED ARC WELDING WIRE AND FLUX FOR 490N/mm² HIGH TENSILE STEEL

DESCRIPTION & APPLICATIONS :

- Suitable for thickness plates in deep groove applications. It is designed for multi-pass welds.
- Typical applications include pressure vessels, ship building, bridge and steel structures.

NOTE ON USAGE :

- SF-66 is a neutral flux and need to be re-dry at 350˚C for 1hr prior to use.
- Lower current is recommended for welding first pass.
- Appropriate new flux is required to add with the recycling used flux for maintain the welding quality.

TYPICAL CHEMICAL COMPOSITION OF WELD METAL :

C	Mn	Si	P	S
0.07	1.51	0.42	0.018	0.015

TYPICAL MECHANICAL PROPERTIES OF WELD METAL :

YP N/mm²(Kgf/mm²)	TS N/mm²(Kgf/mm²)	EL %
460(46.9)	560(57.1)	30
425(43.4)	515(52.5)	29
IV -30˚C/-50˚C J(Kgf-m)	**HEAT TREATMENT**	
90(9.2)/70(7.1)	Welding process	
102(10.4)/80(8.2)	620˚Cx1hr	

SF-66xSW-H12K

AWS A5.17 F7A8/P8-EH12K
EN ISO 14171-A-S 46 6 FB S3Si
GB –

SUBMERGED ARC WELDING WIRE AND FLUX FOR 490N/mm² HIGH TENSILE STEEL

DESCRIPTION & APPLICATIONS :

- Suitable for thickness plates in deep groove applications. It is designed for multi-pass welds.
- Typical applications include pressure vessels, ship building, bridge and steel structures.

NOTE ON USAGE :

- SF-66 is a neutral flux and need to be re-dry at 350˚C for 1hr prior to use.
- Lower current is recommended for welding first pass.
- Appropriate new flux is required to add with the recycling used flux for maintain the welding quality.

TYPICAL CHEMICAL COMPOSITION OF WELD METAL :

C	Mn	Si	P	S
0.09	1.62	0.30	0.015	0.004

TYPICAL MECHANICAL PROPERTIES OF WELD METAL :

YP N/mm²(Kgf/mm²)	TS N/mm²(Kgf/mm²)	EL %
490(50.0)	570(58.2)	32
465(47.4)	520(53.1)	34

IV -50˚C/-62˚C J(Kgf-m)	HEAT TREATMENT
72(7.3)/50(5.1)	Welding process
88(9.0)/68(6.9)	620˚Cx1hr

Mild steel & High Tensile Steel: Electroslag Welding and Electrogas Welding

Profiles

◆ (1)ESW(Electroslag Welding):

Electroslag welding was so called SESNET (Simplified Electroslag Welding Process with Non-consumable Elevating Tip) usually used to make square-groove weld for box column in steel construction segment. It is a high-efficiency welding process in which a non-consumable nozzle, which is used to guide the electrode, is designed to elevate automatically as welding progresses.

The SESNET process is most effective when it is used to weld. In order to avoid poor feeding wire or conductivity, standard package forms usually by drums. Ensure wire feeding smoothly with good copper coating on wire surface would be avoid welding bead apperance poor penetration and slag inclusion defect.

In accordance AWS A5.25 classification, the wire types include both solid and composite metal cored. And fluxes were classified by tensile strength and impact value.

Wire types	Composition	Weld Metal Composition	Classified	Weld metal types
Solid wire	Specified	--	1.Medium-Manganese Classes: EM5K, EM12, EM12K, EM13K, EM15K 2.High-Manganese Classes: EH14 3.Special Classes: EWS(Weather resistant), EA3K(Heat resistant), EH10K, EH11K, ES-G	--
Metal Core Flux Wire	--	Specifiedt	--	EWT1, EWT2, EWT3, EWTG

◆ (2)EGW (Electrogas Welding):

Electrogas Welding is a continuous vertical position arc welding process but self-shielding is sometimes used. In EGW, the heat of the welding arc causes the electrode and workpiece to melt the flow into the cavity between the parts being welded. This molten metal solidifies from the bottom up, joining the parts being welded together.

EGW process usually use CO_2 or MIX GAS (Argon, Argon/CO_2, Argon/He Mixing Gas). A Self-shielding is sometimes used. In general, the flux cored usually large diameter but solid wire also been used. The welding recommendation as following condition:

TYPES	Conditions
Workpiece thickness	12~35mm
Consumable	AISI Grades 1008 to 1020
Current type	AC or DC
Current range	400 ~ 700A
Diameter	2.4~3.2mm

In accordance AWS A5.26 classification, the wire types include both solid, flux cored and metal cored. And specification would be classified by tensile strength, impact value and weld metal composition.

Classification	Welding wire com-postion	Weld metal compositon	Wire types	Weld Metal types
Solid wire	Specified	--	EGXXS-1 / -2 / -3 / -5 / -6 / -6 / -D2 / -G NOTE: Please refer AWS A5.26 Chapter A1 & A7	--
Flux cored and Met-al cored	--	Specified	--	EG6XT-1, EG7XT-1, EG8XT-1, EG6XT-2, EG7XT-2, EGXXT-Ni1, EGXXT-NM1, EGXXT-NM2, EGXXT-W, EGXXT-G NOTE: Please refer AWS A5.26 Chapter A7

Working instruction

◆ (1)Storage management:

①Be aware of wire scramble due to drum damaged.

②In general drum package formed by paper. Please keep away heat and high humid ambient.

③For Coil package form, please be careful wire damage or exposure humidity during moving.

◆ (2)Caution:

①Check wire feeding direction from drum and be aware of wire scramble issue.

②In order to avoid poor penetration and slag inclusions defect. Please ensure wire feeding moving average works perfect.

SFC-721

AWS A5.26 EG72T-1
EN –
GB –

ELECTROGAS ARC WELDING FOR 490N/mm² HIGH TENSILE STEEL (EGW)

DESCRIPTION & APPLICATIONS :

- SFC-721 is a self-shielded flux cored wire designed for vertical up, single pass welding with high deposition rate.
- Suitable for mild steel, high tensile steel, base metal thickness range 19-100mm. Such as steel structure, boxes,, heavy shop fabrication welding.

NOTE ON USAGE :

- Pre-heat the workpiece and welding zone.
- Consumable guide tube material chemistry close to deposit metal is recommended. (ref. AISI Grades 1008 to 1020)

WELDING POSITION :

TYPICAL CHEMICAL COMPOSITION OF WELD METAL (wt%) :

C	Mn	Si	P	S	Mo
0.08	1.32	0.26	0.014	0.006	0.12

TYPICAL MECHANICAL PROPERTIES OF WELD METAL :

YP N/mm²(Kgf/mm²)	TS N/mm²(Kgf/mm²)	EL %	IV -30°C J(Kgf-m)
440(44.9)	580(59.2)	25	56(5.7)

SIZE AND RECOMMENDED CURRENT RANGE : DC(-)

Diameter (mm) / Parameters	3.0			
Thickness (mm)	19	25	38	50
WFS (cm/min)	510	580	750	890
Voltage (Volt)	34-37	38-41	41-43	43-45

Low-Alloy Steel

LOW ALLOY STEEL

Base metal introduction

Definition: Main metal of low alloy steel is iron, and the total of the other metal is/or less than 5%. Low alloy steel by composition includes heat resistant steel, low temperature service steel, atmospheric corrosion resistant steel, and high tensile steel. By usage, structure, tool, special application.

Heat resistant low alloy steel includes carbon(C), chromium(Cr), molybdenum(Mo), tungsten(W), vanadium(V), niobium(Nb), boron(B), and remain tensile strength, anti-creep or corrosion under high temperature.

Low temperature service steel includes nickel(Ni), minor molybdenum(Mo), minor vanadium(V), and remain impact resistance and ductility under low temperature.

Atmospheric corrosion resistant steel includes chromium(Cr), nickel(Ni), copper(Cu), or minor vanadium(V) for resist the pitting corrosion on the surface.

Low temperature service steel includes manganese(Mn), chromium(Cr), minor molybdenum(Mo), nickel(Ni) to enhance strength for structures, tools, modules, and bearings.

Welding method and Specifications

Welding methods of low alloy steel is the same as mild steel and high tensile steel. Heat input, temperature control, diffusible hydrogen reducing are the main points.

There is possibly internal stress on the beads because of the adding alloy, especially for the heat resistant steel. Post heat treatment is necessary to eliminate the stress.

SELECTION RECOMMENDATION

Material of Base metal, tensile strength, assembly structure, and method of welding are important for selecting welding consumable. For example, ASTM A387 G.11 contains 1.25%Cr + 0.5%Mo. Its tensile strength range from 515 to 690 N/mm^2, so the suitable consumable are E8018-B2, E8018-B2, or ER80S-B.

According to AWS A5.5, the classification and features of stick electrodes are as below:

Classification	Characteristic	Group	Features
Carbon molybdenum steel	Heat resistant	A1	1.The heat resistance and anti-corrosion abilities increase because of adding 0.5%Mo, however the impact toughness decreases. 2.Suitable for the welding for steel plates of ASTM A204 or pipes of A355 P1.
Chrome molybdenum steel	Heat resistant	B2, B3, B4, B5, B6, B7, B8	1.The heat resistance and anti-corrosion abilities increase because of adding 0.5%~10%Cr - 0.5%~1.25%Mo, however the impact toughness decreases. 2.Suitable for the welding for steel plates of ASTM A387 or pipes of A213 or A335.
	Heat resistant	B23	1.Under high temperature, the creep and anti-fatigue, impact toughness, and Anti-oxidation and corrosion abilities increase because of adding 2.5% Cr–1.5% W–0.2%Mo–0.20% V–0.04% Nb. 2.Suitable for the welding for ASTM A283.
	Heat resistant	B24	1.Under high temperature, the creep and anti-fatigue, impact toughness, and Anti-oxidation and corrosion abilities increase because of adding 2.5% Cr–1.0% Mo–0.20%V–0.10% Ti–0.04% Nb. 2.Suitable for the welding ASTM A283.
	Heat resistant	B91	1.Under high temperature, the creep and anti-fatigue, impact toughness, and Anti-oxidation and corrosion abilities increase because of adding 9% Cr–1% Mo and minor Nb&V. 2.Suitable for the welding for steel plates of ASTM A387 Gr.91 or A213 T91, or pipes of A335 P91. 3.The heat input, temperature, and post heat treatment must be strictly followed.
	Heat resistant	B92	1.Under high temperature, with excellent creep and anti-fatigue, impact toughness, and Anti-oxidation and corrosion abilities because of adding 9% Cr–2% W–0.5% Mo–0.20%V–0.05% Nb. 2.Suitable for the welding for pipes of ASTM A213 T92 or A335 P92. 3.The heat input, temperature, and post heat treatment must be strictly followed.

Classification	Characteristic	Group	Features
Nickel steel	Low Temperature	C1, C2, C3, C4, C5	1.The material is with 1~6.5%Ni , and classified to 5 grades. With excellent impact toughness when the temperature ranges -115°C~room temperature. 2.Suitable for the welding for steel plates of ASTM ASTM A203 Gr.91 or A645.
Nickel molybdenum steel	Special purpose	NM1	1.The material, with 1%Ni - 0.5%Mo and minor V&Cu, is for high tensile strength under special circumstance. 2.Not require post heat treatment.
	Special purpose	NM2	1.The material, with 2%Ni - 0.4%Mo, is for high tensile strength under special circumstance. 2.For the equipment of Nuclear power plant because of longer time of post heat treatment. To remain the strength, there is usually falling weight test.
Manganese Molybdenum Steel	Special purpose	D1, D2, D3	1.The material, with 1.5~1.8%Mn - 0.3~0.5%Mo – 0.2~0.4%Ni , has better performance of tensile strength and impact toughness than Carbon molybdenum steel and Nickel molybdenum steel. 2.PWHT is required.
Regular	Muti-classification	G	1.Classified to 6 materials and range E70~E120 by tensile strength. 2. The requirement for the chemical composition of G series is that, P&S need to be under its upper limit, and at least one of the others need to be above its lower limit. 3. The material's characteristic of G series must be checked and confirmed in case of any misuse.
Military	Military	M	1.For Military, with multi-alloy, especially Ni, to meet the requirement of low temperature impact toughness. 2.Diffusible hydrogen is required, and heat input need to be strictly controlled, but post heat treatment is not required.
Pipe	Cellulose	P1	1.Designed for first bead of pipe's vertical welding, and normally with V-down position. 2.Used for the welding of pipes of API-5L-X52,API-5L-X65,API-5L-X70.
	Low hydrogen	P2	1.Designed for pipe welding, and suitable for the layer after first bead. With all positions and V-down. 2.Designed for API-5L series, up to X80 grade pipe.
Atmospheric Corrosion Resistant	Anti-pitting corrosion	W1, W2	1.With minor Ni, Cr, and 0.5%Cu, to improve Anti-pitting corrosion. 2.Designed for the welding of Atmospheric Corrosion Resistant steel (e.g ASTM A242 or A588)

WELDING OPERATION

◆ (1)Storage:

①The cover of low alloy steel is normally low hydrogen, which need to avoid the environment of high humidity (≥80%R.H) and high temperature(≥30°C), to avoid humid cover of electrode.

②Re-bake low tungsten electrode need to be put in the oven or containers with temperature 100~150°C. Taking proper quantity to reduce the humidity and avoid high diffusible hydrogen. See annex for drying condition.

◆ (2)Note:

①The temperature of heat input, preheat, bead temperature, post heat, and post heat treatment must be strictly controlled, to avoid crack or quality problem.

②Oxide layer, water, oil, rust, and anything on surface will increase gas and diffusible hydrogen, and case the defects, so the surface must be clean before welding.

③Low hydrogen electrode need to be welded with short arc to avoid water and nitrogen into the beads and causing air hole or crack.

④Low hydrogen electrode need to take the method of forward-back welding for arcing. The arcing point should be 1~2cm in front of welding start point, to eliminate air holes.

⑤The current is suggested as low as possible, and the width of weave is also suggested as small as possible, to avoid the alloy damaged by burning, and the grain enlarge.

⑥When B3(2.25%Cr-1%Mo) Heat resistant steel is heated under the temperature 400-500°C for long period of time, the trace elements(P,Sb,As,Sn) in the bead will spread to the cell of Austenitic, and cause the strength of cell reduce and the toughness degrade. This is so called temper brittleness. To avoid this, the composition need to be managed, and the temperature of bead need to be controlled in 160~190°C.

SL-60

AWS A5.5 E8016-G
EN ISO 2560-A E 46 3 B 3 2
GB T5118 E5516-G

≥ 550N/mm² High tensile steel SMAW

DESCRIPTION & APPLICATIONS :

- SL-60 is a low hydrogen electrode for the welding of 550N/mm² grade high tensile steel.
- This electrode is suitable for forging, structural steel, alloy steel, high pressure pipe, pressure vessel, ASTM A299/302/372, etc.

NOTE ON USAGE :

- Prebake the base metal at 100~150°C.
- Rebake the electrodes at 350~400°C for 60 minutes and keep at 100~150°C before use.
- Take the backstep method to prevent blowholes at the arc starting.

WELDING POSITION :

TYPICAL CHEMICAL COMPOSITION OF WELD METAL (wt%) :

C	Mn	Si	P	S
0.081	1.27	0.39	0.021	0.008

TYPICAL MECHANICAL PROPERTIES OF WELD METAL :

YIELD POINT N/mm²(Kgf/mm²)	TENSILE STRENGTH N/mm²(Kgf/mm²)	ELONGATION RATE %	IMPACT VALUES -30°C J(Kgf-m)
539(55)	637(65)	29	80(8.2)

SIZE AND RECOMMENDED CURRENT RANGE : AC or DC(+)

Diameter (mm)		3.2	4.0	5.0
Length (mm)		350	400	400
Current (Amp)	F	90-130	130-180	180-240
	V & OH	80-120	110-160	150-200

SL-63

AWS A5.5 E8013-G
EN –
GB –

≥ 550N/mm² High tensile steel SMAW

DESCRIPTION & APPLICATIONS :

- SL-63 is electrodes designed for 550N/mm² grade high tensile steel application. Thin plate to middle thickness plate joining is typically recommended especially for horizontal welding.
- Superior weldability with high deposition rate but less spatters. Stable arc transfer and smooth slag removal, good for all positional welding and nice bead appearance.
- It is good for steel fabrication i.e. mobile, bridges, constructions.

NOTE ON USAGE :

- If the consumable expose to the air more than 4 hours, rebake the electrodes at 80~100°C for 30~60 minutes before welding.

WELDING POSITION :

TYPICAL CHEMICAL COMPOSITION OF WELD METAL (wt%) :

C	Mn	Si	P	S	Cu
0.08	0.62	0.32	0.016	0.007	0.32

TYPICAL MECHANICAL PROPERTIES OF WELD METAL :

YIELD POINT N/mm²(Kgf/mm²)	TENSILE STRENGTH N/mm²(Kgf/mm²)	ELONGATION RATE %
482(49.2)	570(58.1)	25

SIZE AND RECOMMENDED CURRENT RANGE : AC or DC(+)

Diameter (mm)		3.2	4.0	5.0
Length (mm)		350	450	450
Current (Amp)	F	100-140	140-180	180-240
	V & OH	70-110	100-160	140-200

SL-80

AWS A5.5 E9016-G
EN ISO 18275-A E 55 3 B 1 2
GB T5118 E6016-G

≥ 550N/mm² High tensile steel SMAW

DESCRIPTION & APPLICATIONS :

- SL-80 is a low hydrogen electrode for the welding of 620N/mm² grade high tensile steel.
- It is suitable for shipbuilding, machine fabrication, offshore structure, pressure vessel, high pressure pipe.

NOTE ON USAGE :

- Preheating base metals at 100 ~ 150°C.
- Rebake the electrodes at 300 ~ 350°C for 60 minutes and keep at 100 ~ 150°C before use.
- Take the backstep method to prevent blowholes at the arc starting.

WELDING POSITION :

TYPICAL CHEMICAL COMPOSITION OF WELD METAL (wt%) :

C	Mn	Si	P	S	Ni	Mo
0.08	1.15	0.43	0.018	0.004	0.77	0.30

TYPICAL MECHANICAL PROPERTIES OF WELD METAL :

YIELD POINT N/mm²(Kgf/mm²)	TENSILE STRENGTH N/mm²(Kgf/mm²)	ELONGATION RATE %	IMPACT VALUES -30°C J(Kgf-m)
620(63.3)	705(72)	24	78(8.0)

SIZE AND RECOMMENDED CURRENT RANGE : AC or DC(+)

Diameter (mm)		3.2	4.0	5.0
Length (mm)		350	400	400
Current (Amp)	F	90-130	130-180	180-240
	V & OH	80-120	110-160	150-200

SL-108M

AWS A5.5 E10018-M
EN ISO 18275-A E 62 5 1.5NiMo B 3 2
GB T5118 E7018-M

≥ 550N/mm² High tensile steel SMAW

DESCRIPTION & APPLICATIONS :

- SL-108M is an iron powder low hydrogen electrode designed for welding 690N/mm² grade high tensile steel.
- It can obtain good heat resistance and great crack resistance because of its low hydrogen composition in the weld metal.
- In addition to the welding before hardfacing.

NOTE ON USAGE :

- Rebake the electrodes at 300 ~ 400°C for 60 minutes and keep at 100 ~ 150°C before use.
- Backstep is the welding method to prevent blowholes during the arc starting.

WELDING POSITION :

TYPICAL CHEMICAL COMPOSITION OF WELD METAL (wt%) :

C	Mn	Si	P	S	Ni	Cr	Mo
0.06	1.12	0.32	0.012	0.005	1.98	0.01	0.36

TYPICAL MECHANICAL PROPERTIES OF WELD METAL :

YIELD POINT N/mm²(Kgf/mm²)	TENSILE STRENGTH N/mm²(Kgf/mm²)	ELONGATION RATE %	IMPACT VALUES -51 °C J(Kgf-m)
638(65.1)	725(73.9)	22	60(6.1)

SIZE AND RECOMMENDED CURRENT RANGE : DC(+)

Diameter (mm)		3.2	4.0	5.0
Length (mm)		350	400	400
Current (Amp)	F	90-130	130-180	180-240
	V & OH	80-120	110-160	–

SL-118M

AWS A5.5 E11018-M
EN ISO 18275-A E 69 5 Mn2NiCrMo B 3 2
GB T5118 E7518-M

≥ 550N/mm² High tensile steel SMAW

DESCRIPTION & APPLICATIONS :

- SL-118M is an iron power low hydrogen electrode designed for welding 780N/mm² grade high tensile steel.
- It can obtain good heat resistance and excellent mechanical properties.
- It is suitable for the welding of WEL TEN-80 high tensile steel as well.

NOTE ON USAGE :

- Rebake the electrodes at 300 ~ 400°C for 60 minutes and keep at 100 ~ 150°C before use.
- Backstep is the welding method to prevent blowholes during the arc starting.

WELDING POSITION :

TYPICAL CHEMICAL COMPOSITION OF WELD METAL (wt%) :

C	Mn	Si	P	S	Ni	Cr	Mo
0.06	1.51	0.42	0.010	0.009	1.98	0.03	0.38

TYPICAL MECHANICAL PROPERTIES OF WELD METAL :

YIELD POINT N/mm²(Kgf/mm²)	TENSILE STRENGTH N/mm²(Kgf/mm²)	ELONGATION RATE %	IMPACT VALUES -51 °C J(Kgf-m)
695(70.9)	785(80.1)	23	58(5.9)

SIZE AND RECOMMENDED CURRENT RANGE : DC(+)

Diameter (mm)		3.2	4.0	5.0
Length (mm)		350	400	400
Current (Amp)	F	90-130	130-180	180-240
	V & OH	80-120	110-160	–

SL-110

AWS A5.5 E11016-G
EN ISO 18275-A E 69 2 Mn2NiMo B 1 2
GB T5118 E7516-G

≥ 550N/mm² High tensile steel SMAW

DESCRIPTION & APPLICATIONS :

- SL-110 is a low hydrogen electrode designed for welding 690N/mm² grade high tensile steel.
- It can obtain good heat resistance and excellent mechanical properties in all position because of its low hydrogen composition.

NOTE ON USAGE :

- Rebake the electrodes at 300 ~ 400°C for 60 minutes and keep at 100 ~ 150°C before use.
- Backstep is the welding method to prevent blowholes during the arc starting.

WELDING POSITION :

TYPICAL CHEMICAL COMPOSITION OF WELD METAL (wt%) :

C	Mn	Si	P	S	Ni	Cr	Mo
0.08	1.5	0.25	0.016	0.008	2.2	0.32	0.5

TYPICAL MECHANICAL PROPERTIES OF WELD METAL :

YIELD POINT N/mm²(Kgf/mm²)	TENSILE STRENGTH N/mm²(Kgf/mm²)	ELONGATION RATE %	IMPACT VALUES -20°C J(Kgf-m)
740(75.5)	870(88.8)	21	56(5.7)

SIZE AND RECOMMENDED CURRENT RANGE : AC or DC(+)

Diameter (mm)		3.2	4.0	5.0
Length (mm)		350	400	400
Current (Amp)	F	90-130	130-180	180-240
	V & OH	80-120	110-160	–

SL-120

AWS A5.5 E12016-G
EN ISO 18275-A E 79 2 Mn2NiCrMo B 1 2
GB T5118 E8516-G

≥ 550N/mm² High tensile steel SMAW

DESCRIPTION & APPLICATIONS :

- SL-120 is a low hydrogen electrode for the welding of 830N/mm² grade high tensile steel.
- It is used for heat treatable low alloy steels, such as SCM21/4 chrome-molybdenum steel, SNCM8 Ni-Cr-Mo steel, high tensile steels such as WEL-TEN80/80C/80P/80E,ASTM A486 Gr120/A508 Gr5a.4a/A543 GrB3.C, etc.

NOTE ON USAGE :

- Rebake the electrodes at 350 ~ 400°C for 60 minutes and keep at 100 ~ 150°C before use.
- Take the backstep method to prevent blowholes at the arc starting.
- Preheating base metals at 150-200°C.

WELDING POSITION :

TYPICAL CHEMICAL COMPOSITION OF WELD METAL (wt%) :

C	Mn	Si	P	S	Ni	Cr	Mo
0.06	1.60	0.80	0.012	0.004	2.58	0.15	0.52

TYPICAL MECHANICAL PROPERTIES OF WELD METAL :

YIELD POINT N/mm²(Kgf/mm²)	TENSILE STRENGTH N/mm²(Kgf/mm²)	ELONGATION RATE %	IMPACT VALUES -20°C J(Kgf-m)
810(82.7)	900(91.8)	20	54(5.5)

SIZE AND RECOMMENDED CURRENT RANGE : AC or DC(+)

Diameter (mm)		3.2	4.0	5.0
Length (mm)		350	400	400
Current (Amp)	F	90-130	130-180	180-240
	V & OH	80-120	110-160	–

SC-70A1

AWS A5.5 E7010-A1
EN ISO 3580-A E Mo B 2 2
GB T5118 E5010-A1

HEAT-RESISTANT LOW-ALLOY STEEL SMAW

DESCRIPTION & APPLICATIONS :

- SC-70A1 is a low hydrogen electrode for the welding of 490N/mm2 grade high tensile steel.
- It can be used for welding of 0.5%Mo steel used for high temperature and pressure application.
- It can be used for high pressure boilers, chemical industries, oil refining industries and turbine casting.

NOTE ON USAGE :

- Proper preheat at 100 ~ 200°C and PWHT at 620 ~ 680°C.
- Rebake the electrodes at 70 ~ 80°C for 30 ~ 60 minutes before use.

WELDING POSITION :

TYPICAL CHEMICAL COMPOSITION OF WELD METAL (wt%) :

C	Mn	Si	P	S	Mo
0.093	0.41	0.23	0.016	0.009	0.55

TYPICAL MECHANICAL PROPERTIES OF WELD METAL :

YIELD POINT $N/mm^2(Kgf/mm^2)$	TENSILE STRENGTH $N/mm^2(Kgf/mm^2)$	ELONGATION RATE %	HEAT TREATMENT
510(52)	570(58.2)	27	620°Cx1hr

SIZE AND RECOMMENDED CURRENT RANGE : DC(+)

Diameter (mm)		3.2	4.0	5.0
Length (mm)		350	350	350
Current (Amp)	F	80-120	110-170	150-200
	V & OH	70-110	90-150	–

SR-76A1

AWS A5.5 E7016-A1
EN ISO 3580-A E Mo B 1 2
GB T5118 E5016-A1

HEAT-RESISTANT LOW-ALLOY STEEL SMAW

DESCRIPTION & APPLICATIONS :

- SR-76A1 is a low hydrogen electrode alloyed with 0.5% Mo for welding steels of pressure vessels.
- It is suitable for welding 0.5%Mo steel used at high temperature and high pressure.
- It can be used for ATPA12, A335-P1 of Steel Pipes, STBA 12, A209-T1, A161-T1 of heat exchanger, A217-WCI casting steel and A182-F1, A366-F1 of forging steels.

NOTE ON USAGE :

- Proper preheat at 100 ~ 200°C and PWHT at 620 ~ 680°C.
- Rebake the electrodes at 350 ~ 400°C for 60 minutes and keep at 100 ~ 150°C before use.
- Take the backstep method to prevent blowholes at the arc starting.

WELDING POSITION :

TYPICAL CHEMICAL COMPOSITION OF WELD METAL (wt%) :

C	Mn	Si	P	S	Mo
0.068	0.60	0.68	0.015	0.008	0.50

TYPICAL MECHANICAL PROPERTIES OF WELD METAL :

YIELD POINT $N/mm^2(Kgf/mm^2)$	TENSILE STRENGTH $N/mm^2(Kgf/mm^2)$	ELONGATION RATE %	HEAT TREATMENT
530(54.1)	600(61.2)	28	620°Cx1hr

SIZE AND RECOMMENDED CURRENT RANGE : AC or DC(+)

Diameter (mm)		3.2	4.0	5.0
Length (mm)		350	400	400
Current (Amp)	F	90-130	140-180	190-220
	V & OH	80-120	120-160	-

SR-78A1

AWS A5.5 E7018-A1
EN ISO 3580-A E Mo B 3 2
GB T5118 E5018-A1

HEAT-RESISTANT LOW-ALLOY STEEL SMAW

DESCRIPTION & APPLICATIONS :

- SR-78A1 is a 490N/mm^2 iron powder low hydrogen electrode.
- It can provide high welding efficiency because of additional iron powder. Suitable for alloy with 0.5% Mo under high temperature and pressure.
- Suitable for ATPA12, A335-P1 of Steel Pipes, STBA 12, A209-T1, A161-T1 of heat exchanger, A217-WCI casting steel and A182-F1, A366-F1 of forging steels.

NOTE ON USAGE :

- Proper preheat at 100 ~ 200°C and PWHT at 620 ~ 680°C.
- Rebake the electrodes at 350 ~ 400°C for 60 minutes and keep at 100 ~ 150°C before use.
- Take the backstep method to prevent blowholes at the arc starting.

WELDING POSITION :

TYPICAL CHEMICAL COMPOSITION OF WELD METAL (wt%) :

C	Mn	Si	P	S	Mo
0.070	0.62	0.66	0.016	0.009	0.55

TYPICAL MECHANICAL PROPERTIES OF WELD METAL :

YIELD POINT N/mm^2(Kgf/mm^2)	TENSILE STRENGTH N/mm^2(Kgf/mm^2)	ELONGATION RATE %	HEAT TREATMENT
535 (54.6)	610 (62.2)	29	620°Cx1hr

SIZE AND RECOMMENDED CURRENT RANGE : AC or DC(+)

Diameter (mm)		3.2	4.0	5.0
Length (mm)		350	400	400
Current (Amp)	F	90-130	140-180	190-220
	V & OH	80-120	120-160	-

SR-86B2

AWS A5.5 E8016-B2
EN ISO 3580-A E CrMo1 B 1 2
GB T5118 E5516-B2

HEAT-RESISTANT LOW-ALLOY STEEL SMAW

DESCRIPTION & APPLICATIONS :

- SR-86B2 is a basic coated low hydrogen electrode for heat resistant low alloy steel.
- The electrode can weld in all position and suitable for welding 1.25%Cr-0.5%Mo heat resistant steels with operating temperature above 550C.
- The weld metal SR-86B2 can be applied for ASTM A193 Gr. B7; A335 Gr. P11 a. P12; A217.

NOTE ON USAGE :

- Proper preheat at 150 ~ 300°C and PWHT at 650 ~ 700°C.
- Rebake the electrodes at 350 ~ 400°C for 60 minutes and keep at 100 ~ 150°C before use.
- Take the backstep method to prevent blowholes at the arc starting.

WELDING POSITION :

TYPICAL CHEMICAL COMPOSITION OF WELD METAL (wt%) :

C	Mn	Si	P	S	Cr	Mo
0.07	0.51	0.45	0.016	0.005	1.20	0.52

TYPICAL MECHANICAL PROPERTIES OF WELD METAL :

YIELD POINT $N/mm^2(Kgf/mm^2)$	TENSILE STRENGTH $N/mm^2(Kgf/mm^2)$	ELONGATION RATE %	HEAT TREATMENT
560(57.1)	650(66.3)	26	690°Cx1hr

SIZE AND RECOMMENDED CURRENT RANGE : AC or DC(+)

Diameter (mm)		3.2	4.0	5.0
Length (mm)		350	400	400
Current (Amp)	F	90-140	140-180	190-220
	V & OH	80-120	120-160	-

SR-88B2

AWS A5.5 E8018-B2
EN ISO 3580-A E CrMo1 B 3 2
GB T5118 E5518-B2

HEAT-RESISTANT LOW-ALLOY STEEL SMAW

DESCRIPTION & APPLICATIONS :

- SR-88B2 is an iron powder low hydrogen electrode designed for welding heat resistant low alloy steel.
- The electrode coated by iron powder marks characteristics of high working efficiency suitable for welding steel with 1.25%Cr-0.5%Mo.
- SR-86B2 is suitablly appied for ASTM A193 Gr. B7; A335 Gr. P11 a. P12; A217 Gr. WC6.; A336 Gr. F12.

NOTE ON USAGE :

- Proper preheat at 150 ~ 300°C and PWHT at 650 ~ 700°C.
- Rebake the electrodes at 350 ~ 400°C for 60 minutes and keep at 100 ~ 150°C before use.
- Take the backstep method to prevent blowholes at the arc starting.

WELDING POSITION :

TYPICAL CHEMICAL COMPOSITION OF WELD METAL (wt%) :

C	Mn	Si	P	S	Cr	Mo
0.08	0.59	0.46	0.016	0.005	1.28	0.49

TYPICAL MECHANICAL PROPERTIES OF WELD METAL :

YIELD POINT $N/mm^2(Kgf/mm^2)$	TENSILE STRENGTH $N/mm^2(Kgf/mm^2)$	ELONGATION RATE %	HEAT TREATMENT
568(58.0)	660(67.3)	27	690°Cx1hr

SIZE AND RECOMMENDED CURRENT RANGE : AC or DC(+)

Diameter (mm)		3.2	4.0	5.0
Length (mm)		350	400	400
Current (Amp)	F	90-140	140-180	190-220
	V & OH	80-120	120-160	-

SR-96B3

AWS A5.5 E9016-B3
EN ISO 3580-A E CrMo2 B 1 2
GB T5118 E6016-B3

HEAT-RESISTANT LOW-ALLOY STEEL SMAW

DESCRIPTION & APPLICATIONS :

- SR-96B3 is a basic coated low hydrogen electrode for heat resistant low alloy steel.
- The electrode can weld in all position, designed for welding 2.25%Cr-1%Mo heat resistant steels.
- The weld metal of SR-96B3 can be applied for ASTM A335 Gr. P22; A217 Gr. WC 9.

NOTE ON USAGE :

- Proper preheat at 200 ~ 350°C and PWHT at 680 ~ 730°C.
- Rebake the electrodes at 350 ~ 400°C for 60 minutes and keep at 100 ~ 150°C before use.
- Keep the arc as short as possible. Please take the method of back-forward.

WELDING POSITION :

TYPICAL CHEMICAL COMPOSITION OF WELD METAL (wt%) :

C	Mn	Si	P	S	Cr	Mo
0.06	0.45	0.31	0.015	0.005	2.35	1.07

TYPICAL MECHANICAL PROPERTIES OF WELD METAL :

YIELD POINT $N/mm^2(Kgf/mm^2)$	TENSILE STRENGTH $N/mm^2(Kgf/mm^2)$	ELONGATION RATE %	HEAT TREATMENT
640(65.3)	722(73.7)	22	690°Cx1hr

SIZE AND RECOMMENDED CURRENT RANGE : AC or DC(+)

Diameter (mm)		3.2	4.0	5.0
Length (mm)		350	400	400
Current (Amp)	F	90-140	140-180	190-220
	V & OH	80-120	120-160	-

SR-98B3

AWS A5.5 E9018-B3
EN ISO 3580-A E CrMo2 B 3 2
GB T5118 E6018-B3

HEAT-RESISTANT LOW-ALLOY STEEL SMAW

DESCRIPTION & APPLICATIONS :

- SR-98B3 is an iron powder low hydrogen electrode for heat resistant low alloy steel.
- Thanks to its high working efficiency contribued from iron powder, it' s suitable for the weld containing 2.25%Cr-1%Mo under high temperature.
- Suitable for welding high temperature and pressure thick pipes, pipes for boiler heat exchanger, extended steel, steel casting, and forged steel.

NOTE ON USAGE :

- Proper preheat at 200 ~ 350°C and PWHT at 680 ~ 730°C.
- Rebake the electrodes at 350 ~ 400°C for 60 minutes and keep at 100 ~ 150°C before use.
- Keep the arc as short as possible. Please take the method of back-forward.

WELDING POSITION :

TYPICAL CHEMICAL COMPOSITION OF WELD METAL (wt%) :

C	Mn	Si	P	S	Cr	Mo
0.06	0.40	0.26	0.016	0.007	2.35	1.06

TYPICAL MECHANICAL PROPERTIES OF WELD METAL :

YIELD POINT $N/mm^2(Kgf/mm^2)$	TENSILE STRENGTH $N/mm^2(Kgf/mm^2)$	ELONGATION RATE %	HEAT TREATMENT
629(64.2)	692(70.6)	21	690°Cx1hr

SIZE AND RECOMMENDED CURRENT RANGE : AC or DC(+)

Diameter (mm)		3.2	4.0	5.0
Length (mm)		350	400	400
Current (Amp)	F	90-140	140-180	190-220
	V & OH	80-120	120-160	-

SR-86B6

AWS A5.5 E8016-B6
EN ISO 3580-A E CrMo5 B 1 2
GB –

HEAT-RESISTANT LOW-ALLOY STEEL SMAW

DESCRIPTION & APPLICATIONS :

- SR-86B6 is a basic low hydrogen electrode for heat resistant low alloy steel.
- As its weld metal contains 5%Cr-0.5%Mo, SR-86B6 has good performance of hear resistance.
- Suitable for ASTM A387 Gr. 5 for refineries, JIS SCMV6 for petro-chemical and power plants.

NOTE ON USAGE :

- Proper preheat at 250 ~ 350°C and PWHT at 710 ~ 760°C.
- Rebake the electrodes at 350 ~ 400°C for 60 minutes and keep at 100 ~ 150°C before use.
- Keep the arc as short as possible. Please take the method of back-forward.

WELDING POSITION :

TYPICAL CHEMICAL COMPOSITION OF WELD METAL (wt%) :

C	Mn	Si	P	S	Cr	Mo
0.08	0.55	0.3	0.013	0.006	5.58	0.57

TYPICAL MECHANICAL PROPERTIES OF WELD METAL :

YIELD POINT $N/mm^2(Kgf/mm^2)$	TENSILE STRENGTH $N/mm^2(Kgf/mm^2)$	ELONGATION RATE %	HEAT TREATMENT
640(65.3)	680(69.4)	22	740°Cx1hr

SIZE AND RECOMMENDED CURRENT RANGE : AC or DC(+)

Diameter (mm)		3.2	4.0	5.0
Length (mm)		350	400	400
Current (Amp)	F	90-130	140-180	180-210
	V & OH	80-120	120-160	-

SR-86B8

AWS A5.5 E8016-B8
EN ISO 3580-A E CrMo9 B 1 2
GB –

HEAT-RESISTANT LOW-ALLOY STEEL SMAW

DESCRIPTION & APPLICATIONS :

- SR-86B8 is a low hydrogen electrode for heat resistant low alloy steel.
- As its weld metal contains 9%Cr-1%Mo, SR-86B6 has good performance of hear resistance.
- Suitable for refineries, petro-chemical.

NOTE ON USAGE :

- Proper preheat at 250 ~ 350°C and PWHT at 710 ~ 760°C.
- Rebake the electrodes at 350 ~ 400°C for 60 minutes and keep at 100 ~ 150°C before use.
- Keep the arc as short as possible. Please take the method of back-forward.

WELDING POSITION :

TYPICAL CHEMICAL COMPOSITION OF WELD METAL (wt%) :

C	Mn	Si	P	S	Cr	Mo
0.07	0.53	0.29	0.016	0.005	9.60	0.9

TYPICAL MECHANICAL PROPERTIES OF WELD METAL :

YIELD POINT $N/mm^2(Kgf/mm^2)$	TENSILE STRENGTH $N/mm^2(Kgf/mm^2)$	ELONGATION RATE %	HEAT TREATMENT
560(57.1)	670(68.4)	22	740°Cx1hr

SIZE AND RECOMMENDED CURRENT RANGE : AC or DC(+)

Diameter (mm)		3.2	4.0	5.0
Length (mm)		350	400	400
Current (Amp)	F	90-130	140-180	180-210
	V & OH	80-120	120-160	-

SR-96B9

AWS A5.5 E9016-B91
EN –
GB –

HEAT-RESISTANT LOW-ALLOY STEEL SMAW

DESCRIPTION & APPLICATIONS :

- SR-96B9 is a low hydrogen electrode for heat resistant low alloy steel.
- Welding for all positions. As containing 9%Cr-1%Mo and minor niobium(Nb) and vanadium(V), it is with excellent creep under high temperature of 550-650°C.
- Suitable for steel pipe of ASTM A213-T91, A335 P91, extended steel plate of A387 Gr.91.

NOTE ON USAGE :

- Proper preheat at 250 ~ 350°C and PWHT at 710 ~ 780°C.
- Rebake the electrodes at 350 ~ 400°C for 60 minutes and keep at 100 ~ 150°C before use.
- Keep the arc as short as possible. Please take the method of back-forward.

WELDING POSITION :

TYPICAL CHEMICAL COMPOSITION OF WELD METAL (wt%) :

C	Mn	Si	P	S	Cr	Mo	Nb	V	N
0.09	0.55	0.22	0.008	0.007	10.2	0.95	0.05	0.21	0.05

TYPICAL MECHANICAL PROPERTIES OF WELD METAL :

YIELD POINT $N/mm^2(Kgf/mm^2)$	TENSILE STRENGTH $N/mm^2(Kgf/mm^2)$	ELONGATION RATE %	HEAT TREATMENT
610(62.2)	710(72.4)	20	760°Cx2hr

SIZE AND RECOMMENDED CURRENT RANGE : AC or DC(+)

Diameter (mm)		3.2	4.0	5.0
Length (mm)		350	400	400
Current (Amp)	F	90-130	140-180	180-210
	V & OH	80-120	120-160	-

SR-591

AWS A5.5 E9015-B91
EN -
GB -

HEAT-RESISTANT LOW-ALLOY STEEL SMAW

DESCRIPTION & APPLICATIONS :

- SR-591 is a low hydrogen electrode for heat resistant low alloy steel.
- Welding for all positions. As containing 9%Cr-1%Mo and minor niobium(Nb) and vanadium(V), it is with excellent creep under high temperature of 550-650°C.
- Suitable for steel pipe of ASTM A213-T91, A335 P91, extended steel plate of A387 Gr.91.

NOTE ON USAGE :

- Proper preheat at 200 ~ 315°C and PWHT at 760 ± 15°C.
- Rebake the electrodes at 350 ~ 400°C for 60 minutes and keep at 100 ~ 150°C before use.
- Keep the arc as short as possible. Please take the method of back-forward.

WELDING POSITION :

TYPICAL CHEMICAL COMPOSITION OF WELD METAL (wt%) :

C	Mn	Si	P	S	Cr	Ni	Mo	Nb	V	N
0.09	0.55	0.22	0.008	0.007	9.10	0.51	0.99	0.04	0.19	0.03

TYPICAL MECHANICAL PROPERTIES OF WELD METAL :

YIELD POINT $N/mm^2(Kgf/mm^2)$	TENSILE STRENGTH $N/mm^2(Kgf/mm^2)$	ELONGATION RATE %	HEAT TREATMENT
584(59.5)	690(70.4)	21	760°Cx2hr

SIZE AND RECOMMENDED CURRENT RANGE : DC(+)

Diameter (mm)		3.2	4.0	5.0
Length (mm)		350	400	400
Current (Amp)	F	90-130	140-170	170-220
	V & OH	80-120	120-160	-

SR-592

AWS A5.5 E9015-B92
EN –
GB –

HEAT-RESISTANT LOW-ALLOY STEEL SMAW

DESCRIPTION & APPLICATIONS :

- SR-592 is a low hydrogen electrode for heat resistant low alloy steel.
- As containing 9%Cr-1%Mo and minor niobium(Nb) and vanadium(V), it is with excellent creep under high temperature of 600°C.
- Suitable for steel pipe of ASTM A213-T92, A335 P91, extended steel plate of A387 Gr.92.

NOTE ON USAGE :

- Proper preheat at 200 ~ 315°C and PWHT at 760 ± 15°C.
- Rebake the electrodes at 350 ~ 400°C for 60 minutes and keep at 100 ~ 150°C before use.
- Keep the arc as short as possible. Please take the method of back-forward.

WELDING POSITION :

TYPICAL CHEMICAL COMPOSITION OF WELD METAL (wt%) :

C	Mn	Si	P	S	Cr	Ni	Mo	Nb	V	W	N
0.01	0.61	0.21	0.008	0.007	9.15	0.50	0.49	0.04	0.23	1.67	0.04

TYPICAL MECHANICAL PROPERTIES OF WELD METAL :

YIELD POINT $N/mm^2(Kgf/mm^2)$	TENSILE STRENGTH $N/mm^2(Kgf/mm^2)$	ELONGATION RATE %	HEAT TREATMENT
603(61.5)	705(71.9)	21	760°Cx2hr

SIZE AND RECOMMENDED CURRENT RANGE : DC(+)

Diameter (mm)		3.2	4.0	5.0
Length (mm)		350	400	400
Current (Amp)	F	90-130	140-170	170-220
	V & OH	80-120	120-160	-

SN-86C1

AWS A5.5 E8016-C1
EN ISO 2560-A E 46 6 2Ni B 1 2
GB T5118 E5516-C1

LOW TEMPERATURE-SERVICE LOW-ALLOY STEEL SMAW

DESCRIPTION & APPLICATIONS :

- SR-86C1 is a low hydrogen electrode for low temperature service low alloy steel.
- For all welding positions. With good impact performance down to -60°C and good mechanical properties.
- Suitable for low temperature machine, welding of aluminum killer steel and 2.5%Ni steel. For instance JIS G3127 SL2N 255.

NOTE ON USAGE :

- Proper preheat at 100~150°C and PWHT at 600~630°C.
- Rebake the electrodes at 350 ~ 400°C for 60 minutes and keep at 100 ~ 150°C before use.
- Keep the arc as short as possible. Please take the method of back-forward.
- Set up current in a recommended range to obtain impact value.

WELDING POSITION :

TYPICAL CHEMICAL COMPOSITION OF WELD METAL (wt%) :

C	Mn	Si	P	S	Ni
0.06	0.68	0.30	0.013	0.006	2.20

TYPICAL MECHANICAL PROPERTIES OF WELD METAL :

YIELD POINT $N/mm^2(Kgf/mm^2)$	TENSILE STRENGTH $N/mm^2(Kgf/mm^2)$	ELONGATION RATE %	IMPACT VALUES -60°C J(Kgf-m)	HEAT TREATMENT
530(54.1)	590(60.2)	28	64(6.5)	605°Cx1hr

SIZE AND RECOMMENDED CURRENT RANGE : AC or DC(+)

Diameter (mm)		3.2	4.0	5.0
Length (mm)		350	400	400
Current (Amp)	F	100-140	140-180	180-210
	V & OH	90-120	120-160	-

SN-88C1

AWS A5.5 E8018-C1
EN ISO 2560-A E 46 6 2Ni B 3 2
GB T5118 E5518-C1

LOW TEMPERATURE-SERVICE LOW-ALLOY STEEL SMAW

DESCRIPTION & APPLICATIONS :

- SR-88C1 is an iron low hydrogen electrode for low temperature service low alloy steel.
- Its coating contains iron power to increase working efficiency. For all welding positions. With good impact performance down to -60°C and good mechanical properties.
- Suitable for low temperature machine, welding of aluminum killer steel and 2.5%Ni steel. For instance ASME SA203Gr.A or B.

NOTE ON USAGE :

- Proper preheat at 100~150°C and PWHT at 600~630°C.
- Rebake the electrodes at 350 ~ 400°C for 60 minutes and keep at 100 ~ 150°C before use.
- Keep the arc as short as possible. Please take the method of back-forward.
- Set up current in a recommended range to obtain impact value.

WELDING POSITION :

TYPICAL CHEMICAL COMPOSITION OF WELD METAL (wt%) :

C	Mn	Si	P	S	Ni
0.06	0.70	0.35	0.014	0.007	2.23

TYPICAL MECHANICAL PROPERTIES OF WELD METAL :

YIELD POINT $N/mm^2(Kgf/mm^2)$	TENSILE STRENGTH $N/mm^2(Kgf/mm^2)$	ELONGATION RATE %	IMPACT VALUES -60°C J(Kgf-m)	HEAT TREATMENT
526(53.7)	596(60.8)	27	61(6.2)	605°Cx1hr

SIZE AND RECOMMENDED CURRENT RANGE : AC or DC(+)

Diameter (mm)		3.2	4.0	5.0
Length (mm)		350	400	400
Current (Amp)	F	100-140	140-180	180-210
	V & OH	90-120	120-160	-

SN-86C2

AWS A5.5 E8016-C2
EN ISO 2560-A E 46 6 3Ni B 1 2
GB T5118 E5516-C2

LOW TEMPERATURE-SERVICE LOW-ALLOY STEEL SMAW

DESCRIPTION & APPLICATIONS :

- SN-86C2 is a low hydrogen electrode for low temperature service low alloy steel.
- For all welding positions. With stable arc and the slag is easy to clean. With good impact performance down to -75°C and good mechanical properties.
- Suitable for LPG container or low temperature service 3.5%Ni steel.

NOTE ON USAGE :

- Proper preheat at 100~150°C and PWHT at 600~630°C.
- Rebake the electrodes at 350 ~ 400°C for 60 minutes and keep at 100 ~ 150°C before use.
- Keep the arc as short as possible. Please take the method of back-forward.
- Set up current in a recommended range to obtain impact value.

WELDING POSITION :

TYPICAL CHEMICAL COMPOSITION OF WELD METAL (wt%) :

C	Mn	Si	P	S	Ni
0.06	0.94	0.51	0.020	0.006	3.50

TYPICAL MECHANICAL PROPERTIES OF WELD METAL :

YIELD POINT $N/mm^2(Kgf/mm^2)$	TENSILE STRENGTH $N/mm^2(Kgf/mm^2)$	ELONGATION RATE %	IMPACT VALUES -75°C J(Kgf-m)	HEAT TREATMENT
540(55.1)	620(63.3)	24	50(5.1)	605°Cx1hr

SIZE AND RECOMMENDED CURRENT RANGE : AC or DC(+)

Diameter (mm)		3.2	4.0	5.0
Length (mm)		350	400	400
Current (Amp)	F	100-140	140-180	180-210
	V & OH	90-120	120-160	-

SN-88C2

AWS A5.5 E8018-C2
EN ISO 2560-A E 46 6 3Ni B 3 2
GB T5118 E5518-C2

LOW TEMPERATURE-SERVICE LOW-ALLOY STEEL SMAW

DESCRIPTION & APPLICATIONS :

- SN-88C2 is an iron powder low hydrogen electrode for low temperature service low alloy steel.
- It has excellent deposition efficiency and mechanic properties, also excellent impact value down to -75°C.
- Suitable for welding of 3.5%Ni steel or LPG tanks.

NOTE ON USAGE :

- Proper preheat at 100~150°C and PWHT at 600~630°C.
- Rebake the electrodes at 350 ~ 400°C for 60 minutes and keep at 100 ~ 150°C before use.
- Keep the arc as short as possible. Please take the method of back-forward.
- Set up current in a recommended range to obtain impact value.

WELDING POSITION :

TYPICAL CHEMICAL COMPOSITION OF WELD METAL (wt%) :

C	Mn	Si	P	S	Ni
0.07	0.9	0.56	0.018	0.005	3.40

TYPICAL MECHANICAL PROPERTIES OF WELD METAL :

YIELD POINT N/mm²(Kgf/mm²)	TENSILE STRENGTH N/mm²(Kgf/mm²)	ELONGATION RATE %	IMPACT VALUES -75°C J(Kgf-m)	HEAT TREATMENT
550(56.1)	625(63.8)	23	51(5.2)	605°Cx1hr

SIZE AND RECOMMENDED CURRENT RANGE : AC or DC(+)

Diameter (mm)		3.2	4.0	5.0
Length (mm)		350	400	400
Current (Amp)	F	100-140	140-180	180-210
	V & OH	90-120	120-160	-

SN-86C3

AWS A5.5 E8016-C3
EN ISO 2560-A E 46 4 1Ni B 1 2
GB T5118 E5516-C3

LOW TEMPERATURE-SERVICE LOW-ALLOY STEEL SMAW

DESCRIPTION & APPLICATIONS :

- SN-88C3 is a low hydrogen electrode for low temperature service low alloy steel.
- Suitable for all positions. It has excellent mechanic properties and excellent impact value down to -75˚C.
- Suitable for welding of 1%Ni steel or LPG tanks.

NOTE ON USAGE :

- Proper preheat at 100~150˚C and PWHT at 600~630˚C.
- Rebake the electrodes at 350 ~ 400°C for 60 minutes and keep at 100 ~ 150°C before use.
- Keep the arc as short as possible. Please take the method of back-forward.
- Set up current in a recommended range to obtain impact value.

WELDING POSITION :

TYPICAL CHEMICAL COMPOSITION OF WELD METAL (wt%) :

C	Mn	Si	P	S	Ni
0.06	0.94	0.42	0.018	0.012	0.96

TYPICAL MECHANICAL PROPERTIES OF WELD METAL :

YIELD POINT $N/mm^2(Kgf/mm^2)$	TENSILE STRENGTH $N/mm^2(Kgf/mm^2)$	ELONGATION RATE %	IMPACT VALUES -40 °C J(Kgf-m)
514(52.4)	598(61)	24	95(9.7)

SIZE AND RECOMMENDED CURRENT RANGE : AC or DC(+)

Diameter (mm)		3.2	4.0	5.0
Length (mm)		350	400	400
Current (Amp)	F	100-140	140-180	180-210
	V & OH	90-120	120-160	-

SN-88C3

AWS A5.5 E8018-C3
EN ISO 2560-A E 46 4 1Ni B 3 2
GB T5118 E5518-C3

LOW TEMPERATURE-SERVICE LOW-ALLOY STEEL SMAW

DESCRIPTION & APPLICATIONS :

- SN-88C3 is an iron powder low hydrogen electrode for low temperature service low alloy steel.
- Its coating contains iron power to increase working efficiency and deposition efficiency. For all welding positions. With good impact performance down to -40°C and good mechanical properties.
- Suitable for welding of 1%Ni steel or LPG tanks.

NOTE ON USAGE :

- Proper preheat at 100~150°C.
- Rebake the electrodes at 350 ~ 400°C for 60 minutes and keep at 100 ~ 150°C before use.
- Keep the arc as short as possible. Please take the method of back-forward.
- Set up current in a recommended range to obtain impact value.

WELDING POSITION :

TYPICAL CHEMICAL COMPOSITION OF WELD METAL (wt%) :

C	Mn	Si	P	S	Ni
0.07	0.91	0.6	0.017	0.012	1.02

TYPICAL MECHANICAL PROPERTIES OF WELD METAL :

YIELD POINT $N/mm^2(Kgf/mm^2)$	TENSILE STRENGTH $N/mm^2(Kgf/mm^2)$	ELONGATION RATE %	IMPACT VALUES -40°C J(Kgf-m)
520(53.1)	590(60.2)	25	106(10.8)

SIZE AND RECOMMENDED CURRENT RANGE : AC or DC(+)

Diameter (mm)		3.2	4.0	5.0
Length (mm)		350	400	400
Current (Amp)	F	100-140	140-180	180-210
	V & OH	90-120	120-160	-

SN-86G

AWS A5.5 E8016-G
EN ISO 2560-A E 50 5 2Ni B 1 2
GB T5118 E5516-G

LOW TEMPERATURE-SERVICE LOW-ALLOY STEEL SMAW

DESCRIPTION & APPLICATIONS :

- SN-86G is a low hydrogen electrode for low temperature service low alloy steel.
- For all welding positions. With good impact performance down to -45°C and good mechanical properties.
- Suitable for welding of 1.5%Ni steel or LPG tanks.

NOTE ON USAGE :

- Proper preheat at 100~150°C.
- Rebake the electrodes at 350 ~ 400°C for 60 minutes and keep at 100 ~ 150°C before use.
- Keep the arc as short as possible. Please take the method of back-forward.
- Set up current in a recommended range to obtain impact value.

WELDING POSITION :

TYPICAL CHEMICAL COMPOSITION OF WELD METAL (wt%) :

C	Mn	Si	P	S	Ni
0.06	0.86	0.40	0.013	0.004	2.00

TYPICAL MECHANICAL PROPERTIES OF WELD METAL :

YIELD POINT $N/mm^2(Kgf/mm^2)$	TENSILE STRENGTH $N/mm^2(Kgf/mm^2)$	ELONGATION RATE %	IMPACT VALUES -45 °C J(Kgf-m)
540(55.1)	630(64.3)	26	80(8.2)

SIZE AND RECOMMENDED CURRENT RANGE : AC or DC(+)

Diameter (mm)		3.2	4.0	5.0
Length (mm)		350	400	400
Current (Amp)	F	100-140	140-180	180-210
	V & OH	90-120	120-160	-

SN-88G

AWS A5.5 E8018-G
EN ISO 2560-A E 50 5 2Ni B 3 2
GB T5118 E5518-G

LOW TEMPERATURE-SERVICE LOW-ALLOY STEEL SMAW

DESCRIPTION & APPLICATIONS :

- SN-88G is an iron powder low hydrogen electrode for low temperature service low alloy steel.
- Its coating contains iron power to increase working efficiency and deposition efficiency. For all welding positions. With good impact performance down to -45°C and good mechanical properties.
- Suitable for welding of 1.5%Ni steel or LPG tanks.

NOTE ON USAGE :

- Proper preheat at 100~150°C.
- Rebake the electrodes at 350 ~ 400°C for 60 minutes and keep at 100 ~ 150°C before use.
- Keep the arc as short as possible. Please take the method of back-forward.
- Set up current in a recommended range to obtain impact value.

WELDING POSITION :

TYPICAL CHEMICAL COMPOSITION OF WELD METAL (wt%) :

C	Mn	Si	P	S	Ni
0.06	0.85	0.35	0.012	0.005	2.05

TYPICAL MECHANICAL PROPERTIES OF WELD METAL :

YIELD POINT $N/mm^2(Kgf/mm^2)$	TENSILE STRENGTH $N/mm^2(Kgf/mm^2)$	ELONGATION RATE %	IMPACT VALUES -45 °C J(Kgf-m)
536(54.7)	625(63.8)	28	76(7.8)

SIZE AND RECOMMENDED CURRENT RANGE : AC or DC(+)

Diameter (mm)		3.2	4.0	5.0
Length (mm)		350	400	400
Current (Amp)	F	100-140	140-180	180-210
	V & OH	90-120	120-160	-

SN-98G

AWS A5.5 E9018-G
EN ISO 18275-A E55 4 Mn1NiMo B 3 2
GB T5118 E6018-G

LOW TEMPERATURE-SERVICE LOW-ALLOY STEEL SMAW

DESCRIPTION & APPLICATIONS :

- SN-98G is an iron powder low hydrogen electrode designed for welding of 620N/mm^2 grade low temperature service slow alloy teel.
- Its coating contains iron power to increase working efficiency and deposition efficiency. For all welding positions. With good impact performance down to -45°C and good mechanical properties.
- Suitable for welding of LPG tanks or aluminum killer steel for low temperature.

NOTE ON USAGE :

- Proper preheat at 100~150°C.
- Rebake the electrodes at 350 ~ 400°C for 60 minutes and keep at 100 ~ 150°C before use.
- Keep the arc as short as possible. Please take the method of back-forward.
- Set up current in a recommended range to obtain impact value.

WELDING POSITION :

TYPICAL CHEMICAL COMPOSITION OF WELD METAL (wt%) :

C	Mn	Si	P	S	Ni	Mo
0.07	1.50	0.49	0.016	0.004	0.90	0.28

TYPICAL MECHANICAL PROPERTIES OF WELD METAL :

YIELD POINT N/mm^2(Kgf/mm^2)	TENSILE STRENGTH N/mm^2(Kgf/mm^2)	ELONGATION RATE %	IMPACT VALUES -45 °C J(Kgf-m)
584(59.6)	710(72.4)	26	52(5.3)

SIZE AND RECOMMENDED CURRENT RANGE : AC or DC(+)

Diameter (mm)		3.2	4.0	5.0
Length (mm)		350	400	400
Current (Amp)	F	100-140	140-180	180-210
	V & OH	90-120	120-160	-

SW-78W1

AWS A5.5 E7018-W1
EN –
GB T5118 E5018-W

ATMOSPHERIC CORROSION RESISTANT LOW-ALLOY STEEL SMAW

DESCRIPTION & APPLICATIONS :

- SN-78W1 is an iron powder low hydrogen electrode designed for welding of atmospheric corrosion resistant steel.
- This electrode has resistibility to the atmospheric corrosion, and good crack resistance in all positions welding. The weld metal of SW-78W1 consists of Cu and Ni which has good corrosion resistance.
- Suitable for 490N/mm^2 corrosion resistant steel, like bridges, constructions, and cars.

NOTE ON USAGE :

- Proper preheat at 80~100°C.
- Rebake the electrodes at 350 ~ 400°C for 60 minutes and keep at 100 ~ 150°C before use.
- Keep the arc as short as possible. Please take the method of back-forward.

WELDING POSITION :

TYPICAL CHEMICAL COMPOSITION OF WELD METAL (wt%) :

C	Mn	Si	P	S	Ni	Cr	Cu
0.06	0.62	0.50	0.016	0.006	0.33	0.19	0.46

TYPICAL MECHANICAL PROPERTIES OF WELD METAL :

YIELD POINT N/mm^2(Kgf/mm^2)	TENSILE STRENGTH N/mm^2(Kgf/mm^2)	ELONGATION RATE %	IMPACT VALUES -20 °C J(Kgf-m)
517(52.8)	582(59.4)	28	120(12.2)

SIZE AND RECOMMENDED CURRENT RANGE : AC or DC(+)

Diameter (mm)		3.2	4.0	5.0
Length (mm)		350	400	400
Current (Amp)	F	100-140	140-180	180-210
	V & OH	90-120	120-160	-

SW-88W2

AWS A5.5 E8018-W2
EN –
GB T5118 E5518-W

ATMOSPHERIC CORROSION RESISTANT LOW-ALLOY STEEL SMAW

DESCRIPTION & APPLICATIONS :

- SN-88W2 is an iron powder low hydrogen electrode designed for welding of atmospheric corrosion resistant steel.
- This electrode has resistibility to the atmospheric corrosion, and good crack resistance in all positions welding. The weld metal of SW-78W1 consists of Cu and Ni which has good corrosion resistance.
- The weld metal contains Ni, Cu and Cr. It is suitable for 590N/mm^2 grade high tensile steel ASTM A588, A242 and SMA 570W, P.

NOTE ON USAGE :

- Proper preheat at 100~150°C.
- Rebake the electrodes at 350 ~ 400°C for 60 minutes and keep at 100 ~ 150°C before use.
- Keep the arc as short as possible. Please take the method of back-forward.

WELDING POSITION :

TYPICAL CHEMICAL COMPOSITION OF WELD METAL (wt%) :

C	Mn	Si	P	S	Ni	Cr	Cu
0.06	0.55	0.41	0.015	0.006	0.63	0.65	0.55

TYPICAL MECHANICAL PROPERTIES OF WELD METAL :

YIELD POINT N/mm^2(Kgf/mm^2)	TENSILE STRENGTH N/mm^2(Kgf/mm^2)	ELONGATION RATE %	IMPACT VALUES -20 °C J(Kgf-m)
640(65.3)	700(71.4)	25	110(11.2)

SIZE AND RECOMMENDED CURRENT RANGE : AC or DC(+)

Diameter (mm)		3.2	4.0	5.0
Length (mm)		350	400	400
Current (Amp)	F	100-140	140-180	180-210
	V & OH	90-120	120-160	-

SELECTION RECOMMENDATION

According to AWS A5.29, low alloy steel flux cored wire can be classified, by characteristic, to T1, T4, T5, T6, T7, T8, T11, TG. These are to define welding position, shielding gas, polarity, single or multiple beads. If to be classified by weld metal, the classification is similar to covered electrodes. The features are as follows:

Classification	Characteristic	Group	Features
Carbon molybdenum steel	Heat resistant	A1	1.The heat resistance and anti-corrosion abilities increase because of adding 0.5%Mo, however the impact toughness decreases. 2.Suitable for the welding for steel plates of ASTM A204 or pipes of A355 P1.
Chrome molybdenum steel	Heat resistant	B1, B2, B3, B6, B8	1.The heat resistance and anti-corrosion abilities increase because of adding 0.5%~10%Cr - 0.5%~1.2%Mo, however the impact toughness decreases. 2.Suitable for the welding for steel plates of ASTM A387 or pipes of A213 or A335. 3.By using L grade consumables(e.g. B1L, B2L), the hardness of beads decreases because of low carbon, but high temperature strength and creep resistance decreases as well.
	Heat resistant	B9	1.The creep resistance under high temperature, anti-fatigue, and anti-corrosion abilities increase because of adding 9% Cr–1% Mo and minor Nb&V. 2.Suitable for welding ASTM A387 Gr.91, A213 T91, and A335 P91. 3.The heat input, temperature control, and PWHT should be strictly managed.
Nickel steel	Low Temperature	Ni1, Ni2, Ni3	1.The material is with 1~3.5%Ni , and classified to 3 grades. With excellent impact toughness when the temperature ranges –115°C~room temperature. Not required PWHT for regular usage in case of high temperature brittle. 2.Suitable for the welding for steel plates of ASTM ASTM, A352 LC1, A352 LC2, A302 and A734.
Manganese Molybdenum Steel	Special purpose	D1, D2, D3	1.The material, with 1~2%Mn - 0.3~0.5%Mo, has better performance of tensile strength and impact toughness than Carbon molybdenum steel and Nickel molybdenum steel. 2. PWHT is required for D2 grade.
Nickel molybdenum steel	Special purpose	K1, K2, K3, K4, K5, K6, K7, K8, K9	1.The material, with 1.0~3.5%Ni – 0.2~0.5%Mo and minor V, is for high tensile strength under special circumstance. Normally used for requirement of high tensile strength and low temperature impact toughness, such as military or oil pipe. 2.PWHT is not required.
Atmospheric Corrosion Resistant	Anti-pitting corrosion	W2	1.With 0.5%Ni – 0.5%Cr - 0.5%Cu, to improve Anti-pitting corrosion. 2.Designed for the welding of Atmospheric Corrosion Resistant steel (e.g ASTM A242 or A588).

Classification	Characteristic	Group	Features
Regular	Multi-classification	G	1.The material of G series requires that P, S, Si need to be under the upper limit, and for the other chemical composition, only need one of them meet the requirement of AWS. 2. The material composition of G series need to be confirmed and classified, in case of misuse.

WELDING OPERATION

(1)Storage:

①This classification cannot be re-baked with high temperature like covered electrodes, so should be avoid stored in the environment of high temperature and humidity, and damage of packing. This can prevent the consumable from the moisture.

②Most flux cored wires are with seam, so the requirement of moisture resistance is more than seamless ones. If the storage environment of high temperature and humidity is unavoidable, the aluminum foil packing is recommended.

(2)Note:

①The heat input and temperature of as weld for low alloy steel should be relatively stricter than carbon steel, to prevent the beads from crack and life reducing of assembly or equipment.

②If the surface of groove or base metal are not clear, there will easily be crack and porosity for beads. The pre-work need to be carried out.

③The welding suggestion is that in workable situation, lower the current, stick-out-length, and the width of weaving, to prevent the alloy from burned and cell enlargement.

SFC-101

AWS A5.29 E101T1-GC/GM
EN –
GB –

FLUX CORED WIRES FOR ≧ 550N/mm² HIGH TENSILE STEEL

DESCRIPTION & APPLICATIONS :

- SFC-101 is a high tensile strength flux cored wire designed for high tensile steel carries 690N/mm².
- Suitable for petro-chemical industry, oil refinery components, pipes.

NOTE ON USAGE :

- Use DC (+) polarity. CO_2 gas (min. 99.8%) G.F.R: 15~25 l/min.
- Pre-heat the workpiece at temp. 220~350°C.

WELDING POSITION :

TYPICAL CHEMICAL COMPOSITION OF WELD METAL (wt%) : (CO_2)

C	Mn	Si	P	S	Ni	Cr	Mo
0.06	1.21	0.45	0.021	0.012	0.63	0.35	0.41

TYPICAL MECHANICAL PROPERTIES OF WELD METAL: (CO_2)

YIELD POINT N/mm²(Kgf/mm²)	TENSILE STRENGTH N/mm²(Kgf/mm²)	ELONGATION RATE %
660(67.3)	721(73.6)	22

SIZE AND RECOMMENDED CURRENT RANGE : DC(+)

Parameters \ Diameter (mm)	1.2		1.4		1.6	
	F	V	F	V	F	V
Voltage (Volt)	25-36	25-26	28-38	25-28	30-40	26-30
Current (Amp)	150-300	150-220	180-350	150-230	200-400	160-250
Stickout (m/m)	10-15		15-20		15-30	
Gas flow (l/min)	15-25		15-25		15-25	

SFC-110

AWS A5.29 E111T1-GC/GM
AWS A5.29 E111T1-K3C/K3M-J
EN –
GB –

FLUX CORED WIRES FOR ≧ 550N/mm² HIGH TENSILE STEEL

DESCRIPTION & APPLICATIONS :

- SFC-101 is a high tensile strength flux cored wire designed for high tensile steel carries 780N/mm².
- Suitable for petro chemical industry, oil refinery components, pipes.

NOTE ON USAGE :

- Use DC (+) polarity. CO_2 gas (min. 99.8%) G.F.R: 15~25 l/min.
- Pre-heat the workpiece at temp. 220~350°C.

WELDING POSITION :

TYPICAL CHEMICAL COMPOSITION OF WELD METAL (wt%) : (CO_2)

C	Mn	Si	P	S	Ni	Mo
0.042	1.20	0.20	0.010	0.006	2.50	0.47

TYPICAL MECHANICAL PROPERTIES OF WELD METAL: (CO_2)

YIELD POINT N/mm²(Kgf/mm²)	TENSILE STRENGTH N/mm²(Kgf/mm²)	ELONGATION RATE %	IMPACT VALUES -40°C J(Kgf-m)
730(74.5)	801(81.7)	21	51(5.2)

SIZE AND RECOMMENDED CURRENT RANGE : DC(+)

Parameters \ Diameter (mm)	1.2		1.4		1.6	
	F	V	F	V	F	V
Voltage (Volt)	25-36	25-28	28-38	25-28	30-40	26-30
Current (Amp)	150-300	150-220	180-350	150-230	200-400	160-250
Stickout (m/m)	10-15		15-20		15-30	
Gas flow (l/min)	15-25		15-25		15-25	

SFC-120

AWS A5.29 E121T1-GC/GM
EN –
GB –

FLUX CORED WIRES FOR ≧ 550N/mm² HIGH TENSILE STEEL

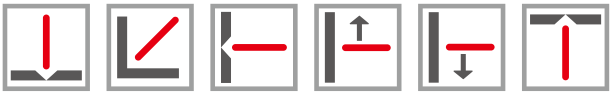
DESCRIPTION & APPLICATIONS :

- SFC-120 is a high tensile strength flux cored wire designed for high tensile steel carries 830N/mm².
- Suitable for petro chemical industry, oil refinery components, pipes, machinery for harbor, high tensile strength steel structure.

NOTE ON USAGE :

- Use DC (+) polarity. CO_2 gas (min. 99.8%) G.F.R: 15~25 l/min.
- Pre-heat the workpiece at temp. 220~350°C.

WELDING POSITION :



TYPICAL CHEMICAL COMPOSITION OF WELD METAL (wt%) : (CO_2)

C	Mn	Si	P	S	Ni	Mo
0.045	1.67	0.30	0.006	0.005	2.30	0.55

TYPICAL MECHANICAL PROPERTIES OF WELD METAL: (CO_2)

YIELD POINT N/mm²(Kgf/mm²)	TENSILE STRENGTH N/mm²(Kgf/mm²)	ELONGATION RATE %	IMPACT VALUES -30°C J(Kgf-m)
760(77.6)	840(85.7)	18	50(5.1)

SIZE AND RECOMMENDED CURRENT RANGE : DC(+)

Parameters \ Diameter (mm)	1.2		1.4		1.6	
	F	V	F	V	F	V
Voltage (Volt)	25-36	25-28	28-38	25-28	30-40	26-30
Current (Amp)	150-300	150-220	180-350	150-230	200-400	160-250
Stickout (m/m)	10-15		15-20		15-30	
Gas flow (l/min)	15-25		15-25		15-25	

SFC-81A1

AWS A5.29 E81T1-A1C/M
EN ISO 17634-A T Mo P C1/M21 1
GB T17493 E551T1-A1

FLUX CORED WIRES FOR HEAT RESISTANT LOW ALLOY STEEL

DESCRIPTION & APPLICATIONS :

- The weld metal of SFC-81A1 is 0.5% molybdenum.
- Suitable for pressure vessel, pressure pipe, and boiler.

NOTE ON USAGE :

- Use DC (+) polarity. CO_2 gas (min. 99.8%) G.F.R: 15~25 l/min.
- Proper preheat at 100 ~ 200°C and PWHT at 620 ~ 680°C.

WELDING POSITION :

TYPICAL CHEMICAL COMPOSITION OF WELD METAL (wt%) : (CO_2)

C	Mn	Si	P	S	Mo
0.040	1.05	0.46	0.010	0.006	0.61

TYPICAL MECHANICAL PROPERTIES OF WELD METAL: (CO_2)

YIELD POINT $N/mm^2(Kgf/mm^2)$	TENSILE STRENGTH $N/mm^2(Kgf/mm^2)$	ELONGATION RATE %	HEAT TREATMENT
596(60.8)	643(65.6)	24	620°Cx1hr

SIZE AND RECOMMENDED CURRENT RANGE : DC(+)

Parameters \ Diameter (mm)	1.2		1.4		1.6	
	F/H	V/OH	F/H	V/OH	F/H	V/OH
Voltage (Volt)	30-36	25-28	32-40	26-30	34-42	26-30
Current (Amp)	250-330	150-220	270-360	170-220	300-400	170-220

SFC-81B2

AWS A5.29 E81T1-B2C/M
EN ISO 17634-A T CrMo1 P C1/M21 1
GB T17493 E551T1-B2

FLUX CORED WIRES FOR HEAT RESISTANT LOW ALLOY STEEL

DESCRIPTION & APPLICATIONS :

- The weld metal of SFC-81B2 is 1.25%Cr-0.5%Mo.
- Suitable for chemical plant, oil refinery plant, ship building, and high pressure vessel.

NOTE ON USAGE :

- Use DC (+) polarity. CO_2 gas (min. 99.8%) G.F.R: 15~25 l/min.
- Proper preheat at 150 ~ 300°C and PWHT at 650 ~ 700°C.

WELDING POSITION :

TYPICAL CHEMICAL COMPOSITION OF WELD METAL (wt%) : (CO_2)

C	Mn	Si	P	S	Cr	Mo
0.055	1.10	0.42	0.010	0.006	1.20	0.58

TYPICAL MECHANICAL PROPERTIES OF WELD METAL: (CO_2)

YIELD POINT N/mm^2(Kgf/mm^2)	TENSILE STRENGTH N/mm^2(Kgf/mm^2)	ELONGATION RATE %	HEAT TREATMENT
640(65.3)	700(71.4)	22	690°Cx1hr

SIZE AND RECOMMENDED CURRENT RANGE : DC(+)

Parameters \ Diameter (mm)	1.2		1.4		1.6	
	F/H	V/OH	F/H	V/OH	F/H	V/OH
Voltage (Volt)	30-36	25-28	32-40	26-30	34-42	26-30
Current (Amp)	250-330	150-220	270-360	170-220	300-400	170-220

SFC-91B3

AWS A5.29 E91T1-B3C/M
EN ISO 17634-A T CrMo2 P C1/M21 1
GB T17493 E601T1-B3

FLUX CORED WIRES FOR HEAT RESISTANT LOW ALLOY STEEL

DESCRIPTION & APPLICATIONS :

- The weld metal of SFC-91B3 is 2.25%Cr-1%Mo.
- Suitable for chemical plant, oil refinery equipment, high temperature high pressure pipe.

NOTE ON USAGE :

- Use DC (+) polarity. CO_2 gas (min. 99.8%) G.F.R: 15~25 l/min.
- Proper preheat at 200 ~ 350°C and PWHT at 680 ~ 730°C.

WELDING POSITION :

TYPICAL CHEMICAL COMPOSITION OF WELD METAL (wt%) : (CO_2)

C	Mn	Si	P	S	Cr	Mo
0.055	1.10	0.35	0.012	0.06	2.45	1.11

TYPICAL MECHANICAL PROPERTIES OF WELD METAL: (CO_2)

YIELD POINT $N/mm^2(Kgf/mm^2)$	TENSILE STRENGTH $N/mm^2(Kgf/mm^2)$	ELONGATION RATE %	HEAT TREATMENT
650(66.3)	720(73.5)	20	690°Cx1hr

SIZE AND RECOMMENDED CURRENT RANGE : DC(+)

Parameters \ Diameter (mm)	1.2		1.4		1.6	
	F/H	V/OH	F/H	V/OH	F/H	V/OH
Voltage (Volt)	30-36	25-28	32-40	26-30	34-42	26-30
Current (Amp)	250-330	150-220	270-360	170-220	300-400	170-220

AFL-X70-O

AWS A5.29 E71T8-Ni1J
EN ISO 17632-A T42 4 1Ni Y N 1
GB T17493 E491T8-Ni1J

FLUX CORED SELF-SHIELDED WIRES FOR LOW TEMPERATURE LOW ALLOY STEEL

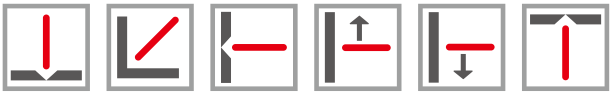
DESCRIPTION & APPLICATIONS :

- AFL-X70-O is a self-shielded low alloy flux core wire designed for 490N/mm^2 grade steel.
- Suitable for low alloy steel, X70 pipe, outdoor carbon steel welding.

NOTE ON USAGE :

- Use DC(-) polarity.

WELDING POSITION :



TYPICAL CHEMICAL COMPOSITION OF WELD METAL (wt%) :

C	Mn	Si	P	S	Ni	Al
0.06	1.13	0.12	0.011	0.004	0.82	1.14

TYPICAL MECHANICAL PROPERTIES OF WELD METAL :

YIELD POINT N/mm^2(Kgf/mm^2)	TENSILE STRENGTH N/mm^2(Kgf/mm^2)	ELONGATION RATE %	IMPACT VALUES -40 °C J(Kgf-m)
424(43.3)	523(53.4)	28	120(12.2)

SIZE AND RECOMMENDED CURRENT RANGE : DC(-)

Parameters \ Diameter (mm)	1.6	2.0
Voltage (Volt)	16-20	16-20
Current (Amp)	180-250	180-280
Stickout (m/m)	10-20	10-20

AFR-X80-O

AWS A5.29 E81T8-Ni2J H8
EN ISO 17632-A T46 3 2Ni Y N 1
GB T17493 E551T8-Ni2J H8

FLUX CORED SELF-SHIELDED WIRES FOR LOW TEMPERATURE LOW ALLOY STEEL

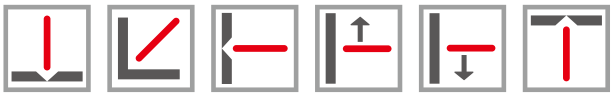
DESCRIPTION & APPLICATIONS :

- AFL-X80-O is a self-shielded low alloy flux core wire designed for 490N/mm^2 grade steel. The weld metal of SFC-81A1 is 2%Ni.
- Deep arc penetration, nice bead appearance, easy spatter off. especially suitable for vertical down position because the bead solidify quickly.
- With excellent low temperature impact toughness, good crack resistance, high efficiency of weldability.
- Suitable for high requirement of low temperature impact toughness X80 pipe.

NOTE ON USAGE :

- Use DC(-) polarity.

WELDING POSITION :



TYPICAL CHEMICAL COMPOSITION OF WELD METAL (wt%) :

C	Mn	Si	P	S	Ni	Al
0.05	1.10	0.07	0.010	0.003	1.83	1.01

TYPICAL MECHANICAL PROPERTIES OF WELD METAL :

YIELD POINT N/mm^2(Kgf/mm^2)	TENSILE STRENGTH N/mm^2(Kgf/mm^2)	ELONGATION RATE %	IMPACT VALUES -40 °C J(Kgf-m)
485(49.5)	578(58.9)	24	110(11.2)

SIZE AND RECOMMENDED CURRENT RANGE : DC(-)

Parameters \ Diameter (mm)	1.6	2.0
Voltage (Volt)	16-20	16-20
Current (Amp)	180-250	180-280
Stickout (m/m)	10-20	10-20

SFC-81Ni1

AWS A5.29 E81T1-Ni1C/M
EN ISO 17632-A T46 3 1Ni P C1/M21 1
GB T17493 E551T1-Ni1

FLUX CORED WIRES FOR LOW TEMPERATURE LOW ALLOY STEEL

DESCRIPTION & APPLICATIONS :

- SFC-81Ni1 is a low alloy flux core wire designed for 550N/mm^2 grade steel. The weld metal of is SFC-81Ni1 1%Ni.
- Suitable for low temperature container, ocean construction, storage tank, pipe, and welding of high tensile strength structure.

NOTE ON USAGE :

- Use DC (+) polarity. CO_2 gas (min. 99.8%) G.F.R: 15~25 l/min.

WELDING POSITION :

TYPICAL CHEMICAL COMPOSITION OF WELD METAL (wt%) : (CO_2)

C	Mn	Si	P	S	Ni
0.048	1.26	0.45	0.010	0.006	0.95

TYPICAL MECHANICAL PROPERTIES OF WELD METAL: (CO_2)

YIELD POINT N/mm^2(Kgf/mm^2)	TENSILE STRENGTH N/mm^2(Kgf/mm^2)	ELONGATION RATE %	IMPACT VALUES -30 °C J(Kgf-m)
534(54.5)	618(63.1)	28	85(8.7)

SIZE AND RECOMMENDED CURRENT RANGE : DC(+)

Parameters \ Diameter (mm)	1.2		1.4		1.6	
	F/H	V/OH	F/H	V/OH	F/H	V/OH
Voltage (Volt)	30-36	25-28	32-34	26-30	34-42	26-30
Current (Amp)	250-330	150-220	270-360	170-220	300-400	170-220

SFC-81Ni2

AWS A5.29 E81T1-Ni2 C/M
EN ISO 17632-A T46 4 2Ni P C1/M21 1
GB T17493 E551T1-Ni2

FLUX CORED WIRES FOR LOW TEMPERATURE LOW ALLOY STEEL

DESCRIPTION & APPLICATIONS :

- SFC-81Ni2 is a low alloy flux core wire designed for 550N/mm^2 grade steel. The weld metal of is SFC-81Ni1 2%Ni.
- Suitable for low temperature container, ocean construction, storage tank, pipe, and welding of high tensile strength structure.

NOTE ON USAGE :

- Use DC (+) polarity. CO_2 gas (min. 99.8%) G.F.R: 15~25 l/min.

WELDING POSITION :

TYPICAL CHEMICAL COMPOSITION OF WELD METAL (wt%) : (CO_2)

C	Mn	Si	P	S	Ni
0.052	1.30	0.35	0.009	0.006	2.00

TYPICAL MECHANICAL PROPERTIES OF WELD METAL: (CO_2)

YIELD POINT N/mm^2(Kgf/mm^2)	TENSILE STRENGTH N/mm^2(Kgf/mm^2)	ELONGATION RATE %	IMPACT VALUES -40 °C/-60 °C J(Kgf-m)
560(57.1)	631(64.4)	27	100(10.2)/55(5.6)

SIZE AND RECOMMENDED CURRENT RANGE : DC(+)

Parameters \ Diameter (mm)	1.2		1.4		1.6	
	F/H	V/OH	F/H	V/OH	F/H	V/OH
Voltage (Volt)	30-36	25-28	32-34	26-30	34-42	26-30
Current (Amp)	250-330	150-220	270-360	170-220	300-400	170-220

SFC-91Ni2

AWS A5.29 E91T1-Ni2 C/M
EN ISO 17632-A T50 4 2Ni P C1/M21 1
GB T17493 E601T1-Ni2

FLUX CORED WIRES FOR LOW TEMPERATURE LOW ALLOY STEEL

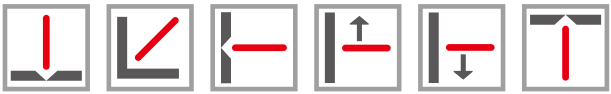
DESCRIPTION & APPLICATIONS :

- SFC-91Ni2 is a 620N/mm^2 grade high tensile strength steel. The weld metal of is SFC-91Ni2 2.2%Ni.
- Suitable for low temperature container, ocean construction, storage tank, and pipe.

NOTE ON USAGE :

- Use DC (+) polarity. CO_2 gas (min. 99.8%) G.F.R: 15~25 l/min.

WELDING POSITION :



TYPICAL CHEMICAL COMPOSITION OF WELD METAL (wt%) : (CO_2)

C	Mn	Si	P	S	Ni
0.035	1.35	0.52	0.009	0.006	2.20

TYPICAL MECHANICAL PROPERTIES OF WELD METAL: (CO_2)

YIELD POINT N/mm^2(Kgf/mm^2)	TENSILE STRENGTH N/mm^2(Kgf/mm^2)	ELONGATION RATE %	IMPACT VALUES -40 °C/-50 °C J(Kgf-m)
600(61.2)	680(69.4)	24	58(5.9)/49(5.0)

SIZE AND RECOMMENDED CURRENT RANGE : DC(+)

Parameters \ Diameter (mm)	1.2		1.4		1.6	
	F/H	V/OH	F/H	V/OH	F/H	V/OH
Voltage (Volt)	30-36	25-28	32-34	26-30	34-42	26-30
Current (Amp)	250-330	150-220	270-360	170-220	300-400	170-220

SFC-81K2

AWS A5.29 E81T1-K2 C/M
EN ISO 17632-A T46 6 1.5Ni P C1/M21 1 H5
GB T17493 E551T1-K2

FLUX CORED WIRES FOR LOW TEMPERATURE LOW ALLOY STEEL

DESCRIPTION & APPLICATIONS :

- SFC-81K2 is a 550N/mm^2 grade high tensile strength steel. The weld metal of is SFC-81K2 1.8%Ni.
- Suitable for offshore construction, low temperature container, ocean construction, LPG and LNG ship.

NOTE ON USAGE :

- Use DC (+) polarity. CO_2 gas (min. 99.8%) G.F.R: 15~25 l/min.

WELDING POSITION :

TYPICAL CHEMICAL COMPOSITION OF WELD METAL (wt%) : (CO_2)

C	Mn	Si	P	S	Ni
0.04	1.60	0.38	0.008	0.007	1.80

TYPICAL MECHANICAL PROPERTIES OF WELD METAL: (CO_2)

YIELD POINT N/mm^2(Kgf/mm^2)	TENSILE STRENGTH N/mm^2(Kgf/mm^2)	ELONGATION RATE %	IMPACT VALUES -60 °C J(Kgf-m)
582(59.4)	624(63.7)	27	70(7.1)

SIZE AND RECOMMENDED CURRENT RANGE : DC(+)

Parameters \ Diameter (mm)	1.2		1.4		1.6	
	F/H	V/OH	F/H	V/OH	F/H	V/OH
Voltage (Volt)	30-36	25-28	32-34	26-30	34-42	26-30
Current (Amp)	250-330	150-220	270-360	170-220	300-400	170-220

SFC-81M

AWS A5.28 E80C-G
EN ISO 17632-A-T46 6 Z M C1/M21 1 H5
GB –

FLUX CORED WIRES FOR LOW TEMPERATURE LOW ALLOY STEEL

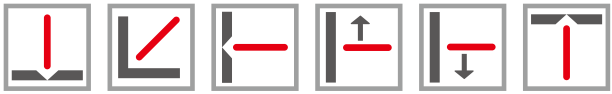
DESCRIPTION & APPLICATIONS :

- SFC-81K2 is a 550N/mm^2 grade high tensile strength steel metal core wire.
- Suitable for ship body, storage tank, engineering machinery, bridge structure, steel structure, and pipe.

NOTE ON USAGE :

- Use CO_2 gas (min. 99.8%) G.F.R: 15~25 l/min. 80%Ar+20%CO_2 can also be used to get better weldability.

WELDING POSITION :



TYPICAL CHEMICAL COMPOSITION OF WELD METAL (wt%) : (100%CO_2, MIX 80%Ar+20%CO_2)

C	Mn	Si	P	S	Ni	Gas
0.006	0.75	0.36	0.006	0.005	0.40	CO_2
0.007	1.00	0.50	0.006	0.006	0.38	MIX

TYPICAL MECHANICAL PROPERTIES OF WELD METAL: (100%CO_2, MIX 80%Ar+20%CO_2)

YIELD POINT N/mm^2 (Kgf/mm^2)	TENSILE STRENGTH N/mm^2(Kgf/mm^2)	ELONGATION RATE %	IMPACT VALUES -60 °C J(Kgf-m)	Gas
480(49.0)	590(60.2)	30	55(5.6)	CO_2
585(59.7)	621(63.4)	27	67(6.8)	MIX

SIZE AND RECOMMENDED CURRENT RANGE : DC(+)

Parameters \ Diameter (mm)	1.2		1.4		1.6	
	F/H	V/OH	F/H	V/OH	F/H	V/OH
Voltage (Volt)	23-34	18-23	24-36	20-23	26-38	20-23
Current (Amp)	150-300	80-150	180-350	100-150	200-400	100-150
Stickout (m/m)	10-15		15-20		15-30	
Gas flow (l/min)	15-25		15-25		20-25	

SFC-91M

AWS A5.28 E90C-G
EN –
GB –

FLUX CORED WIRES FOR LOW TEMPERATURE LOW ALLOY STEEL

DESCRIPTION & APPLICATIONS :

- SFC-91M is a 620N/mm^2 grade low alloy steel metal core wire.
- Suitable for ship body, storage tank, engineering machinery, bridge structure, steel structure, and pipe.

NOTE ON USAGE :

- Use CO_2 gas (min. 99.8%) G.F.R: 15~25 l/min. 80%Ar+20%CO_2 can also be used to get better weldability.

WELDING POSITION :

TYPICAL CHEMICAL COMPOSITION OF WELD METAL (wt%) : (80%Ar+20%CO_2)

C	Mn	Si	P	S	Ni	Mo
0.030	1.06	0.26	0.008	0.005	2.61	0.42

TYPICAL MECHANICAL PROPERTIES OF WELD METAL: (80%Ar+20%CO_2)

YIELD POINT N/mm^2(Kgf/mm^2)	TENSILE STRENGTH N/mm^2(Kgf/mm^2)	ELONGATION RATE %	IMPACT VALUES -51 °C J(Kgf-m)
652(66.5)	713(72.8)	21	50(5.1)

SIZE AND RECOMMENDED CURRENT RANGE : DC(+)

Parameters \ Diameter (mm)	1.2		1.4		1.6	
	F/H	V/OH	F/H	V/OH	F/H	V/OH
Voltage (Volt)	23-34	18-23	24-36	20-23	26-38	20-23
Current (Amp)	150-300	80-150	180-350	100-150	200-400	100-150
Stickout (m/m)	10-15		15-20		15-30	
Gas flow (l/min)	15-25		15-25		20-25	

SFC-81W2

AWS A5.29 E81T1-W2 C/M
EN –
GB T17493 E551T1-W

FLUX CORED WIRES FOR ATMOSPHERIC CORRSION RESISTANT LOW ALLOY STEEL

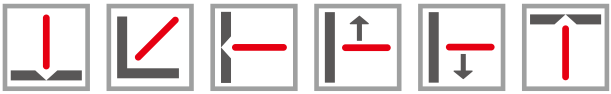
DESCRIPTION & APPLICATIONS :

- SFC-81W2 is a 550N/mm^2 grade atmospheric corrosion resistant low alloy steel metal core wire.
- Suitable for ASTM A242, A588, bridge, and building.

NOTE ON USAGE :

- Use DC (+) polarity. CO_2 gas (min. 99.8%) G.F.R: 15~25 l/min.

WELDING POSITION :



TYPICAL CHEMICAL COMPOSITION OF WELD METAL (wt%) : (CO_2)

C	Mn	Si	P	S	Ni	Cr	Cu
0.04	1.00	0.40	0.010	0.005	0.48	0.60	0.41

TYPICAL MECHANICAL PROPERTIES OF WELD METAL: (CO_2)

YIELD POINT N/mm^2(Kgf/mm^2)	TENSILE STRENGTH N/mm^2(Kgf/mm^2)	ELONGATION RATE %	IMPACT VALUES -30 °C J(Kgf-m)
570(58.2)	630(64.3)	25	53(5.4)

SIZE AND RECOMMENDED CURRENT RANGE : DC(+)

Parameters \ Diameter (mm)	1.2		1.4		1.6	
	F/H	V/OH	F/H	V/OH	F/H	V/OH
Voltage (Volt)	30-36	25-28	32-40	26-30	34-42	26-30
Current (Amp)	250-330	150-220	270-360	170-220	300-400	170-220

SELECTION RECOMMENDATION

According to AWS A5.28, the classification for manufacturing low alloy steel solid wire is as per the following table. Please refer to flux cored wire for material features and application.

Product type	Characteristic	Chemical composition code	features and application
Solid wire (ERXXS-XX series)	Carbon molybdenum steel	A1	For heat resistant steel
	Chrome molybdenum steel	B2, B3, B6, B8, B9	For heat resistant steel
	Nickel steel	Ni1, Ni2, Ni3	For low temperature steel
	Manganese Molybdenum Steel	D2	With better tensile strength and impact toughness than carbon molybdenum steel and nickel molybdenum steel
	Others	1	For military equipment
	Regular	G	Selecting heat resistant and low temperature high tensile strength steel according to the physical property and chemical composition of manufacturer
Metal cored wire (EXXC-XX series)	Chrome molybdenum steel	B2, B3, B6, B8, B9	For heat resistant steel
	Nickel steel	Ni1, Ni2, Ni3	For low temperature steel
	Manganese Molybdenum Steel	D2	With better tensile strength and impact toughness than carbon molybdenum steel and nickel molybdenum steel
	Others	K3, K4	For military equipment, ocean construction, or shipbuilding
	Atmospheric corrosion resistant steel	W2	For atmospheric corrosion resistant steel
	Regular	G	Selecting heat resistant and low temperature high tensile strength steel according to the physical property and chemical composition of manufacturer

WELDING OPERATION

◆ **(1)Storage:**

As per flux cored wire.

◆ **(2)Note:**

①Solid wires for low alloy steel normally take the weld method of MIG or MAG. The suggested gas flow should be 20~25 l/min. When welding in windy places, the possibility of porosity is high, so wind shielded facility is necessary. Turbulence will happen when the gas flow is too high, causing porosities in the beads.

②The welding suggestion is that in workable situation, lower the current, stick-out-length, and the width of weaving, to prevent the alloy from burned and cell enlargement.

SMG-60

AWS A5.28 ER80S-G
EN ISO 14341-A-G 46 4 C1/M21 Z H5
GB T8110 ER55-G

MIG WIRE FOR ≧ 550N/mm² HIGH TENSILE STRENGTH STEEL

DESCRIPTION & APPLICATIONS :

- SMG-60 is a solid wire of mild steel and 550N/mm² grade steel. Used for high tensile strength steel structure, and with wider range of current and stable arc.
- Used for Bridge, construction, engineering machinery, harbor machinery, and pressure vessel.

NOTE ON USAGE :

- Proper gas flow should be 20~25 l/min.
- Wire-stick-out must be kept between 15 ~ 25mm.
- Maintaining the cover and TIP of welding gun.

WELDING POSITION :

TYPICAL CHEMICAL COMPOSITION OF WELD METAL (wt%) : (CO_2)

C	Mn	Si	P	S	Mo
0.074	1.41	0.73	0.013	0.006	0.20

TYPICAL MECHANICAL PROPERTIES OF WELD METAL: (CO_2)

YIELD POINT N/mm²(Kgf/mm²)	TENSILE STRENGTH N/mm²(Kgf/mm²)	ELONGATION RATE %	IMPACT VALUES -30°C J(Kgf-m)
510(52.0)	590(60.2)	28	50(5.1)

SIZE AND RECOMMENDED CURRENT RANGE : DC(+)

Diameter (mm)	0.8	0.9	1.0	1.2	1.6
Current (Amp)	50-180	50-200	80-250	100-350	250-500

SMG-60N

AWS A5.28 ER80S-G
EN ISO 14341-A-G 46 6 C1/M21 Z H5
GB –

MIG WIRE FOR ≧ 550N/mm² HIGH TENSILE STRENGTH STEEL

DESCRIPTION & APPLICATIONS :

- SMG-60N is a solid wire of mild steel and 550N/mm² grade steel. Used for high tensile strength steel structure, and with wider range of current and stable arc.
- Used for Bridge, construction, engineering machinery, harbor machinery, and pressure vessel.

NOTE ON USAGE :

- Proper gas flow should be 20~25 l/min.
- Wire-stick-out must be kept between 15 ~ 25mm.
- Maintaining the cover and TIP of welding gun.

WELDING POSITION :

TYPICAL CHEMICAL COMPOSITION OF WELD METAL (wt%) : (100%CO_2 , MIX 80%Ar+20%CO_2)

C	Mn	Si	P	S	Ni	Gas
0.08	1.15	0.71	0.012	0.008	1.03	CO_2
0.09	1.32	0.75	0.013	0.009	1.16	MIX

TYPICAL MECHANICAL PROPERTIES OF WELD METAL: (100%CO_2 , MIX 80%Ar+20%CO_2)

YIELD POINT N/mm²(Kgf/mm²)	TENSILE STRENGTH N/mm²(Kgf/mm²)	ELONGATION RATE %	IMPACT VALUES -60°C J(Kgf-m)	Gas
510(52.0)	585(59.7)	29	68(6.9)	CO_2
542(55.3)	614(62.7)	27	74(7.6)	MIX

SIZE AND RECOMMENDED CURRENT RANGE : DC(+)

Diameter (mm)	0.8	0.9	1.0	1.2	1.6
Current (Amp)	50-180	50-200	80-250	100-350	250-500

STG-60

AWS A5.28 ER80S-G
EN ISO 636-A W 55 3 Z
GB T8110 ER55-G

TIG WIRE FOR ≧ 550N/mm² HIGH TENSILE STRENGTH STEEL

DESCRIPTION & APPLICATIONS :

●STG-60 is a solid tungsten rod for 550N/mm² grade steel. Suitable for deep penetration on root and filler layer of butt, and normally used for welding high tensile strength steel such as molybdenum steel and manganese molybdenum steel.

NOTE ON USAGE :

●Use Ar as shield gas, purity should be above 99.997%, and control the flow properly. The gas flow should be 7~12 l/min when the current is 100~200Amp; 12~15 l/min when the current is 200~300Amp.

●The proper Wire-stick-out should be 5mm, and arc should be 1~3mm.

●There should be proper win shielded facility in case of porosities.

WELDING POSITION :

TYPICAL CHEMICAL COMPOSITION OF WELD METAL (wt%) : (Ar)

C	Mn	Si	P	S	Mo
0.04	1.50	0.57	0.010	0.006	0.15

TYPICAL MECHANICAL PROPERTIES OF WELD METAL: (Ar)

YIELD POINT N/mm²(Kgf/mm²)	TENSILE STRENGTH N/mm²(Kgf/mm²)	ELONGATION RATE %	IMPACT VALUES -30°C J(Kgf-m)
585(59.7)	650(66.3)	24	250(25.5)

SIZE AND RECOMMENDED CURRENT RANGE : DC(-)

Diameter (mm)	1.2	1.6	2.0	2.4	3.2	4.0
Current (Amp)	70-90	80-100	90-120	100-160	160-220	180-250

STG-80B2

AWS A5.28 ER80S-B2
EN –
GB T8110 ER55-B2

TIG RODS FOR HEAT-RESISTANT LOW-ALLOY STEEL

DESCRIPTION & APPLICATIONS :

- STG-80B2 is a solid tungsten rod for 1.25%Cr-0.5%Mo heat-resistant low alloy steel with high tensile strength and excellent creep resistance.
- Suitable for pipelines of high temperature high pressure, steel of boiler exchanger, A387 Gr.11 and Gr.12.

NOTE ON USAGE :

- Use Ar as shield gas, purity should be above 99.997%, and control the flow properly. The gas flow should be 7~12 l/min when the current is 100~200Amp; 12~15 l/min when the current is 200~300Amp.
- The proper Wire-stick-out should be 5mm, and arc should be 1~3mm.
- There should be proper win shielded facility in case of porosities.

WELDING POSITION :

TYPICAL CHEMICAL COMPOSITION OF WELD METAL (wt%) : (Ar)

C	Mn	Si	P	S	Cr	Mo
0.08	0.59	0.53	0.018	0.009	1.29	0.53

TYPICAL MECHANICAL PROPERTIES OF WELD METAL: (Ar)

YIELD POINT $N/mm^2(Kgf/mm^2)$	TENSILE STRENGTH $N/mm^2(Kgf/mm^2)$	ELONGATION RATE %	HEAT TREATMENT
490(50.0)	580(59.2)	26	690°Cx1hr

SIZE AND RECOMMENDED CURRENT RANGE : DC(-)

Diameter (mm)	1.2	1.6	2.0	2.4	3.2	4.0
Current (Amp)	70-90	80-100	90-120	100-160	160-220	180-250

STG-80B6

AWS A5.28 ER80S-B6
EN –
GB T8110 ER55-G

TIG RODS FOR HEAT-RESISTANT LOW-ALLOY STEEL

DESCRIPTION & APPLICATIONS :

- STG-80B6 is a solid tungsten rod for 5%Cr-0.5%Mo heat-resistant low alloy steel with high tensile strength and excellent creep resistance.
- Suitable for the welding of ASTM A213Gr.T5, ASTM A217Gr.C5, and ASTM A335Gr.P5.

NOTE ON USAGE :

- When welding, heat input and temperature need to be managed to avoid crack of beads.
- Use Ar as shield gas, purity should be above 99.997%, and control the flow properly. The gas flow should be 7~12 l/min when the current is 100~200Amp; 12~15 l/min when the current is 200~300Amp.
- The proper Wire-stick-out should be 5mm, and arc should be 1~3mm.
- There should be proper win shielded facility in case of porosities.

WELDING POSITION :

TYPICAL CHEMICAL COMPOSITION OF WELD METAL (wt%) : (Ar)

C	Mn	Si	P	S	Ni	Cr	Mo
0.08	0.46	0.42	0.016	0.008	0.4	5.53	0.56

TYPICAL MECHANICAL PROPERTIES OF WELD METAL: (Ar)

YIELD POINT $N/mm^2(Kgf/mm^2)$	TENSILE STRENGTH $N/mm^2(Kgf/mm^2)$	ELONGATION RATE %	HEAT TREATMENT
495(50.5)	614(62.7)	25	740°Cx1hr

SIZE AND RECOMMENDED CURRENT RANGE : DC(-)

Diameter (mm)	1.2	1.6	2.0	2.4	3.2	4.0
Current (Amp)	70-90	80-100	90-120	100-160	160-220	180-250

STG-90B3

AWS A5.28 ER90S-B3
EN –
GB T8110 ER62-B3

TIG RODS FOR HEAT-RESISTANT LOW-ALLOY STEEL

DESCRIPTION & APPLICATIONS :

- STG-90B3 is a solid rod for 2.25%Cr-1%Mo heat-resistant low alloy steel with high tensile strength and excellent creep resistance.
- Suitable for pipelines of high temperature high pressure, steel of boiler exchanger, A387 Gr.11 and Gr.12.

NOTE ON USAGE :

- Use Ar as shield gas, purity should be above 99.997%, and control the flow properly. The gas flow should be 7~12 l/min when the current is 100~200Amp; 12~15 l/min when the current is 200~300Amp.
- The proper Wire-stick-out should be 5mm, and arc should be 1~3mm.
- There should be proper win shielded facility in case of porosities.

WELDING POSITION :

TYPICAL CHEMICAL COMPOSITION OF WELD METAL (wt%) : (Ar)

C	Mn	Si	P	S	Cr	Mo
0.08	0.58	0.48	0.018	0.009	2.37	1.02

TYPICAL MECHANICAL PROPERTIES OF WELD METAL: (Ar)

YIELD POINT $N/mm^2(Kgf/mm^2)$	TENSILE STRENGTH $N/mm^2(Kgf/mm^2)$	ELONGATION RATE %	HEAT TREATMENT
590(60.2)	660(67.3)	22	690°Cx1hr

SIZE AND RECOMMENDED CURRENT RANGE : DC(-)

Diameter (mm)	1.2	1.6	2.0	2.4	3.2	4.0
Current (Amp)	70-90	80-100	90-120	100-160	160-220	180-250

STG-90B9

AWS A5.28 ER90S-B9
EN –
GB T8110 ER62-G

TIG RODS FOR HEAT-RESISTANT LOW-ALLOY STEEL

DESCRIPTION & APPLICATIONS :

- STG-90B9 is a solid rod for 9%Cr-1%Mo heat-resistant low alloy steel with excellent creep resistance because of its combination of minor Nb and V.
- Suitable for the welding of ASTM A213-T91 steel pipe, A335 P91 and A387 Gr.91 steel plate.

NOTE ON USAGE :

- Use Ar as shield gas, purity should be above 99.997%, and control the flow properly. The gas flow should be 7~12 l/min when the current is 100~200Amp; 12~15 l/min when the current is 200~300Amp.
- The proper Wire-stick-out should be 5mm, and arc should be 1~3mm.
- There should be proper win shielded facility in case of porosities.

WELDING POSITION :

TYPICAL CHEMICAL COMPOSITION OF WELD METAL (wt%) : (Ar)

C	Mn	Si	P	S	Ni	Cr	Mo	Nb	V
0.09	0.56	0.24	0.015	0.009	0.66	8.74	0.92	0.05	0.2

TYPICAL MECHANICAL PROPERTIES OF WELD METAL: (Ar)

YIELD POINT $N/mm^2(Kgf/mm^2)$	TENSILE STRENGTH $N/mm^2(Kgf/mm^2)$	ELONGATION RATE %	HEAT TREATMENT
610(62.2)	730(74.5)	20	750°Cx1hr

SIZE AND RECOMMENDED CURRENT RANGE : DC(-)

Diameter (mm)	1.2	1.6	2.0	2.4	3.2	4.0
Current (Amp)	70-90	80-100	90-120	100-160	160-220	180-250

SELECTION RECOMMENDATION

According to AWS A5.23, wires are classified to solid wire, combined wire, and flux cored wire. Flux are classified by Two-Run or multiple pass, level of tensile strength and impact, heat treatment or not, adding slag or not.

The classification for SAW is detailed. For multiple pass, besides the wire, the weld metal also need to be classified. For two-run, only need to classify the wire or the weld metal. The classification and application is as below:

Application	Wire Classification	Bare wire composition	Weld metal composition	Bare wire Classification	Weld metal classification
Multuple Pass (FXXX-EXXX-XX)	Bare wire	Carbon molybdenum steel	Carbon molybdenum steel	1.Carbon steel: Low, medium, and high, manganese. (Low, medium, and high group) 2.Heat resistant steel: Carbon molybdenum(A group) and chrome molybdenum(B group) 3.Low temperature steel: Nickel(Ni group) 4.Special steel: chrome nickel molybdenum(F group) and military(M group) 5.atmospheric corrosion resistant steel: chrome nickel copper(W group) 6.Regular multi classification: In accordance to the design of manufacturer	1.A group(Carbon molybdenum): A1, A2, A3, A4 2.B group(chrome molybdenum): B1, B2, B3, B4, B5, B6, B8, B23, B24, B91 3.F group(chrome nickel steel): F1, F2, F3, F4, F5, F6 4.M group: M1, M2, M3, M4, M5, M6 5.Ni group: Ni1, Ni2, Ni3, Ni4, Ni5, Ni6 6.W group: atmospheric corrosion resistant steel 7.G group: In accordance to the design of manufacturer
	Combined wire Or Flux cored wire	--	To be classified	--	Same as above
Two-Run (FXTXX-EXX)	Bare wire	To be classified	--	Same as above	--
	Combined wire Or Flux cored wire	--	To be classified	--	Same as above

WELDING OPERATION

(1)Storage:

①Welding consumable should be stored in where without high temperature and humidity, and the packing should not be easily damaged. To avoid the moisture.

②Preheat is suggested for SAW flux before using, 350°C×1hr for Sintered flux, and 200~300°C× 1hr for melting flux.

③The un-melted flux after welding could be added with new flux if sieved, but the ratio should not be over 30%. For higher alloy or special usage, do not use the recycled flux.

(2)Note:

①To prevent burn-through for the first pass of groove welding, manufacturer's suggestion is backing welding semi-automatically before surfacing welding.

②The cover length of flux is that the arc expose a little bit through the flux. Either too much arc or flux will cause porosity or pitting.

③When welding steel plates thicker than 50mm, every bead should overlap the one before for more than 2/3, in case any cracks happening when the beads cooling down after welding because the pass is too thin.

④Preheat, the temperature between passes, and PWHT should be strictly managed to avoid cracks result from cooling too soon and cell embrittlement.

SF-66xSW-60G

AWS A5.23 F8A8-EG-G
EN ISO 14171-A S 46 6 FB S3Si
GB –

SUBMERGED ARC WELDING WIRE AND FLUX FOR HIGH TENSILE STEEL ≧ 550N/mm²

DESCRIPTION & APPLICATIONS :

- It is suitable for single-layer as well as multi-layers submerged arc welding of extreme thick plates and high tensile strength low temperature thick plate.
- Suitable for the welding of shipbuilding, pressure vessels, steel structures and bridges.

NOTE ON USAGE :

- Rebake flux at 350°C for 1hours after opening.
- Use lower electric current during the welding of the bottom layer so as to avoid the crack.
- Appropriate new flux is required to add with the recycling used flux for maintaining the welding quality.

TYPICAL CHEMICAL COMPOSITION OF WELD METAL :

C	Mn	Si
0.054	1.29	0.21
P	S	Mo
0.014	0.006	0.46

TYPICAL MECHANICAL PROPERTIES OF WELD METAL :

YIELD POINT N/mm²(Kgf/mm²)	TENSILE STRENGTH N/mm²(Kgf/mm²)
535(54.6)	592(60.4)
ELONGATION RATE %	IMPACT VALUES -62 °C J(Kgf-m)
29	62(6.3)

SF-68xSW-60G

AWS A5.23 F8A2-EG-G
EN ISO 14171-A S 50 3 AB SZ
GB –

SUBMERGED ARC WELDING WIRE AND FLUX FOR HIGH TENSILE STEEL ≧ 550N/mm²

DESCRIPTION & APPLICATIONS :

- It is suitable for single-layer as well as multi-layers submerged arc welding of thick plates and extreme thick plate.
- It is used for the joint welding of 550N/mm2 high tensile steel such as SM570, ocean construction and pressure vessel.

NOTE ON USAGE :

- Rebake flux at 350°C for 1hours after opening.
- Use lower electric current during the welding of the bottom layer so as to avoid the crack.
- Appropriate new flux is required to add with the recycling used flux for maintaining the welding quality.

TYPICAL CHEMICAL COMPOSITION OF WELD METAL :

C	Mn	Si
0.05	2.00	0.60
P	S	Mo
0.021	0.008	0.15

TYPICAL MECHANICAL PROPERTIES OF WELD METAL :

YIELD POINT N/mm²(Kgf/mm²)	TENSILE STRENGTH N/mm²(Kgf/mm²)
480(49.0)	580(59.1)
ELONGATION RATE %	IMPACT VALUES -62 °C J(Kgf-m)
29	60(6.1)

SELECTION RECOMMENDATION

According to AWSA5.25, electroslag wire can be classified to solid wire and metal cored wire. Fluxes are classified by tensile strength and impact.

See below chart for classification and usage:

Wire Classification	Bare wire composition	Weld metal composition	Bare wire Classification	Weld metal classification
Bare wire (EXX-EW)	To be classified	--	1.Medium manganese steel: Classified to EM5K, EM12, EM12K, EM13K, EM15K 2.High manganese steel: EH14 3.Special usage: Classified to EWS(atmospheric corrosion resistance), EA3K(heat resistance), EH10K, EH11K, ES-G.	--
Metal cored wire (EWTX)	--	To be classified	--	Classified to EWT1, EWT2, EWT3, EWTG.

WELDING OPERATION

◆ **(1)Storage:**

①The packing of drum pack should avoid any depression by crashing, because it will cause the wire crossed.

②The drum pack, normally used with paper packing material, should be store in the environment without high temperature and humidity.

◆ **(2)Note:**

①Before using, check if the wire is crossed, and the direction of guide board is correct.

②When automatic wire feeding machine works with swing function, check if the swing is smooth, to avoid incomplete melting.

SF-60xSWE-60G

AWS A5.25 FES80-ES-G-EW
EN –
GB –

ELECTROSLAG WELDING FOR ≧ 550N/mm² GRADE HIGH TENSILE STRENGTH STEEL

DESCRIPTION & APPLICATIONS :

- SF-60 x SWE-60G is designed for electroslag welding.
- It's combination of melting flux and low alloy steel wire with special alloy.
- With special alloy elements, the cell will be shrunk and the toughness of the bead will increased.
- Suitable for the welding of high efficiency and vertical thick steel plate of 550N/mm² grade high tensile strength steel.
- Suitable for welding of shipbuilding, steel structure, and bridge. Especially for the box column of SC.

NOTE ON USAGE :

- The precision of the assembly' s gap should be under 0.5mm. Keep the position of spot welding at the outer side.
- Remove any bump, oil, and moisture before welding.
- The wire-stick-out should be 30~40mm.

TYPICAL CHEMICAL COMPOSITION OF WELD METAL :

C	Mn	Si	P	S	Special elements
0.12	1.52	0.14	0.012	0.008	properly

TYPICAL MECHANICAL PROPERTIES OF WELD METAL :

YIELD POINT N/mm²(Kgf/mm²)	TENSILE STRENGTH N/mm²(Kgf/mm²)	ELONGATION RATE %	IMPACT VALUES -30 °C J(Kgf-m)
545(55.6)	637(65.0)	27	43(4.4)

MEMO

Stainless Steel

Base metal introduction

Definition: The content of chromium (Cr) in steel liquid > 12% of steel is called stainless steel, the general commercial specification of chromium content of ≥11%. When the content of chromium in steel exceeds 12%, a film of chromium oxide is formed on the surface of the steel to isolate the erosion of the parent material in the environment.

Stainless steel classification methods are many, the common classification is based on structure types or compositions for classification, related material categories and main uses as shown in the table below:

Categores	Composition	Steel Grade	Main Application
Martensite	Fe-Cr	SUS410	Blades, Turbine Blades
Ferrite		SUS410L/SUS405/ SUS430	Exhaust Accessory, Hot Water Heater, Roofing Material
Austenite	Fe-Cr-Ni	SUS201/SUS304/SUS316	Food/Beverage Equipment, Chemical Apparatus, Nuclear Energy Use
Duplex Stainless Steel (Austenite + Ferrite)		SUS329J3L/SUS329J4L/ SUS2205	Oil Well Pipes, Chemical Apparatus, Seawater Condenser, Seawater Desalination Plant
Precipitation Hardening Stainless Steel		SUS630	Blades, Molds, Shafts

◆ (1)Martensite Family:

	Grade	Features
Martensite Family	403	Turbine & High-Stress Accessory
	410	General Uses
	414	Add Ni for corrosion resistance improvement
	416	Increase P and S for processability improvement
	416Se	Add Se for a better processing surface
	420	Add C for mechanical properties improvement
	420F	Increase P and S for processability improvement
	422	Add Mo, V, and W for better strength and toughness at 649°C
	431	Add Cr and Ni for better corrosion resistance and mechanical property
	440A	Add Cr for corrosion resistance improvement
	440B	Little higher C than 440A for tools, gauges, and bearings Slightly higher C content than 440A, for tools, gauges, bearings
	440C	Carbon content of 440 series of the highest for high hardness, nozzles, bearings

◆ (2)Ferrite Family:

	Grade	Features
Ferrite Family	405	Reduce Cr and add Al to prevent hardening when cooled at high temperatures
	409	Reduce Cr for mainly use in automotive exhaust systems
	429	Reduce Cr for better weldability
	430	General Use
	430F	Add P for processability improvement
	430FSe	Add Se for a better processing surface
	434	Add Mo for corrosion resistance improvement
	436	Add Mo, V, and Ta for corrosion and heat resistances improvement
	442	Add Cr for scale resistance improvement
	444	Add Mo for corrosion resistance improvement
	446	Add Cr for scale resistance improvement

◆ (3)Austenite Family:

	Grade	Features
Austenite Family	201	Add N and Mn instead of partial content of Ni for general industrial use such as iron windows, iron doors, beams
	202	Add N and Mn instead of partial content of Ni for general industrial use
	205	Add N and Mn instead of partial content of Ni for general industrial use
	301	Reduce Cr and Ni to increase processing hardening
	302	Higher content of C than 304 for general use
	302HQ (UNS S30430)	Add Cu for cold processing improvement
	302B	Add Si to increase the scale resistance
	303	Add P for processability improvement
	303Se	Add Se for a better processing surface
	304	Lower content of C better for corrosion resistance
	304L	Lower content of C than 304 for corrosion resistance improvement
	304LN	Add N and lower C to increase strength and corrosion resistance improvement
	304N	Add N to increase strength
	305	Add Ni to reduce processing hardening
	308	Higher content of Cr and Ni than 304 mainly for welding

	Grade	Features
Austenite Family	309	Add Cr and Ni to increase heat and oxidation resistances
	309S	Lower content of P than 309
	310	Add more Cr and Ni to significantly improve heat resistance
	310S	Add more Cr and Ni to significantly improve heat and creep resistances
	314	Add Si for excellent heat resistance
	316	Add Mo to increase pitting corrosion resistance
	316L	Reduce C for better weldability and corrosion resistance
	316LN	Reduce C and add N to increase strength
	317	Add more Mo and Cr for excellent corrosion resistance
	317L	Reduce C for better weldability and corrosion resistance than 317
	321	Add Ti to prevent carbide precipitation and increase corrosion resistance
	329	Add Cr and Ni similar to duplex property, reduce stress corrosion cracking resistance
	347	Add Nb and Ta to prevent carbide precipitation and increase corrosion resistance
	348	Limitation of Ta and Co for nuclear energy plant application
	384	Add Ni to reduce processing hardening

◆ (4)Duplex Stainless Steel (Austenite + Ferrite) Family:

	Grade	Features
Duplex Stainless Steel (Austenite + Ferrite) Family	S32900/ SUS329J1L	PRE (%) about 29.5% the 1st Duplex Stainless Steel
	S31803/ SUS329J3L/ SAF2205	PRE (%) about 33.6% the 2nd Duplex Stainless Steel as more general use
	S31260/ SUS329J4L	PRE (%) about 36.6% the 2nd Duplex Stainless Steel
	S32550	PRE (%) about 40.6% the 3rd Duplex Stainless Steel so-called Super-duplex Stainless Steel
	S32750/ SAF2507	PRE (%) about 40.7% the 3rd Duplex Stainless Steel so-called Super-duplex Stainless Steel

Note:
The highest PRE the best pitting corrosion resistance.

◆ (5)Precipitation Hardening Stainless Steel Family:

	Grade	Features
Precipitation Hardening Stainless Steel Family	15-5PH	Content 15%Cr - 5%Ni as the precipitation hardening type of Martensitic structure for aerospace industry
	630, 17-4PH	Content 17%Cr - 4%Ni - 4%Cu - 0.4%Nb+Ta as the precipitation hardening type of Martensitic structure for aerospace, biomedical, petrochemical, food and beverage, and papermaking industries
	631, 17-7PH	Content 17%Cr - 7%Ni - 1%Al as the precipitation hardening type of semi-austenitic structure for aerospace, biomedical, chemical, petrochemical, papermaking, and metal processing industries
	632, PH15-7Mo	Content 15%Cr - 7%Ni - 2%Mo - 1%Al as the precipitation hardening type of semi-austenitic structure for spring, medical care, oil drilling industries
	17-10P	Content 17%Cr + 10%Ni as the precipitation hardening type of austenitic structure for flanges, molds, and tools

Welding method and Specifications

Structural category	welding characteristics and precausion
Martensite	The structure characteristics is hard and brittle, especially in the heat-affected areas caused by the high sensitivity of cracking; the temperature management needs to be implemented.
Ferrite	The temperature of the weld is prone to brittleness at 370-925°C for a long time, so as to avoid excessive overhigh temperature between the welds.
Austenite	The temperature of the weld is prone to sensitivity at 450-850°C for a long time, resulting in chromium carbide precipitation and reducing corrosion resistance.
Duplex Stainless Steel (Austenite + Ferrite)	The temperature of the weld is prone to sensitivity at 300-900°C for a long time, the heat input and weld temperature should not be too high.
Precipitation Hardening Stainless Steel	General selection of 308 series or 309 series or the same type of steel material; When considering PWHT and cracking sensitivity, consider using Ni-Cr system or NiCrMo system for use.

SELECTION RECOMMENDATION

Definition of Stainless Steel materials according to AWS: The content of chromium (Cr) > 12% the Fe content higher than other alloys. Welding material is mainly based on a match of the parent material, the engineering design requirements, the environment of the workpieces, and any other requirements of PWHT and welding methods as a basic selection.

It belongs to the field of the iron-based high alloy steel, the heat input control, the preheat temperature, and the weld temperature between the welds all are relatively important, in order to avoid excessive burning of components, carbonation over-precipitated to reduce corrosion resistance, grain over-extensive, structural brittle phase precipitation and other problems.

It is due to the engineering requirements for the Austenitic stainless steels; it is usually specified the content of ferrite number (Fn). The measures are generally testified under Ferrite Detector (real measures), the table lookup (table of the chemical composition), and metallographic analysis.

Classification of Stainless Steel covered metal arc welding specification according to AWS A5.4, is based on the composition, welding current, and welding position, but without the information of tensile strength on specification. The following is an overview of the relevant classifications and applications:

Classification	Welding Current	Welding Position	Features & Applications
EXXX(X)-15	DC(+)	All	It is usually designed for basic covered fluxes, spatters, and slag removal worse than -16, but better mechanical properties, generally used at -196°C the super-low temperature environment.
EXXX(X)-16	AC & DC(+)	All	General types for titanium oxide low hydrogen covered design.
EXXX(X)-17	AC & DC(+)	All	It replaces Ti with Si on design for covered electrodes in order to obtain finer transition droplets and weld flatness, especially in the vertical and overhead welding the weld convexity more even than -16
EXXX(X)-26	AC & DC(+)	F,H-Fillet	The welding material for the horizontal fillet welding for excellent weld flatness.

Marks: For all welding positions, the vertical and overhead welding positions recommended using ≤ 4.0mm

WELDING OPERATION

◆ (1)Storage Management:

①It requires an appropriately dry warehouse for storage in order to avoid high humidity (≥80% R.H) and high heat temperate (≥30°C) coexisting environment, resulting in the excessive moisture absorption on the electrodes.

②Most of the stainless steel covered electrodes are low-hydrogen system, which must be dried at high temperature prior to use, and placed in a thermostat-container or a low temperature oven at 100~150°C for storage. Use with a small amount each time from the storage to reduce the moisture concerns in the covered flux for the weld blowhole matters. Please refer to the instructions of the dry conditions in the appendix.

◆ (2)Welding Precaution:

①The core rod of the stainless steel covered electrode is mostly made of stainless steel material. The slower heat conductivity and higher coefficient expansion, and therefore, it causes the resistance of the core rod at height while the excessive welding current through; the covered flux generates heat in red and the condition of flux comes off.

② When the welding current is excessive or the welding speed too slow, it causes the chromium carbide precipitation, the structure brittleness, the corrosion resistance and cracking on the weld.

③Oxidation film, water vapor, oil pollution, skin, surface spraying and other intermediates on the parent metal workpiece that would increase the gas content of the weld metal and cause the blowhole on the weld. Besides, cleaning the surface of the workpiece prior to welding.

④It maintains a short arc welding in order to avoid water vapor and nitrogen dissolved into the weld that generates blowholes.

⑤The swing arc may not exceed 3 times of the electrode diameter while welding by weaving mode to ensure the melting quality of the weld.

⑥The deformation of the workpiece after welding is bigger than carbon steel materials. Therefore, it requires a jip and symmetrical welding method to prevent the workpiece deformed.

⑦Outdoor welding, it requires wind protection process if the wind speed exceeds 3 m/s, in order to avoid the outside air/gas into the weld that generates blowhole matters.

⑧Preheat and weld temperature suggests to maintain at 16~150°C while welding in Austenitic Stainless Steel, the rest in accordance with welding regulations and WPS.

⑨When weld a dissimilar material joint by stainless steel 309, the carbon equivalent or the excessive dilution rate matters of the parent metal is to cause the weld cracking. Therefore, it requires a low heat-input welding or surface spreading on carbon steel/alloy steel/cast iron ahead, and then does weld two different parent metals.

⑩Without the content of ferrite in full austenitic stainless steel, it is strictly required the heat input for the hot cracking matter on the weld.

SS-307

AWS A5.4 E307-16
EN ISO 3581-A E 18 9 MnMo R 1 2
GB T983 E307-16

COVERED ELECTRODES FOR STAINLESS STEEL

DESCRIPTION & APPLICATIONS :

- SS-307 is a titanium oxide low hydrogen electrode, the weld metal contains 18%Cr-8%Ni-4%Mn as the full austenitic structure.
- It is suitable for clad stainless steel, high tensile steel, steels difficult to weld, nuclear submarine, and armor plate at a non-magnetic site.

NOTE ON USAGE :

- Rebake the electrodes at 250 ~ 300°C for 1 hour and keep it at 100~150°C prior to use.
- With lower current is to properly keep the dilution of the parent metal for welding crack.

WELDING POSITION :

TYPICAL CHEMICAL COMPOSITION OF WELD METAL (wt%) :

C	Mn	Si	P	S	Ni	Cr	Mo
0.089	4.3	0.45	0.028	0.004	9.62	19.5	0.8

TYPICAL MECHANICAL PROPERTIES OF WELD METAL :

TENSILE STRENGTH $N/mm^2(Kgf/mm^2)$	ELONGATION RATE %
610(62.2)	40

SIZE AND RECOMMENDED CURRENT RANGE : AC or DC(+)

Diameter (mm)		2.6	3.2	4.0	5.0
Length (mm)		300	350	350	350
Current (Amp)	F	50-85	80-120	100-150	140-170
	V & OH	45-80	70-110	90-135	-

SS-307HM

AWS -
EN -
GB -

COVERED ELECTRODES FOR STAINLESS STEEL

DESCRIPTION & APPLICATIONS :

- SS-307HM is a titanium oxide low hydrogen electrode, the weld metal contains 18%Cr-8%Ni-6%Mn the full austenitic structure.
- It is suitable for clad stainless steel, high tensile steel, steels difficult to weld, nuclear submarine, and armor plate at a non-magnetic site.

NOTE ON USAGE :

- Rebake the electrodes at 250 ~ 300˚C for 1 hour and keep it at 100~150˚C prior to use.
- With lower current is to properly keep the dilution of the parent metal for welding crack.

WELDING POSITION :

TYPICAL CHEMICAL COMPOSITION OF WELD METAL (wt%) :

C	Mn	Si	P	S	Ni	Cr
0.098	5.5	0.45	0.029	0.010	8.8	19.7

TYPICAL MECHANICAL PROPERTIES OF WELD METAL :

TENSILE STRENGTH $N/mm^2(Kgf/mm^2)$	ELONGATION RATE %
615(62.8)	39

SIZE AND RECOMMENDED CURRENT RANGE : AC or DC(+)

Diameter (mm)		2.6	3.2	4.0	5.0
Length (mm)		300	350	350	350
Current (Amp)	F	50-85	80-120	100-150	140-170
	V & OH	45-80	70-110	90-135	-

SS-308

AWS A5.4 E308-16
EN ISO 3581-A E 19 9 R 1 2
GB T983 E308-16

COVERED ELECTRODES FOR STAINLESS STEEL

DESCRIPTION & APPLICATIONS :

- SS-308 is a titanium oxide low hydrogen electrode, the weld metal contains 19%Cr-9%Ni the austenitic structure.
- It is suitable for Petrol Chemical Industry, Pressure Vessel, Food and Beverage Machinery, and the stainless steels such as AISI 301, 302, 304S, and SUS 304.

NOTE ON USAGE :

- Rebake the electrodes at 250 ~ 300°C for 1 hour and keep it at 100~150°C prior to use.
- With lower current is to properly keep the dilution of the parent metal for welding crack.

WELDING POSITION :

TYPICAL CHEMICAL COMPOSITION OF WELD METAL (wt%) :

C	Mn	Si	P	S	Ni	Cr
0.038	1.15	0.62	0.030	0.005	9.60	19.7

TYPICAL MECHANICAL PROPERTIES OF WELD METAL :

TENSILE STRENGTH $N/mm^2(Kgf/mm^2)$	ELONGATION RATE %
591(60.3)	40

SIZE AND RECOMMENDED CURRENT RANGE : AC or DC(+)

Diameter (mm)		2.6	3.2	4.0	5.0
Length (mm)		300	350	350	350
Current (Amp)	F	50-85	80-120	100-150	140-180
	V & OH	45-80	70-110	90-135	-

SS-308H

AWS A5.4 E308H-16
EN ISO 3581-A E 19 9 H R 1 2
GB T983 E308H-16

COVERED ELECTRODES FOR STAINLESS STEEL

DESCRIPTION & APPLICATIONS :

- SS-308H is a titanium oxide low hydrogen electrode, the weld metal contains 19%Cr-9%Ni the austenitic structure.
- It is suitable for Petrol Chemical Industry, Pressure Vessel, Food and Beverage Machinery, and the stainless steels such as AISI 301, 302, 304S, and SUS 304.

NOTE ON USAGE :

- Rebake the electrodes at 250 ~ 300˚C for 1 hour and keep it at 100~150˚C prior to use.
- With lower current is to properly keep the dilution of the parent metal for welding crack.

WELDING POSITION :

TYPICAL CHEMICAL COMPOSITION OF WELD METAL (wt%) :

C	Mn	Si	P	S	Ni	Cr
0.07	1.60	0.65	0.030	0.004	9.38	20.1

TYPICAL MECHANICAL PROPERTIES OF WELD METAL :

TENSILE STRENGTH $N/mm^2(Kgf/mm^2)$	ELONGATION RATE %
650(66.3)	42

SIZE AND RECOMMENDED CURRENT RANGE : AC or DC(+)

Diameter (mm)		2.6	3.2	4.0	5.0
Length (mm)		300	350	350	350
Current (Amp)	F	50-85	80-120	100-150	140-180
	V & OH	45-80	70-110	90-135	-

SS-308L

AWS A5.4 E308L-16
EN ISO 3581-A E 19 9 L R 1 2
GB T983 E308L-16

COVERED ELECTRODES FOR STAINLESS STEEL

DESCRIPTION & APPLICATIONS :

- SS-308L is a titanium oxide low hydrogen electrode, the weld metal contains 19%Cr-9%Ni the austenitic structure.
- It is suitable for Petrol Chemical Industry, Pressure Vessel, Food and Beverage Machinery, and the stainless steels such as AISI 301, 302, 304S, and SUS 304 or 304L.

NOTE ON USAGE :

- Rebake the electrodes at 250 ~ 300°C for 1 hour and keep it at 100~150°C prior to use.
- With lower current is to properly keep the dilution of the parent metal for welding crack.

WELDING POSITION :

TYPICAL CHEMICAL COMPOSITION OF WELD METAL (wt%) :

C	Mn	Si	P	S	Ni	Cr
0.024	1.15	0.58	0.030	0.005	9.51	19.60

TYPICAL MECHANICAL PROPERTIES OF WELD METAL :

TENSILE STRENGTH $N/mm^2(Kgf/mm^2)$	ELONGATION RATE %
600(61.2)	41

SIZE AND RECOMMENDED CURRENT RANGE : AC or DC(+)

Diameter (mm)		2.6	3.2	4.0	5.0
Length (mm)		300	350	350	350
Current (Amp)	F	50-85	80-120	100-150	140-180
	V & OH	45-80	70-110	90-135	-

SS-308LT

AWS A5.4 E308L-15
EN ISO 3581-A E 19 9 L B 2 2
GB T983 E308L-15

COVERED ELECTRODES FOR STAINLESS STEEL

DESCRIPTION & APPLICATIONS :

- SS-308LT is a titanium oxide low hydrogen electrode, the weld metal contains 19%Cr-9%Ni the austenitic structure.
- It possesses of great Impact property at -196°C.
- It is suitable for Petrol Chemical Industry, Pressure Vessel, Food and Beverage Machinery, and the stainless steels such as AISI 301, 302, 304S, SUS 304L, and lower temp. storage tank.

NOTE ON USAGE :

- Rebake the electrodes at 250 ~ 300°C for 1 hour and keep it at 100~150°C prior to use.
- With lower current is to properly keep the dilution of the parent metal for welding crack.

WELDING POSITION :

TYPICAL CHEMICAL COMPOSITION OF WELD METAL (wt%) :

C	Mn	Si	P	S	Ni	Cr
0.038	1.13	0.60	0.030	0.009	10.01	18.75

TYPICAL MECHANICAL PROPERTIES OF WELD METAL :

TENSILE STRENGTH $N/mm^2(Kgf/mm^2)$	ELONGATION RATE %	IMPACT VALUES -196°C J(Kgf-m)	SIDE EXPANSION (mm)
575(58.6)	41	35(3.6)	0.8

SIZE AND RECOMMENDED CURRENT RANGE : DC(+)

Diameter (mm)		2.6	3.2	4.0	5.0
Length (mm)		300	350	350	350
Current (Amp)	F	50-85	80-120	100-150	140-180
	V & OH	45-80	70-110	90-135	-

SS-309

AWS A5.4 E309-16
EN –
GB T983 E309-16

COVERED ELECTRODES FOR STAINLESS STEEL

DESCRIPTION & APPLICATIONS :

- SS-309 is a titanium oxide low hydrogen electrode, the weld metal contains 22%Cr-12%Ni the austenitic structure.
- It is suitable for dissimilar joints welding in stainless steel and carbon steel; the SUS 304 composite steel overlay bottom welding.

NOTE ON USAGE :

- Rebake the electrodes at 250 ~ 300°C for 1 hour and keep it at 100~150°C prior to use.
- With lower current is to properly keep the dilution of the parent metal for welding crack.

WELDING POSITION :

TYPICAL CHEMICAL COMPOSITION OF WELD METAL (wt%) :

C	Mn	Si	P	S	Ni	Cr
0.04	1.40	0.55	0.030	0.005	13.50	24.20

TYPICAL MECHANICAL PROPERTIES OF WELD METAL :

TENSILE STRENGTH $N/mm^2(Kgf/mm^2)$	ELONGATION RATE %
615(62.8)	37

SIZE AND RECOMMENDED CURRENT RANGE : AC or DC(+)

Diameter (mm)		2.6	3.2	4.0	5.0
Length (mm)		300	350	350	350
Current (Amp)	F	50-85	80-120	100-150	140-180
	V & OH	45-80	70-110	90-135	-

SS-309L

AWS A5.4 E309L-16
EN ISO 3581-A E 23 12 L R 1 2
GB T983 E309L-16

COVERED ELECTRODES FOR STAINLESS STEEL

DESCRIPTION & APPLICATIONS :

- SS-309L is a titanium oxide low hydrogen electrode, the weld metal contains 22%Cr-12%Ni the austenitic structure.
- It is suitable for dissimilar joints welding in stainless steel and carbon steel; the SUS 304 composite steel overlay bottom welding.

NOTE ON USAGE :

- Rebake the electrodes at 250 ~ 300˚C for 1 hour and keep it at 100~150˚C prior to use.
- With lower current is to properly keep the dilution of the parent metal for welding crack.

WELDING POSITION :

TYPICAL CHEMICAL COMPOSITION OF WELD METAL (wt%) :

C	Mn	Si	P	S	Ni	Cr
0.032	1.42	0.48	0.030	0.006	13.44	24.12

TYPICAL MECHANICAL PROPERTIES OF WELD METAL :

TENSILE STRENGTH $N/mm^2(Kgf/mm^2)$	ELONGATION RATE %
608(62.1)	38

SIZE AND RECOMMENDED CURRENT RANGE : AC or DC(+)

Diameter (mm)		2.6	3.2	4.0	5.0
Length (mm)		300	350	350	350
Current (Amp)	F	50-85	80-120	100-150	140-180
	V & OH	45-80	70-110	90-135	-

SS-309MoL

AWS A5.4 E309LMo-16
EN ISO 3581-A E 23 12 2 L R 1 2
GB T983 E309MoL-16

COVERED ELECTRODES FOR STAINLESS STEEL

DESCRIPTION & APPLICATIONS :

- SS-309MoL is a titanium oxide low hydrogen electrode, the weld metal contains 22%Cr-12%Ni.
- Advantage of weldability, corrosion resistance, and heat resistance than SS-309 and SS-309L.
- It is suitable for dissimilar joints welding in stainless steel and carbon steel; the SUS 316 or 316L composite steel overlay bottom welding.

NOTE ON USAGE :

- Rebake the electrodes at 250 ~ 300°C for 1 hour and keep it at 100~150°C prior to use.
- With lower current is to properly keep the dilution of the parent metal for welding crack.

WELDING POSITION :

TYPICAL CHEMICAL COMPOSITION OF WELD METAL (wt%) :

C	Mn	Si	P	S	Ni	Cr	Mo
0.031	0.95	0.81	0.029	0.009	13.20	22.50	2.40

TYPICAL MECHANICAL PROPERTIES OF WELD METAL :

TENSILE STRENGTH $N/mm^2(Kgf/mm^2)$	ELONGATION RATE %
630(64.3)	36

SIZE AND RECOMMENDED CURRENT RANGE : AC or DC(+)

Diameter (mm)		2.6	3.2	4.0	5.0
Length (mm)		300	350	350	350
Current (Amp)	F	50-85	80-120	100-150	140-180
	V & OH	45-80	70-110	90-135	-

SS-309Nb

AWS A5.4 E309Nb-16
EN –
GB T983 E309Nb-16

COVERED ELECTRODES FOR STAINLESS STEEL

DESCRIPTION & APPLICATIONS :

- SS-309Nb is a titanium oxide low hydrogen electrode, the weld metal contains 23%Cr-13%Ni-Nb the austenitic structure.
- It is suitable for Petrol Chemical Industry, Thermal Power Plant, and the SUS 304 or 347 composite steel overlay bottom welding.

NOTE ON USAGE :

- Rebake the electrodes at 250 ~ 300˚C for 1 hour and keep it at 100~150˚C prior to use.
- With lower current is to properly keep the dilution of the parent metal for welding crack.

WELDING POSITION :

TYPICAL CHEMICAL COMPOSITION OF WELD METAL (wt%) :

C	Mn	Si	P	S	Ni	Cr	Nb
0.050	1.65	0.30	0.031	0.005	12.90	23.50	0.87

TYPICAL MECHANICAL PROPERTIES OF WELD METAL :

TENSILE STRENGTH $N/mm^2(Kgf/mm^2)$	ELONGATION RATE %
700(71.4)	32.0

SIZE AND RECOMMENDED CURRENT RANGE : AC or DC(+)

Diameter (mm)		2.6	3.2	4.0	5.0
Length (mm)		300	350	350	350
Current (Amp)	F	50-85	80-120	100-150	140-180
	V & OH	45-80	70-110	90-135	-

SS-310

AWS A5.4 E310-16
EN ISO 3581-A E 25 20 R 1 2
GB T983 E310-16

COVERED ELECTRODES FOR STAINLESS STEEL

DESCRIPTION & APPLICATIONS :

- SS-310 is a titanium oxide low hydrogen electrode, the weld metal contains 25%Cr-20%Ni the austenitic structure.
- It is suitable for high temp. furnace, the AISI 310, and SUS 310S welding.

NOTE ON USAGE :

- Rebake the electrodes at 250 ~ 300°C for 1 hour and keep it at 100~150°C prior to use.
- With lower current is to properly keep the dilution of the parent metal for welding crack.

WELDING POSITION :

TYPICAL CHEMICAL COMPOSITION OF WELD METAL (wt%) :

C	Mn	Si	P	S	Ni	Cr
0.11	1.75	0.28	0.028	0.001	21.23	26.50

TYPICAL MECHANICAL PROPERTIES OF WELD METAL :

TENSILE STRENGTH $N/mm^2(Kgf/mm^2)$	ELONGATION RATE %
594(60.6)	36

SIZE AND RECOMMENDED CURRENT RANGE : AC or DC(+)

Diameter (mm)		2.6	3.2	4.0	5.0
Length (mm)		300	350	350	350
Current (Amp)	F	50-85	80-120	100-150	140-180
	V & OH	45-80	70-110	90-135	-

SS-312

AWS A5.4 E312-16
EN ISO 3581-A E 29 9 R 1 2
GB T983 E312-16

COVERED ELECTRODES FOR STAINLESS STEEL

DESCRIPTION & APPLICATIONS :

- SS-312 is a titanium oxide low hydrogen electrode, the weld metal contains 29%Cr-9%Ni.
- It is suitable for dissimilar joints welding in stainless steel and carbon steel, welding difficulty, blowhole possibility, and toughness alloy.

NOTE ON USAGE :

- Rebake the electrodes at 250 ~ 300˚C for 1 hour and keep it at 100~150˚C prior to use.
- With lower current is to properly keep the dilution of the parent metal for welding crack.

WELDING POSITION :

TYPICAL CHEMICAL COMPOSITION OF WELD METAL (wt%) :

C	Mn	Si	P	S	Ni	Cr
0.11	0.90	0.82	0.030	0.005	10.40	28.50

TYPICAL MECHANICAL PROPERTIES OF WELD METAL :

TENSILE STRENGTH $N/mm^2(Kgf/mm^2)$	ELONGATION RATE %
813(83)	24

SIZE AND RECOMMENDED CURRENT RANGE : AC or DC(+)

Diameter (mm)		2.6	3.2	4.0	5.0
Length (mm)		300	350	350	350
Current (Amp)	F	50-85	80-120	100-150	140-180
	V & OH	45-80	70-110	90-135	-

SS-316

AWS A5.4 E316-16
EN ISO 3581-A E 19 12 2 R 1 2
GB T983 E316-16

COVERED ELECTRODES FOR STAINLESS STEEL

DESCRIPTION & APPLICATIONS :

- SS-316 is a titanium oxide low hydrogen electrode, the weld metal contains 18%Cr-12%Ni-2%Mo the austenitic structure.
- It is suitable for Chemical Container as AISI 316/316L, SUS 316/316L steels.

NOTE ON USAGE :

- Rebake the electrodes at 250 ~ 300°C for 1 hour and keep it at 100~150°C prior to use.
- With lower current is to properly keep the dilution of the parent metal for welding crack.

WELDING POSITION :

TYPICAL CHEMICAL COMPOSITION OF WELD METAL (wt%) :

C	Mn	Si	P	S	Ni	Cr	Mo
0.040	1.26	0.60	0.030	0.005	12.10	18.70	2.30

TYPICAL MECHANICAL PROPERTIES OF WELD METAL :

TENSILE STRENGTH $N/mm^2(Kgf/mm^2)$	ELONGATION RATE %
580(59.2)	40

SIZE AND RECOMMENDED CURRENT RANGE : AC or DC(+)

Diameter (mm)		2.6	3.2	4.0	5.0
Length (mm)		300	350	350	350
Current (Amp)	F	50-85	80-120	100-150	140-180
	V & OH	45-80	70-110	90-135	-

SS-316L

AWS A5.4 E316L-16
EN ISO 3581-A E 19 12 3 L R 1 2
GB T983 E316L-16

COVERED ELECTRODES FOR STAINLESS STEEL

DESCRIPTION & APPLICATIONS :

- SS-316L is a titanium oxide low hydrogen electrode, the weld metal contains 18%Cr-12%Ni-2%Mo the austenitic structure.
- It is suitable for Chemical Container as AISI 316/316L, SUS 316/316L steels.

NOTE ON USAGE :

- Rebake the electrodes at 250 ~ 300˚C for 1 hour and keep it at 100~150˚C prior to use.
- With lower current is to properly keep the dilution of the parent metal for welding crack.

WELDING POSITION :

TYPICAL CHEMICAL COMPOSITION OF WELD METAL (wt%) :

C	Mn	Si	P	S	Ni	Cr	Mo
0.020	1.15	0.54	0.031	0.004	12.10	18.20	2.29

TYPICAL MECHANICAL PROPERTIES OF WELD METAL :

TENSILE STRENGTH $N/mm^2(Kgf/mm^2)$	ELONGATION RATE %
570(58.2)	42

SIZE AND RECOMMENDED CURRENT RANGE : AC or DC(+)

Diameter (mm)		2.6	3.2	4.0	5.0
Length (mm)		300	350	350	350
Current (Amp)	F	50-85	80-120	100-150	140-180
	V & OH	45-80	70-110	90-135	-

SS-316LT

AWS A5.4 E316L-15
EN ISO 3581-A E 19 12 3 L B 2 2
GB T983 E316L-15

COVERED ELECTRODES FOR STAINLESS STEEL

DESCRIPTION & APPLICATIONS :

- SS-316LT is a titanium oxide low hydrogen electrode, the weld metal contains 18%Cr-13%Ni-2%Mo the austenitic structure.
- It possesses a good impact capability at -196°C.
- It is suitable for Chemical Container as AISI 316/316L, SUS 316/316L steels, and lower temp. container.

NOTE ON USAGE :

- Rebake the electrodes at 250 ~ 300°C for 1 hour and keep it at 100~150°C prior to use.
- With lower current is to properly keep the dilution of the parent metal for welding crack.

WELDING POSITION :

TYPICAL CHEMICAL COMPOSITION OF WELD METAL (wt%) :

C	Mn	Si	P	S	Ni	Cr	Mo
0.035	1.10	0.67	0.030	0.011	12.05	18.1	2.34

TYPICAL MECHANICAL PROPERTIES OF WELD METAL :

TENSILE STRENGTH N/mm^2(Kgf/mm^2)	ELONGATION RATE %	IMPACT VALUES -196°C J(Kgf-m)	SIDE EXPANSION (mm)
571(58.2)	40	31(3.2)	0.8

SIZE AND RECOMMENDED CURRENT RANGE : DC(+)

Diameter (mm)		2.6	3.2	4.0	5.0
Length (mm)		300	350	350	350
Current (Amp)	F	50-85	80-120	100-150	140-180
	V & OH	45-80	70-110	90-135	-

SS-317L

AWS A5.4 E317L-16
EN –
GB T983 E317L-16

COVERED ELECTRODES FOR STAINLESS STEEL

DESCRIPTION & APPLICATIONS :

- SS-317L is a titanium oxide low hydrogen electrode, the weld metal contains 19%Cr-12%Ni-3%Mo the austenitic structure.
- To organic acid, sulfuric acid (H2SO4), and sulphurous acid (H2SO3) advantage of anti-corrosion, stable arc, well weldbead, and slag removal.
- It is suitable for Chemical Container as AISI 316/316L, 317/317L, and SUS 317L steels.

NOTE ON USAGE :

- Rebake the electrodes at 250 ~ 300˚C for 1 hour and keep it at 100~150˚C prior to use.
- With lower current is to properly keep the dilution of the parent metal for welding crack.

WELDING POSITION :

TYPICAL CHEMICAL COMPOSITION OF WELD METAL (wt%) :

C	Mn	Si	P	S	Ni	Cr	Mo
0.02	0.90	0.60	0.030	0.003	12.90	19.00	3.52

TYPICAL MECHANICAL PROPERTIES OF WELD METAL :

TENSILE STRENGTH $N/mm^2(Kgf/mm^2)$	ELONGATION RATE %
597(60.9)	39

SIZE AND RECOMMENDED CURRENT RANGE : AC or DC(+)

Diameter (mm)		2.6	3.2	4.0	5.0
Length (mm)		300	350	350	350
Current (Amp)	F	50-85	80-120	100-150	140-180
	V & OH	45-80	70-110	90-135	-

SS-318

AWS A5.4 E318-16
EN ISO 3581-A E 19 12 3 Nb R 1 2
GB T983 E318-16

COVERED ELECTRODES FOR STAINLESS STEEL

DESCRIPTION & APPLICATIONS :

- SS-318 is a titanium oxide low hydrogen electrode, the weld metal contains 8%Cr-12%Ni-2%Mo-Ti(Nb).
- Contains Mo, features non-oxidative acid of dilute sulfuric acid advantageous to anti-corrosion, besides, within an addition of Nb is advantage of intergranular corrosion and heat resistance.
- It is suitable for Chemical Container as AISI 316Ti, and SUS 316Ti steels.

NOTE ON USAGE :

- Rebake the electrodes at 250 ~ 300°C for 1 hour and keep it at 100~150°C prior to use.
- With lower current is to properly keep the dilution of the parent metal for welding crack.

WELDING POSITION :

TYPICAL CHEMICAL COMPOSITION OF WELD METAL (wt%) :

C	Mn	Si	P	S	Ni	Cr	Mo	Nb
0.025	0.80	0.75	0.030	0.006	11.70	19.70	2.53	0.38

TYPICAL MECHANICAL PROPERTIES OF WELD METAL :

TENSILE STRENGTH $N/mm^2(Kgf/mm^2)$	ELONGATION RATE %
589(60.1)	39

SIZE AND RECOMMENDED CURRENT RANGE : AC or DC(+)

Diameter (mm)		2.6	3.2	4.0	5.0
Length (mm)		300	350	350	350
Current (Amp)	F	50-85	80-120	100-150	140-180
	V & OH	45-80	70-110	90-135	-

SS-347

AWS A5.4 E347-16
EN ISO 3581-A E 19 9 Nb R 1 2
GB T983 E347-16

COVERED ELECTRODES FOR STAINLESS STEEL

DESCRIPTION & APPLICATIONS :

- SS-347 is a titanium oxide low hydrogen electrode, the weld metal contains 19%Cr-9%Ni-Ti(Nb).
- Within an addition of Nb is advantage of intergranular corrosion and well creep strength at high temp.
- It is suitable for AISI 347, 321, 304L, and SUS 347, 321, 304L steels.

NOTE ON USAGE :

- Rebake the electrodes at 250 ~ 300˚C for 1 hour and keep it at 100~150˚C prior to use.
- With lower current is to properly keep the dilution of the parent metal for welding crack.

WELDING POSITION :

TYPICAL CHEMICAL COMPOSITION OF WELD METAL (wt%) :

C	Mn	Si	P	S	Ni	Cr	Nb
0.035	1.50	0.60	0.030	0.004	9.60	19.80	0.52

TYPICAL MECHANICAL PROPERTIES OF WELD METAL :

TENSILE STRENGTH $N/mm^2(Kgf/mm^2)$	ELONGATION RATE %
643(65.6)	37

SIZE AND RECOMMENDED CURRENT RANGE : AC or DC(+)

Diameter (mm)		2.6	3.2	4.0	5.0
Length (mm)		300	350	350	350
Current (Amp)	F	50-85	80-120	100-150	140-180
	V & OH	45-80	70-110	90-135	-

SS-385

AWS A5.4 E385-16
EN ISO 3581-A E 20 25 5 Cu N L R 1 2
GB T983 E385-16

COVERED ELECTRODES FOR STAINLESS STEEL

DESCRIPTION & APPLICATIONS :

- SS-385 is an austenitic structure and the weld metal contains 20%Cr-25%Ni-4.7%Mo-1.5%Cu.
- It possesses the advantage of high corrosion capability against sulfuric acid, and phosphoric acid.
- It is suitable for the use of the steels loading with sulfuric acid and chloride media as ASTM B625 and B673.

NOTE ON USAGE :

- Rebake the electrodes at 250 ~ 300°C for 1 hour and keep it at 100~150°C prior to use.
- With lower current is to properly keep the dilution of the parent metal for welding crack.

WELDING POSITION :

TYPICAL CHEMICAL COMPOSITION OF WELD METAL (wt%) :

C	Mn	Si	P	S	Ni	Cr	Mo	Cu
0.030	1.62	0.49	0.025	0.002	24.80	20.70	4.35	1.35

TYPICAL MECHANICAL PROPERTIES OF WELD METAL :

TENSILE STRENGTH $N/mm^2(Kgf/mm^2)$	ELONGATION RATE %
600(61.2)	40

SIZE AND RECOMMENDED CURRENT RANGE : AC or DC(+)

Diameter (mm)		2.6	3.2	4.0	5.0
Length (mm)		300	350	350	350
Current (Amp)	F	50-85	80-120	100-150	140-180
	V & OH	45-80	70-110	90-135	–

SS-410

AWS A5.4 E410-16
EN ISO 3581-A E 13 R 1 2
GB T983 E410-16

COVERED ELECTRODES FOR STAINLESS STEEL

DESCRIPTION & APPLICATIONS :

- SS-410 is a titanium oxide low hydrogen electrode, the weld metal contains 13%Cr the martensitic structure.
- The hardness, weldbead, or HAZ (Heat Affected Zone) tend to easily crack, the advantage of oxidation and corrosion resistances at high temp.
- It is suitable for SUS 403, 410, 410S, and SUS 420J1, 420J2 steels.

NOTE ON USAGE :

- Rebake the electrodes at 250 ~ 300˚C for 1 hour and keep it at 100~150˚C prior to use.
- With lower current is to properly keep the dilution of the parent metal for welding crack.
- Preheat at 200 ~ 400˚C before welding, and the PWHT at 700 ~ 760˚C afterwards.

WELDING POSITION :

TYPICAL CHEMICAL COMPOSITION OF WELD METAL (wt%) :

C	Mn	Si	P	S	Ni	Cr
0.02	0.30	0.62	0.028	0.008	0.15	13.40

TYPICAL MECHANICAL PROPERTIES OF WELD METAL :

TENSILE STRENGTH $N/mm^2(Kgf/mm^2)$	ELONGATION RATE %	HEAT TREATMENT
540(55.1)	22	730˚Cx1hr

SIZE AND RECOMMENDED CURRENT RANGE : AC or DC(+)

Diameter (mm)		2.6	3.2	4.0	5.0
Length (mm)		300	350	350	350
Current (Amp)	F	60-85	80-120	100-150	140-170
	V & OH	60-80	65-105	95-140	-

SS-410NM

AWS A5.4 E410NiMo-16
EN ISO 3581-A E 13 4 R 1 2
GB T983 E410NiMo-16

COVERED ELECTRODES FOR STAINLESS STEEL

DESCRIPTION & APPLICATIONS :

- SS-410NM is a titanium oxide low hydrogen electrode, the weld metal contains 12%Cr-5%Ni-0.5%Mo the martensitic structure.
- Advantage of arc stability, less spatters, slag removal, anti-cracking, and toughness.
- It is suitable for ASTM CA6NM series the martensitic stainless steel in all welding positions.

NOTE ON USAGE :

- Rebake the electrodes at 250 ~ 300°C for 1 hour and keep it at 100~150°C prior to use.
- With lower current is to properly keep the dilution of the parent metal for welding crack.
- Preheat at 100 ~ 150°C before welding, and the PWHT at 600 ~ 620°C afterwards.

WELDING POSITION :

TYPICAL CHEMICAL COMPOSITION OF WELD METAL (wt%) :

C	Mn	Si	P	S	Ni	Cr	Mo
0.03	0.25	0.32	0.028	0.009	4.58	11.46	0.53

TYPICAL MECHANICAL PROPERTIES OF WELD METAL :

YIELD POINT $N/mm^2(Kgf/mm^2)$	TENSILE STRENGTH $N/mm^2(Kgf/mm^2)$	ELONGATION RATE %	HEAT TREATMENT
940(95.9)	988(100.8)	19	620°Cx1hr

SIZE AND RECOMMENDED CURRENT RANGE : AC or DC(+)

Diameter (mm)		2.6	3.2	4.0	5.0
Length (mm)		300	350	350	350
Current (Amp)	F	60-85	80-120	100-150	140-170
	V & OH	60-80	65-105	95-140	-

SS-430

AWS A5.4 E430-16
EN ISO 3581-A E 17 R 1 2
GB T983 E430-16

COVERED ELECTRODES FOR STAINLESS STEEL

DESCRIPTION & APPLICATIONS :

- SS-430 is a titanium oxide low hydrogen electrode, the weld metal contains 17%Cr the ferritic structure.
- Advantage of corrosion resistance, better heat conductivity to the austenitic structure, and the smaller CTE (Coefficient of thermal expansion).
- It is suitable for SUS 430 and the parts of heavy oil burner.

NOTE ON USAGE :

- Rebake the electrodes at 250 ~ 300˚C for 1 hour and keep it at 100~150˚C prior to use.
- With lower current is to properly keep the dilution of the parent metal for welding crack.
- Preheat at 200 ~ 400˚C before welding, and the PWHT at 760 ~ 790˚C for 2 hours and finally, to naturally cool down to 595˚C.

WELDING POSITION :

TYPICAL CHEMICAL COMPOSITION OF WELD METAL (wt%) :

C	Mn	Si	P	S	Ni	Cr
0.040	0.826	0.64	0.030	0.005	0.20	17.20

TYPICAL MECHANICAL PROPERTIES OF WELD METAL :

TENSILE STRENGTH $N/mm^2(Kgf/mm^2)$	ELONGATION RATE %	HEAT TREATMENT
540(55.1)	22	780˚Cx2hr

SIZE AND RECOMMENDED CURRENT RANGE : AC or DC(+)

Diameter (mm)		2.6	3.2	4.0	5.0
Length (mm)		300	350	350	350
Current (Amp)	F	60-85	80-120	100-150	140-170
	V & OH	60-80	65-105	95-140	-

SS-2209

AWS A5.4 E2209-16
EN ISO 3581-A E 22 9 3 N L R 1 2
GB T983 E2209-16

COVERED ELECTRODES FOR STAINLESS STEEL

DESCRIPTION & APPLICATIONS :

- SS-2209 is a titanium oxide low hydrogen electrode, the weld metal contains 22%Cr-9%Ni-3%Mo-N the duplex stainless steel comprised of austenite and ferrite steels.
- It is suitable for UNS S31803 (as Alloy 2205).

NOTE ON USAGE :

- Rebake the electrodes at 250 ~ 300°C for 1 hour and keep it at 100~150°C prior to use.
- With lower current is to properly keep the dilution of the parent metal for welding crack.

WELDING POSITION :

TYPICAL CHEMICAL COMPOSITION OF WELD METAL (wt%) :

C	Mn	Si	P	S	Ni	Cr	Mo	N
0.03	0.89	0.70	0.029	0.013	8.83	23.20	3.05	0.13

TYPICAL MECHANICAL PROPERTIES OF WELD METAL :

TENSILE STRENGTH $N/mm^2(Kgf/mm^2)$	ELONGATION RATE %
810(82.7)	25

SIZE AND RECOMMENDED CURRENT RANGE : AC or DC(+)

Diameter (mm)		2.6	3.2	4.0	5.0
Length (mm)		300	350	350	350
Current (Amp)	F	60-85	80-120	100-150	140-170
	V & OH	60-80	65-105	95-140	-

SS-2594

AWS A5.4 E2594-16
EN ISO 3581-A E 25 9 4 N L R 1 2
GB T983 E2594-16

COVERED ELECTRODES FOR STAINLESS STEEL

DESCRIPTION & APPLICATIONS :

- SS-2594 is a titanium oxide low hydrogen electrode, the weld metal contains 25%Cr-9%Ni-3.5%Mo-N the duplex stainless steel comprised of austenite and ferrite steels.
- It is suitable for AC (Alternating Current), the advantage of strength and toughness, and better corrosion resistance than SS-2209.
- PREN (Pitting Resistance Equivalent Number) >41.
- Apply for offshore platform, pressure container, chemical equipment and pipelines, seawater desalination industry, pharmaceutical industry, petrochemical industry, natural gas as pumps, pressure containers, valves, heat exchangers, and the chlorine gas equipment.
- It is suitable for UNS S32750 (as Alloy 2507), UNS J93404, A890 GR. 5A.

NOTE ON USAGE :

- Rebake the electrodes at 250 ~ 300˚C for 1 hour and keep it at 100~150˚C prior to use.
- With lower current is to properly keep the dilution of the parent metal for welding crack.

WELDING POSITION :

TYPICAL CHEMICAL COMPOSITION OF WELD METAL (wt%) :

C	Mn	Si	P	S	Ni	Cr	Mo	N
0.023	0.63	0.83	0.024	0.004	9.10	25.50	3.80	0.26

TYPICAL MECHANICAL PROPERTIES OF WELD METAL :

TENSILE STRENGTH $N/mm^2(Kgf/mm^2)$	ELONGATION RATE %
950(96.9)	26

SIZE AND RECOMMENDED CURRENT RANGE : AC or DC(+)

Diameter (mm)		2.6	3.2	4.0	5.0
Length (mm)		300	350	350	350
Current (Amp)	F	60-85	80-120	100-150	140-170
	V & OH	60-80	65-105	95-140	-

SS-2595

AWS A5.4 E2595-16
EN ISO 3581-A E 25 9 4 W N L R 1 2
GB T983 E2595-16

COVERED ELECTRODES FOR STAINLESS STEEL

DESCRIPTION & APPLICATIONS :

- SS-2595 is a titanium oxide low hydrogen electrode, the weld metal contains 25%Cr-8.5%Ni-4%Mo-N the duplex stainless steel comprised of austenite and ferrite steels.
- It is suitable for AC (Alternating Current), the component of micro-copper and wolfram for better corrosion resistance, strength, and toughness.
- The advantage of strength and toughness, and better corrosion resistance than SS-2209.
- PREN (Pitting Resistance Equivalent Number) >41.5 .
- Apply for offshore platform, pressure container, chemical equipment and pipelines, seawater desalination industry, pharmaceutical industry, petrochemical industry, natural gas as pumps, pressure containers, valves, heat exchangers, and the chlorine gas equipment.
- It is suitable for UNS S32750 (as Alloy 2507), UNS J93404, A890 GR. 5A.

NOTE ON USAGE :

- Rebake the electrodes at 250 ~ 300°C for 1 hour and keep it at 100~150°C prior to use.
- With lower current is to properly keep the dilution of the parent metal for welding crack.

WELDING POSITION :

TYPICAL CHEMICAL COMPOSITION OF WELD METAL (wt%) :

C	Mn	Si	P	S	Ni	Cr	Mo	N	Cu	W
0.032	0.82	0.69	0.030	0.009	8.3	25.5	4.1	0.24	0.6	0.75

TYPICAL MECHANICAL PROPERTIES OF WELD METAL :

TENSILE STRENGTH $N/mm^2(Kgf/mm^2)$	ELONGATION RATE %
920(93.9)	20

SIZE AND RECOMMENDED CURRENT RANGE : AC or DC(+)

Diameter (mm)		2.6	3.2	4.0	5.0
Length (mm)		300	350	350	350
Current (Amp)	F	60-85	80-120	100-150	140-170
	V & OH	60-80	65-105	95-140	-

Stainless Steel Welding Consumables Introduction-Flux-cored Wire

SELECTION RECOMMENDATION

Specification of stainless steel flux-cored wire arc welding according to AWS: It is based on welding wire types, composition, welding positions, and gas shield types. The information of the tensile strength is not shown on specification. The welding wire meets the specification of side expansion ≧ 0.38mm at -196°C when required; the letter "J" in the latter specification plus. The following relevant classification and application:

Classification	Welding Method	Gas Shield	Current	Welding Position	Feautres & Applications
EXXXTX-1	FCAW	100%CO_2	DC(+)	EXXXT0-X : For Flat & Horizonta position EXXXT1-X : All position	CO_2 as gas shield for general welding materials.
EXXXTX-3	FCAW	--	DC(+)		Self shielded materials are generally designed to T0 grade.
EXXXTX-4	FCAW	75~80%Ar + 20~25%CO_2	DC(+)		Mixed gas shield possesses better welding control and weld balanced.
EXXXTX-G	FCAW	None	None		Special purpose design
RXXXT1-G	GTAW	None	None	All	Special purpose design
RXXXT1-5	GTAW	100%Ar	DC(-)	All	TIG flux-cored wire for pipeline bottom-welding, not recommended for surface welding due to blowhole and slag risks.
ECXXX	FCAW	98%Ar + 2%02	DC(+)	None	Metal-cored wire possesses better deposition rate and lower depth penetration than solid wire.
ECXXX	GTAW	100%Ar	DC(-)	All	TIG metal-cored wire with no slag.

WELDING OPERATION

◆ (1)Storage Management:

Related to the storage management refers to the instruction of carbon steel flux-cored wire.

◆ (2)Welding Precaution:

①The recommended length of the wire extension is in the range of 15~20 mm, the shorter may cause the high melting point substance undissolved up in the flux that generates wormholes matter on the surface of the weld.

②Use mixed gas shield is better operation control and weldmetal composition balanced than CO_2 when it reaches the critical condition the arc spray formation. Besides, the matchup of voltage and current, the length of wire extension no less than 15mm is to avoid wormholes on the surface of the weld.

③In addition to the guidelines of TIG rod welding when the bottom welding with the TIG flux-cored rod for full penetration welding, the matter of the slag on the top of the molten iron involved into the weldpool should be a subject in consideration.

④The tension of the stainless steel wire is larger than the carbon steel wire, and therefore, the conduit of the welding gun should not be over-bending while wire feeding. The inner conduit may not be shared with carbon steel wire in order to avoid contamination of the powder from the wire surface or drawing oil.

⑤It requires a low heat input and the welding swing width≤25mm when use flux-cored wire for the bottom-welding, in order to avoid excessive dilution rate resulting in the lower alloy content of the weld, the weld overlapping width between the welds recommended at 1/2 weld width from each.

⑥The rest, refer to the precautions of stainless steel covered electrode.

SFC-307

AWS A5.22 E307T1-1/-4
EN ISO 17633-AT18 9 Mn Mo P C1/M21 2
GB –

FLUX CORED WIRES FOR STAINLESS STEEL

DESCRIPTION & APPLICATIONS :

- SFC-307 is a full austenitic structure, the weld metal contains 19%Cr-9%Ni-4%Mn.
- It is suitable for clad stainless steel, high tensile steel, steels difficult to weld, nuclear submarine, and armor plate at a non-magnetic site.

NOTE ON USAGE :

- Use CO_2 within gas purity of 99.8% upward for gas shield, and the flow with 20~25 l/min.

WELDING POSITION :

TYPICAL CHEMICAL COMPOSITION OF WELD METAL (wt%) : (CO_2)

C	Mn	Si	P	S	Ni	Cr	Mo
0.045	4.50	0.60	0.023	0.004	9.20	19.50	0.8

TYPICAL MECHANICAL PROPERTIES OF WELD METAL: (CO_2)

TENSILE STRENGTH $N/mm^2(Kgf/mm^2)$	ELONGATION RATE %
610(62.2)	37

SIZE AND RECOMMENDED CURRENT RANGE : DC(+)

Parameters \ Diameter (mm)	1.2		1.6	
	F , H	V , OH	F , H	V , OH
Voltage (Volt)	23-36	22-26	28-36	–
Current (Amp)	130-250	120-160	180-300	–

SFC-308B

AWS A5.22 E308T1-1
EN –
GB T17853 E308T1-1

FLUX CORED WIRES FOR STAINLESS STEEL

DESCRIPTION & APPLICATIONS :

- Contains less Bi element is to avoid the weldbead embrittling in its structure from the high temp. environment for a lower incidence of thermal cracking.
- It is suitable for Petrol Chemical Industry, Pressure Vessel, Food and Beverage Machinery, Medical Machinery, Textile Machinery, and the stainless steels such as SUS 304 and 304L.
- It is suitable for the workpieces required high temp. heat treatment as solution heat treatment.

NOTE ON USAGE :

- Use CO_2 within gas purity of 99.8% upward for gas shield, and the flow with 20~25 l/min.
- Clean up the base metal from contamination
- Use DC (+) polarity.
- Use proper protection for getting good toughness and avoid blow hole, lower the hydrogen and nitrogen content in the deposit metal.

WELDING POSITION :

TYPICAL CHEMICAL COMPOSITION OF WELD METAL (wt%) : (CO_2)

C	Mn	Si	P	S	Ni	Cr	Bi
0.05	1.17	0.51	0.023	0.001	10.18	19.45	≤10ppm

TYPICAL MECHANICAL PROPERTIES OF WELD METAL: (CO_2)

TENSILE STRENGTH $N/mm^2(Kgf/mm^2)$	ELONGATION RATE %
601(61.3)	44

SIZE AND RECOMMENDED CURRENT RANGE : DC(+)

Parameters \ Diameter (mm)	1.2	1.6
Voltage (Volt)	20-36	24-38
Current (Amp)	120-260	200-300
Stickout (m/m)	15-25	18-25
Flow Rate (l/min)	15-25	15-25

SFC-308H

AWS A5.22 E308HT1-1/-4
EN ISO 17633-A T 19 9 P C1/M21 2
GB T17853 E308HT1-1

FLUX CORED WIRES FOR STAINLESS STEEL

DESCRIPTION & APPLICATIONS :

- SFC-308H is an austenitic structure, the weld metal contains 19%Cr-9%Ni.
- Advantage of anti-tension strength and creep strength in the high temp. environment.
- It is suitable for Petrol Chemical Industry, Pressure Vessel, Food and Beverage Machinery, and the stainless steels such as AISI 301, 302, 304S, 304H, and SUS 304.

NOTE ON USAGE :

- Use CO_2 within gas purity of 99.8% upward for gas shield, and the flow with 20~25 l/min.

WELDING POSITION :

TYPICAL CHEMICAL COMPOSITION OF WELD METAL (wt%) : (CO_2)

C	Mn	Si	P	S	Ni	Cr
0.049	1.55	0.53	0.026	0.002	9.80	20.20

TYPICAL MECHANICAL PROPERTIES OF WELD METAL: (CO_2)

TENSILE STRENGTH $N/mm^2(Kgf/mm^2)$	ELONGATION RATE %
573(58.5)	40

SIZE AND RECOMMENDED CURRENT RANGE : DC(+)

Parameters \ Diameter (mm)	1.2		1.6	
	F , H	V , OH	F , H	V , OH
Voltage (Volt)	23-36	22-26	28-36	–
Current (Amp)	130-250	120-160	180-300	–

SFC-308L

AWS A5.22 E308LT1-1/-4
EN ISO 17633-A T 19 9 L P C1/M21 2
GB T17853 E308LT1-1

FLUX CORED WIRES FOR STAINLESS STEEL

DESCRIPTION & APPLICATIONS :

- SFC-308L is an austenitic structure, the weld metal contains 19%Cr-9%Ni.
- It is suitable for Petrol Chemical Industry, Pressure Vessel, Food and Beverage Machinery, and the stainless steels such as AISI 301, 302, 304S, and SUS 304, 304L.

NOTE ON USAGE :

- Use CO_2 within gas purity of 99.8% upward for gas shield, and the flow with 20~25 l/min.

WELDING POSITION :

TYPICAL CHEMICAL COMPOSITION OF WELD METAL (wt%) : (CO_2)

C	Mn	Si	P	S	Ni	Cr
0.031	1.10	0.70	0.024	0.007	9.83	19.72

TYPICAL MECHANICAL PROPERTIES OF WELD METAL: (CO_2)

TENSILE STRENGTH $N/mm^2(Kgf/mm^2)$	ELONGATION RATE %	IMPACT VALUES -196°C J(Kgf-m)	SIDE EXPANSION (mm)
562(57.3)	42	32(3.3)	1.02

SIZE AND RECOMMENDED CURRENT RANGE : DC(+)

Parameters \ Diameter (mm)	1.2		1.6	
	F , H	V , OH	F , H	V , OH
Voltage (Volt)	23-36	22-26	28-36	–
Current (Amp)	130-250	120-160	180-300	–

SFC-308LB

AWS A5.22 E308LT1-1
EN ISO 17633-A T 19 9 L P C1 2
GB T17853 E308LT1-1

FLUX CORED WIRES FOR STAINLESS STEEL

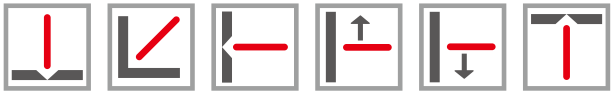
DESCRIPTION & APPLICATIONS :

- Contains less Bi element is to avoid the weldbead embrittling in its structure from the high temp. environment for a lower incidence of thermal cracking.
- The weld metal of the weldbead is designed for lower carbon to increase the capability of intergranular corrosion.
- It is suitable for Petrol Chemical Industry, Pressure Vessel, Food and Beverage Machinery, Medical Machinery, Textile Machinery, and the stainless steels such as SUS 304 and 304L
- It is suitable for the workpieces required high temp. heat treatment as solution heat treatment.

NOTE ON USAGE :

- Use CO_2 within gas purity of 99.8% upward for gas shield, and the flow with 20~25 l/min.
- Clean up the base metal from contamination
- Use DC (+) polarity.
- Use proper protection for getting good toughness and avoid blow hole, lower the hydrogen and nitrogen content in the deposit metal.

WELDING POSITION :



TYPICAL CHEMICAL COMPOSITION OF WELD METAL (wt%) : (CO_2)

C	Mn	Si	P	S	Ni	Cr	Bi
0.024	1.13	0.43	0.024	<0.000	10.23	19.39	≤10ppm

TYPICAL MECHANICAL PROPERTIES OF WELD METAL: (CO_2)

TENSILE STRENGTH $N/mm^2(Kgf/mm^2)$	ELONGATION RATE %
590(60.2)	43

SIZE AND RECOMMENDED CURRENT RANGE : DC(+)

Parameters \ Diameter (mm)	1.2	1.6
Voltage (Volt)	20-36	24-38
Current (Amp)	120-260	200-300
Stickout (m/m)	15-25	18-25
Flow Rate (l/min)	15-25	15-25

SFC-309L

AWS A5.22 E309LT1-1/-4
EN ISO 17633-A T 23 12 L P C1/M21 2
GB T17853 E309LT1-1

FLUX CORED WIRES FOR STAINLESS STEEL

DESCRIPTION & APPLICATIONS :

- SFC-309L is an austenitic structure, the weld metal contains 22%Cr-12%Ni the austenitic structure.
- Contains more ferritic structure for anti-cracking, weldability, corrosion and heat resistances.
- It is suitable for dissimilar joints welding in stainless steel and carbon steel; the SUS 304 composite steel overlay bottom welding.

NOTE ON USAGE :

- Use CO_2 within gas purity of 99.8% upward for gas shield, and the flow with 20~25 l/min.

WELDING POSITION :

TYPICAL CHEMICAL COMPOSITION OF WELD METAL (wt%) : (CO_2)

C	Mn	Si	P	S	Ni	Cr
0.031	1.30	0.65	0.022	0.004	12.80	23.20

TYPICAL MECHANICAL PROPERTIES OF WELD METAL: (CO_2)

TENSILE STRENGTH $N/mm^2(Kgf/mm^2)$	ELONGATION RATE %	IMPACT VALUES -40°C J(Kgf-m)
550(56.1)	38	40(4.1)

SIZE AND RECOMMENDED CURRENT RANGE : DC(+)

Parameters \ Diameter (mm)	1.2		1.6	
	F , H	V , OH	F , H	V , OH
Voltage (Volt)	23-36	22-26	28-36	--
Current (Amp)	130-250	120-160	180-300	--

SFC-309LB

AWS A5.22 E309LT1-1
EN ISO 17633-A T 23 12 L P C1 2
GB T17853 E309LT1-1

FLUX CORED WIRES FOR STAINLESS STEEL

DESCRIPTION & APPLICATIONS :

- Contains more ferritic structure for anti-cracking.
- Contains less Bi element is to avoid the weldbead embrittling in its structure from the high temp. environment for a lower incidence of thermal cracking.
- The weld metal of the weldbead is designed for lower carbon to increase the capability of intergranular corrosion.
- It is suitable for dissimilar joints welding in stainless steel and carbon steel; the stainless steel overlay bottom welding, and the bottom welding on the carbon steel or low alloy steel prior to 308(L) series welding.

NOTE ON USAGE :

- Use CO_2 within gas purity of 99.8% upward for gas shield, and the flow with 20~25 l/min.
- Clean up the base metal from contamination
- Use DC (+) polarity.
- Use proper protection for getting good toughness and avoid blow hole, lower the hydrogen and nitrogen content in the deposit metal.

WELDING POSITION :

TYPICAL CHEMICAL COMPOSITION OF WELD METAL (wt%) : (CO_2)

C	Mn	Si	P	S	Ni	Cr	Bi
0.023	1.18	0.51	0.025	0.003	12.73	23.08	≤10ppm

TYPICAL MECHANICAL PROPERTIES OF WELD METAL: (CO_2)

TENSILE STRENGTH $N/mm^2(Kgf/mm^2)$	ELONGATION RATE %
570(58.2)	42

SIZE AND RECOMMENDED CURRENT RANGE : DC(+)

Parameters \ Diameter (mm)	1.2	1.6
Voltage (Volt)	20-36	24-38
Current (Amp)	120-260	200-300
Stickout (m/m)	15-25	18-25
Flow Rate (l/min)	15-25	15-25

SFC-309MoL

AWS A5.22 E309LMoT1-1/-4
EN ISO 17633-A T 23 12 2 L P C1/M21 2
GB T17853 E309LMoT1-1

FLUX CORED WIRES FOR STAINLESS STEEL

DESCRIPTION & APPLICATIONS :

- SFC-309MoL is an austenitic structure, the weld metal contains 22%Cr-12%Ni-2%Mo.
- Good weldability, the corrosion and heat resistances better than SFC-309L.
- It is suitable for dissimilar joints welding in the stainless steel 316 and carbon steel, the SUS 316, 316L composite steel overlay bottom welding.

NOTE ON USAGE :

- Use CO_2 within gas purity of 99.8% upward for gas shield, and the flow with 20~25 l/min.

WELDING POSITION :

TYPICAL CHEMICAL COMPOSITION OF WELD METAL (wt%) : (CO_2)

C	Mn	Si	P	S	Ni	Cr	Mo
0.030	1.25	0.71	0.025	0.001	13.60	23.40	2.43

TYPICAL MECHANICAL PROPERTIES OF WELD METAL: (CO_2)

TENSILE STRENGTH N/mm^2(Kgf/mm^2)	ELONGATION RATE %
730(74.5)	27

SIZE AND RECOMMENDED CURRENT RANGE : DC(+)

Parameters \ Diameter (mm)	1.2		1.6	
	F , H	V , OH	F , H	V , OH
Voltage (Volt)	23-36	22-26	28-36	–
Current (Amp)	130-250	120-160	180-300	–

SFC-312

AWS A5.22 E312T1-1/-4
EN ISO 17633-A T 29 9 P C1/M21 2
GB T17853 E312T1-1

FLUX CORED WIRES FOR STAINLESS STEEL

DESCRIPTION & APPLICATIONS :

- SFC-312 is an austenitic structure, the weld metal contains 29%Cr-9%Ni.
- Contains more Cr for oxidization resistance and lower cracking sensitivity.
- It is suitable for dissimilar joints welding in stainless steel and carbon steel, welding difficulty, blowhole possibility, and toughness alloy.

NOTE ON USAGE :

- Use CO_2 within gas purity of 99.8% upward for gas shield, and the flow with 20~25 l/min.

WELDING POSITION :

TYPICAL CHEMICAL COMPOSITION OF WELD METAL (wt%) : (CO_2)

C	Mn	Si	P	S	Ni	Cr
0.058	0.875	0.518	0.021	0.004	9.25	30.40

TYPICAL MECHANICAL PROPERTIES OF WELD METAL: (CO_2)

TENSILE STRENGTH $N/mm^2(Kgf/mm^2)$	ELONGATION RATE %
745(76.0)	24

SIZE AND RECOMMENDED CURRENT RANGE : DC(+)

Parameters \ Diameter (mm)	1.2		1.6	
	F , H	V , OH	F , H	V , OH
Voltage (Volt)	23-36	22-26	28-36	–
Current (Amp)	130-250	120-160	180-300	–

SFC-312M

AWS –
EN –
GB –

FLUX CORED WIRES FOR STAINLESS STEEL

DESCRIPTION & APPLICATIONS :

- SFC-312M contains more ferrite in the austenitic structure suitable for dissimilar joints welding in stainless steel and carbon steel, and better anti-cracking than SFC-312.
- Contains more ferrite than 309 series suitable for high carbon steel and low alloy steel on welding.

NOTE ON USAGE :

- Use CO_2 within gas purity of 99.8% upward for gas shield, and the flow with 20~25 l/min.

WELDING POSITION :

TYPICAL CHEMICAL COMPOSITION OF WELD METAL (wt%) : (CO_2)

C	Mn	Si	P	S	Ni	Cr	Others
0.030	1.00	0.55	0.025	0.003	8.30	27.00	1.6

TYPICAL MECHANICAL PROPERTIES OF WELD METAL: (CO_2)

TENSILE STRENGTH $N/mm^2(Kgf/mm^2)$	ELONGATION RATE %
810(82.7)	23

SIZE AND RECOMMENDED CURRENT RANGE : DC(+)

Parameters \ Diameter (mm)	1.2		1.6	
	F , H	V , OH	F , H	V , OH
Voltage (Volt)	23-36	22-26	28-36	–
Current (Amp)	130-250	120-160	180-300	–

SFC-316L

AWS A5.22 E316LT1-1/-4
EN ISO 17633-A T 19 12 3 L P C1/M21 2
GB T17853 E316LT1-1

FLUX CORED WIRES FOR STAINLESS STEEL

DESCRIPTION & APPLICATIONS :

- SFC-316L is an austenitic structure, the weld metal contains 18%Cr-12%Ni-2%Mo.
- It possesses better corrosion resistance, especially in dilute sulfuric acid.
- It is suitable for chemical container as AISI 316/316L, SUS 316/316L steels.

NOTE ON USAGE :

- Use CO_2 within gas purity of 99.8% upward for gas shield, and the flow with 20~25 l/min.

WELDING POSITION :

TYPICAL CHEMICAL COMPOSITION OF WELD METAL (wt%) : (CO_2)

C	Mn	Si	P	S	Ni	Cr	Mo
0.028	1.00	0.65	0.025	0.002	11.50	18.10	2.50

TYPICAL MECHANICAL PROPERTIES OF WELD METAL: (CO_2)

TENSILE STRENGTH N/mm^2(Kgf/mm^2)	ELONGATION RATE %	IMPACT VALUES -196°C J(Kgf-m)	SIDE EXPANSION (mm)
540(55.1)	40	30(3.1)	0.70mm

SIZE AND RECOMMENDED CURRENT RANGE : DC(+)

Parameters \ Diameter (mm)	1.2		1.6	
	F , H	V , OH	F , H	V , OH
Voltage (Volt)	23-36	22-26	28-36	–
Current (Amp)	130-250	120-160	180-300	–

SFC-316LB

AWS A5.22 E316LT1-1
EN ISO 17633-A T 19 12 3 L P C1 2
GB T17853 E316LT1-1

FLUX CORED WIRES FOR STAINLESS STEEL

DESCRIPTION & APPLICATIONS :

- Contains less Bi element is to avoid the weldbead embrittling in its structure from the high temp. environment for a lower incidence of thermal cracking.
- The weld metal of the weldbead is low carbon within 2~3%Mo, the capability of intergranular corrosion and high temp. resistances.
- It is designed for welding the stainless steel 18%Cr-12%Ni-2%Mo such as SUS 316 and 316L. It is suitable for Petrol Chemical Industry, Pressure Vessel, Food and Beverage Machinery.
- It is suitable for the workpieces required high temp. heat treatment as solution heat treatment.

NOTE ON USAGE :

- Use CO_2 within gas purity of 99.8% upward for gas shield, and the flow with 20~25 l/min.
- Clean up the base metal from contamination
- Use DC (+) polarity.
- Use proper protection for getting good toughness and avoid blow hole, lower the hydrogen and nitrogen content in the deposit metal.

WELDING POSITION :

TYPICAL CHEMICAL COMPOSITION OF WELD METAL (wt%) : (CO_2)

C	Mn	Si	P	S	Ni	Cr	Mo	Bi
0.023	1.10	0.60	0.022	<0.000	12.15	18.77	2.35	≤10ppm

TYPICAL MECHANICAL PROPERTIES OF WELD METAL: (CO_2)

TENSILE STRENGTH $N/mm^2(Kgf/mm^2)$	ELONGATION RATE %
583(59.5)	37

SIZE AND RECOMMENDED CURRENT RANGE : DC(+)

Parameters \ Diameter (mm)	1.2	1.6
Voltage (Volt)	20-36	24-38
Current (Amp)	120-260	200-300
Stickout (m/m)	15-25	18-25
Flow Rate (l/min)	15-25	15-25

SFC-316H

AWS A5.22 E316HT1-1/-4
EN –
GB T17853 E316HT1-1

FLUX CORED WIRES FOR STAINLESS STEEL

DESCRIPTION & APPLICATIONS :

- SFC-316H is an austenitic structure, the weld metal contains 18%Cr-12%Ni-2%Mo.
- It possesses better corrosion resistance, especially in dilute sulfuric acid the heat assistance the high temp. strength.
- It is suitable for chemical container such as AISI 316, SUS 316 steels.

NOTE ON USAGE :

- Use CO_2 within gas purity of 99.8% upward for gas shield, and the flow with 20~25 l/min.

WELDING POSITION :

TYPICAL CHEMICAL COMPOSITION OF WELD METAL (wt%) : (CO_2)

C	Mn	Si	P	S	Ni	Cr	Mo
0.053	1.42	0.51	0.020	0.005	11.71	18.23	2.53

TYPICAL MECHANICAL PROPERTIES OF WELD METAL: (CO_2)

TENSILE STRENGTH N/mm²(Kgf/mm²)	ELONGATION RATE %
581(59.4)	38

SIZE AND RECOMMENDED CURRENT RANGE : DC(+)

Parameters \ Diameter (mm)	1.2		1.6	
	F , H	V , OH	F , H	V , OH
Voltage (Volt)	23-36	22-26	28-36	–
Current (Amp)	130-250	120-160	180-300	–

SFC-317L

AWS A5.22 E317LT1-1/-4
EN ISO 17633-A T 19 13 4 L P C1/M21 2
GB T17853 E317LT1-1

FLUX CORED WIRES FOR STAINLESS STEEL

DESCRIPTION & APPLICATIONS :

- SFC-317L is an austenitic structure, the weld metal contains 19%Cr-12%Ni-3%Mo.
- Advantage of organic acid, sulfuric acid/sulphuric acid in corrosion resistance.
- It is suitable for chemical container such as AISI 316/316L, 317/317L, and SUS 317L steels.

NOTE ON USAGE :

- Use CO_2 within gas purity of 99.8% upward for gas shield, and the flow with 20~25 l/min.

WELDING POSITION :

TYPICAL CHEMICAL COMPOSITION OF WELD METAL (wt%) : (CO_2)

C	Mn	Si	P	S	Ni	Cr	Mo
0.03	1.10	0.48	0.021	0.006	13.11	19.30	3.61

TYPICAL MECHANICAL PROPERTIES OF WELD METAL: (CO_2)

TENSILE STRENGTH $N/mm^2(Kgf/mm^2)$	ELONGATION RATE %	IMPACT VALUES 0°C J(Kgf-m)
600(61.2)	30	35(3.6)

SIZE AND RECOMMENDED CURRENT RANGE : DC(+)

Diameter (mm) / Parameters	1.2		1.6	
	F , H	V , OH	F , H	V , OH
Voltage (Volt)	23-36	22-26	28-36	–
Current (Amp)	130-250	120-160	180-300	–

SFC-318

AWS A5.22 EGT1-1/-4
EN ISO 17633-A T 19 12 3 Nb P C1/M21 2
GB –

FLUX CORED WIRES FOR STAINLESS STEEL

DESCRIPTION & APPLICATIONS :

- SFC-318 is an austenitic structure, the weld metal contains 18%Cr-12%Ni-2%Mo-Ti(Nb).
- Contains Mo, features non-oxidative acid of dilute sulfuric acid advantageous to anti-corrosion, besides, within an addition of Nb is advantage of intergranular corrosion and heat resistance.
- It is suitable for chemical container such as AISI 316Ti, and SUS 316Ti steels.

NOTE ON USAGE :

- Use CO_2 within gas purity of 99.8% upward for gas shield, and the flow with 20~25 l/min.

WELDING POSITION :

TYPICAL CHEMICAL COMPOSITION OF WELD METAL (wt%) : (CO_2)

C	Mn	Si	P	S	Ni	Cr	Mo	Nb
0.03	1.14	0.60	0.030	0.005	12.12	18.53	2.50	0.49

TYPICAL MECHANICAL PROPERTIES OF WELD METAL: (CO_2)

TENSILE STRENGTH $N/mm^2(Kgf/mm^2)$	ELONGATION RATE %	IMPACT VALUES -40°C J(Kgf-m)
590(60.2)	32	47(4.8)

SIZE AND RECOMMENDED CURRENT RANGE : DC(+)

Diameter (mm) / Parameters	1.2		1.6	
	F , H	V , OH	F , H	V , OH
Voltage (Volt)	23-36	22-26	28-36	–
Current (Amp)	130-250	120-160	180-300	–

SFC-347B

AWS A5.22 E347T1-1
EN ISO 17633-A T 19 9 Nb P C1 2
GB T17853 E347T1-1

FLUX CORED WIRES FOR STAINLESS STEEL

DESCRIPTION & APPLICATIONS :

- Contains less Bi element is to avoid the weldbead embrittling in its structure from the high temp. environment for a lower incidence of thermal cracking.
- The weld metal of the weldbead contains Nb for lower carbide precipitation and better intergranular corrosion.
- It is suitable for Petrol Chemical Industry, Pressure Vessel, Food and Beverage Machinery such as AISI 347, 321, 304L, and SUS 347, 321, 304L steels.
- It is suitable for the workpieces required high temp. heat treatment as solution heat treatment.

NOTE ON USAGE :

- Use CO_2 within gas purity of 99.8% upward for gas shield, and the flow with 20~25 l/min.
- Clean up the base metal from contamination
- Use DC (+) polarity.
- Use proper protection for getting good toughness and avoid blow hole, lower the hydrogen and nitrogen content in the deposit metal.

WELDING POSITION :

TYPICAL CHEMICAL COMPOSITION OF WELD METAL (wt%) : (CO_2)

C	Mn	Si	P	S	Ni	Cr	Nb	Bi
0.050	1.13	0.59	0.021	0.003	10.21	19.64	0.46	≤10ppm

TYPICAL MECHANICAL PROPERTIES OF WELD METAL: (CO_2)

TENSILE STRENGTH $N/mm^2(Kgf/mm^2)$	ELONGATION RATE %
631(64.4)	42

SIZE AND RECOMMENDED CURRENT RANGE : DC(+)

Parameters \ Diameter (mm)	1.2	1.6
Voltage (Volt)	20-36	24-38
Current (Amp)	120-260	200-300
Stickout (m/m)	15-25	18-25
Flow Rate (l/min)	15-25	15-25

SFC-347L

AWS A5.22 E347T1-1/-4
EN ISO 17633-A T 19 9 Nb P C1/M21 2
GB T17853 E347T1-1

FLUX CORED WIRES FOR STAINLESS STEEL

DESCRIPTION & APPLICATIONS :

- SFC-347L is an austenitic structure, the weld metal contains 19%Cr-9%Ni-Ti(Nb).
- Within an addition of Nb is advantage of intergranular corrosion and well creep strength at high temp.
- It is suitable for AISI 347, 321, 304L, and SUS 347, 321, 304L steels.

NOTE ON USAGE :

- Use CO_2 within gas purity of 99.8% upward for gas shield, and the flow with 20~25 l/min.

WELDING POSITION :

TYPICAL CHEMICAL COMPOSITION OF WELD METAL (wt%) : (CO_2)

C	Mn	Si	P	S	Ni	Cr	Nb
0.031	1.10	0.62	0.030	0.004	10.28	19.50	0.48

TYPICAL MECHANICAL PROPERTIES OF WELD METAL: (CO_2)

TENSILE STRENGTH $N/mm^2(Kgf/mm^2)$	ELONGATION RATE %	IMPACT VALUES -40°C J(Kgf-m)
610(62.2)	37	48(4.9)

SIZE AND RECOMMENDED CURRENT RANGE : DC(+)

Parameters \ Diameter (mm)	1.2		1.6	
	F , H	V , OH	F , H	V , OH
Voltage (Volt)	23-36	22-26	28-36	–
Current (Amp)	130-250	120-160	180-300	–

SFC-347LB

AWS A5.22 E347T1-1
EN ISO 17633-A T 19 9 Nb P C1 2
GB T17853 E347T1-1

FLUX CORED WIRES FOR STAINLESS STEEL

DESCRIPTION & APPLICATIONS :

- Contains less Bi element is to avoid the weldbead embrittling in its structure from the high temp. environment for a lower incidence of thermal cracking.
- The weld metal of the weldbead contains Nb for lower carbide precipitation and better intergranular corrosion.
- It is suitable for Petrol Chemical Industry, Pressure Vessel, Food and Beverage Machinery such as AISI 347, 321, 304L, and SUS 347, 321, 304L steels.
- It is suitable for the workpieces required high temp. heat treatment as solution heat treatment.

NOTE ON USAGE :

- Use CO_2 within gas purity of 99.8% upward for gas shield, and the flow with 20~25 l/min.
- Clean up the base metal from contamination
- Use DC (+) polarity.
- Use proper protection for getting good toughness and avoid blow hole, lower the hydrogen and nitrogen content in the deposit metal.

WELDING POSITION :

TYPICAL CHEMICAL COMPOSITION OF WELD METAL (wt%) : (CO_2)

C	Mn	Si	P	S	Ni	Cr	Nb	Bi
0.026	1.10	0.64	0.023	0.003	10.13	19.54	0.45	≤10ppm

TYPICAL MECHANICAL PROPERTIES OF WELD METAL: (CO_2)

TENSILE STRENGTH $N/mm^2(Kgf/mm^2)$	ELONGATION RATE %
620(63.3)	43

SIZE AND RECOMMENDED CURRENT RANGE : DC(+)

Parameters \ Diameter (mm)	1.2	1.6
Voltage (Volt)	20-36	24-38
Current (Amp)	120-260	200-300
Stickout (m/m)	15-25	18-25
Flow Rate (l/min)	15-25	15-25

SFC-347H

AWS A5.22 E347HT1-1/-4
EN ISO 17633-A T 19 9 Nb P C1/M21 2
GB T17853 E347HT1-1

FLUX CORED WIRES FOR STAINLESS STEEL

DESCRIPTION & APPLICATIONS :

- SFC-347H is an austenitic structure, the weld metal contains 19%Cr-9%Ni-Ti(Nb).
- Within an addition of Nb is advantage of intergranular corrosion and well creep strength at high temp.
- It is suitable for AISI 347, 321, 304L, and SUS 347, 321, 304L steels.

NOTE ON USAGE :

- Use CO_2 within gas purity of 99.8% upward for gas shield, and the flow with 20~25 l/min.

WELDING POSITION :

TYPICAL CHEMICAL COMPOSITION OF WELD METAL (wt%) : (CO_2)

C	Mn	Si	P	S	Ni	Cr	Nb
0.045	1.21	0.42	0.023	0.008	10.32	19.50	0.44

TYPICAL MECHANICAL PROPERTIES OF WELD METAL: (CO_2)

TENSILE STRENGTH $N/mm^2(Kgf/mm^2)$	ELONGATION RATE %	IMPACT VALUES -40°C J(Kgf-m)
593(60.5)	35	43(4.4)

SIZE AND RECOMMENDED CURRENT RANGE : DC(+)

Parameters \ Diameter (mm)	1.2		1.6	
	F , H	V , OH	F , H	V , OH
Voltage (Volt)	23-36	22-26	28-36	–
Current (Amp)	130-250	120-160	180-300	–

SFC-410

AWS A5.22 E410T1-1/-4
EN ISO 17633-A T 13 P C1/M21 2
GB T17853 E410T1-1

FLUX CORED WIRES FOR STAINLESS STEEL

DESCRIPTION & APPLICATIONS :

- SFC-410 is a martensitic structure, the weld metal contains 13%Cr.
- The hardness the advantage of oxidation and corrosion resistances at high temp.
- It is suitable for SUS 403, 410, 410S, 420J1 and 420J2 steels.

NOTE ON USAGE :

- Use CO_2 within gas purity of 99.8% upward for gas shield, and the flow with 20~25 l/min.
- Preheat at 200 ~ 400°C before welding, and the PWHT at 730 ~ 760°C afterwards.

WELDING POSITION :

TYPICAL CHEMICAL COMPOSITION OF WELD METAL (wt%) : (CO_2)

C	Mn	Si	P	S	Ni	Cr
0.042	0.41	0.45	0.021	0.012	0.21	12.10

TYPICAL MECHANICAL PROPERTIES OF WELD METAL: (CO_2)

TENSILE STRENGTH $N/mm^2(Kgf/mm^2)$	ELONGATION RATE %	HEAT TREATMENT
620(63.7)	22	750°Cx1hr

SIZE AND RECOMMENDED CURRENT RANGE : DC(+)

Parameters \ Diameter (mm)	1.2		1.6	
	F , H	V , OH	F , H	V , OH
Voltage (Volt)	23-36	22-26	28-36	--
Current (Amp)	130-250	120-160	180-300	--

SFC-410NM

AWS A5.22 EGT1-1/-4
EN –
GB –

FLUX CORED WIRES FOR STAINLESS STEEL

DESCRIPTION & APPLICATIONS :

- SFC-410NM is a hardfacing flux-cored wire, the weld metal contains 12%Cr-4%Ni-0.5%Mo as a martensitic structure.
- It is suitable for the wear/abrasion and corrosion between metals in any kind of spots such as crane track, printing roller, and the hardfacing maintenance of steel shaft.

NOTE ON USAGE :

- Use CO_2 within gas purity of 99.8% upward for gas shield, and the flow with 20~25 l/min.
- Preheat at 150°C before welding.

WELDING POSITION :

TYPICAL CHEMICAL COMPOSITION OF WELD METAL (wt%) : (CO_2)

C	Mn	Si	P	S	Ni	Cr	Mo
0.070	0.42	0.38	0.030	0.008	3.80	12.10	0.85

TYPICAL HARDNESS OF WELD METAL : (GAS SHIELD: CO_2)

Layers	2nd layer	3rd layer	4th layer
Hardness (HRC)	39	41	42

SIZE AND RECOMMENDED CURRENT RANGE : DC(+)

Diameter (mm) / Parameters	1.2		1.6	
	F , H	V , OH	F , H	V , OH
Voltage (Volt)	23-36	22-26	28-36	–
Current (Amp)	130-250	120-160	180-300	–

SFC-410NiMo

AWS A5.22 E410NiMoT1-1/-4
EN ISO 17633-A T 13 4 P C1/M21 2
GB T17853 E410NiMoT1-1

FLUX CORED WIRES FOR STAINLESS STEEL

DESCRIPTION & APPLICATIONS :

- SFC-410NiMo is a martensitic structure, the weld metal contains 13%Cr-5%Ni-0.5%Mo the flux-cored wire for the high temp. resistance use.
- It is suitable for ASTM CA6NM series of martensitic stainless steel in all welding positions.

NOTE ON USAGE :

- Use CO_2 within gas purity of 99.8% upward for gas shield, and the flow with 20~25 l/min.
- Preheat at 150 ~ 300°C before welding, and the PWHT at 600 ~ 620°C afterwards.

WELDING POSITION :

TYPICAL CHEMICAL COMPOSITION OF WELD METAL (wt%) : (CO_2)

C	Mn	Si	P	S	Ni	Cr	Mo
0.04	0.31	0.25	0.014	0.008	4.39	11.85	0.55

TYPICAL MECHANICAL PROPERTIES OF WELD METAL: (CO_2)

TENSILE STRENGTH $N/mm^2(Kgf/mm^2)$	ELONGATION RATE %	IMPACT VALUES 0°C J(Kgf-m)	HEAT TREATMENT
860(87.8)	17	38(3.9)	620°Cx1hr

SIZE AND RECOMMENDED CURRENT RANGE : DC(+)

Parameters \ Diameter (mm)	1.2		1.6	
	F , H	V , OH	F , H	V , OH
Voltage (Volt)	23-36	22-26	28-36	--
Current (Amp)	130-250	120-160	180-300	--

SFC-2209

AWS A5.22 E2209T1-1/-4
EN ISO 17633-A T 22 9 3 N L P C1/M21 2
GB T17853 E2209T1-1

FLUX CORED WIRES FOR STAINLESS STEEL

DESCRIPTION & APPLICATIONS :

- SS-2209 is a duplex stainless steel comprised of austenite and ferrite steels, the weld metal contains 22%Cr-9%Ni-3%Mo-N.
- It possesses better corrosion resistance, strength, and toughness.
- It is suitable for Petrol Chemical Industry, Heat Exchanger, and UNS S31803 (as Alloy 2205).

NOTE ON USAGE :

- Use CO_2 within gas purity of 99.8% upward for gas shield, and the flow with 20~25 l/min.

WELDING POSITION :

TYPICAL CHEMICAL COMPOSITION OF WELD METAL (wt%) : (CO_2)

C	Mn	Si	P	S	Ni	Cr	Mo	N
0.031	1.00	0.53	0.025	0.007	8.75	22.80	3.30	0.11

TYPICAL MECHANICAL PROPERTIES OF WELD METAL: (CO_2)

TENSILE STRENGTH $N/mm^2(Kgf/mm^2)$	ELONGATION RATE %
786(80.2)	27

SIZE AND RECOMMENDED CURRENT RANGE : DC(+)

Parameters \ Diameter (mm)	1.2		1.6	
	F , H	V , OH	F , H	V , OH
Voltage (Volt)	23-36	22-26	28-36	–
Current (Amp)	130-250	120-160	180-300	–

SFC-2209B

AWS A5.22 E2209T1-1
EN ISO 17633-A T 22 9 3 N L P C1 2
GB T17853 E2209T1-1

FLUX CORED WIRES FOR STAINLESS STEEL

DESCRIPTION & APPLICATIONS :

- SS-2209B is a duplex stainless steel comprised of austenite and ferrite steels, the weld metal contains 22%Cr-9%Ni-3%Mo-N.
- Contains less Bi element is to avoid the weldbead embrittling in its structure from the high temp. environment for a lower incidence of thermal cracking.
- It possesses better corrosion resistance, strength, and toughness.
- It is suitable for Petrol Chemical Industry, Heat Exchanger, and UNS S31803 (as Alloy 2205).

NOTE ON USAGE :

- Use CO_2 within gas purity of 99.8% upward for gas shield, and the flow with 20~25 l/min.
- Clean up the base metal from contamination
- Use DC (+) polarity.
- Use proper protection for getting good toughness and avoid blow hole, lower the hydrogen and nitrogen content in the deposit metal.

WELDING POSITION :

TYPICAL CHEMICAL COMPOSITION OF WELD METAL (wt%) : (CO_2)

C	Mn	Si	P	S	Ni	Cr	Mo	N	Bi
0.030	0.81	0.49	0.024	0.013	8.71	22.35	3.21	0.12	≤10ppm

TYPICAL MECHANICAL PROPERTIES OF WELD METAL: (CO_2)

TENSILE STRENGTH $N/mm^2(Kgf/mm^2)$	ELONGATION RATE %
797.5(81.4)	30

SIZE AND RECOMMENDED CURRENT RANGE : DC(+)

Diameter (mm) / Parameters	1.2		1.6	
	F , H	V , OH	F , H	V , OH
Voltage (Volt)	23-33	24-30	25-38	–
Current (Amp)	130-220	120-180	200-300	–

SFC-2594

AWS A5.22 E2594T1-1/-4
EN ISO 17633-A T 25 9 4 N L P C1/M21 2
GB –

FLUX CORED WIRES FOR STAINLESS STEEL

DESCRIPTION & APPLICATIONS :

- SS-2594 is a duplex stainless steel comprised of austenite and ferrite steels, the weld metal contains 26%Cr-10%Ni-3.5%Mo-0.2%N.
- The advantage of strength and toughness, and better corrosion resistance than SS-2209.
- PREN (Pitting Resistance Equivalent Number) >40.
- Apply for offshore platform, pressure container, chemical equipment and pipelines, seawater desalination industry, pharmaceutical industry, petrochemical industry, natural gas as pumps, pressure containers, valves, heat exchangers, and the chlorine gas equipment.
- It is suitable for UNS S32750 (as Alloy 2507), UNS J93404, A890 GR. 5A.

NOTE ON USAGE :

- Use CO_2 within gas purity of 99.8% upward for gas shield, and the flow with 20~25 l/min.
- When use mixed gas (80%Ar+20%CO_2), the welding voltage should be less 1~2V than CO_2 gas, the electrode extension less than 20mm to prevent worm hole.

WELDING POSITION :

TYPICAL CHEMICAL COMPOSITION OF WELD METAL (wt%) : (CO_2)

C	Mn	Si	P	S	Ni	Cr	Mo	N
0.03	0.85	0.78	0.030	0.006	8.30	25.20	3.48	0.22

TYPICAL MECHANICAL PROPERTIES OF WELD METAL: (CO_2)

TENSILE STRENGTH N/mm²(Kgf/mm²)	ELONGATION RATE %
850(86.7)	25

SIZE AND RECOMMENDED CURRENT RANGE : DC(+)

Parameters \ Diameter (mm)	1.2		1.6	
	F , H	V , OH	F , H	V , OH
Voltage (Volt)	23-36	22-26	28-36	–
Current (Amp)	130-250	120-160	180-300	–

SFC-409Ti

AWS A5.22 EC409T1-1/-4
EN ISO 17633-A T 13 Ti M M21 2
GB –

FLUX CORED WIRES FOR STAINLESS STEEL

DESCRIPTION & APPLICATIONS :

- SFC-409Ti is a metal-cored wire with addition of fewer ionization element to increase arc stability.
- Advantage of higher welding efficiency on thin plate; lower possibility of burn-through, higher deposition rate, better weldability and less sparkle than solid wire.
- It is suitable for AISI 409 the ferritic stainless steel and the similar alloy steels, especially for the automotive exhaust systems and mufflers.

NOTE ON USAGE :

- Use mixed gas with 80%Ar+20%CO_2, and the flow with 15~20 l/min.

WELDING POSITION :

CHEMICAL COMPOSITION (GAS SHIELD: 80%AR+20%CO_2)

C	Mn	Si	P	S	Cr	Ti
0.045	0.56	0.72	0.011	0.009	11.5	0.82

MECHANICAL PROPERTY (GAS SHIELD: 80%AR+20%CO_2)

TENSILE STRENGTH $N/mm^2(Kgf/mm^2)$	ELONGATION RATE %
475(48)	24

SIZE AND RECOMMENDED CURRENT RANGE : DC(+)

Parameters \ Diameter (mm)	1.2
	F , H
Voltage (Volt)	28-32
Current (Amp)	200-240

SFC-409Cb

AWS A5.22 EC409NbT1-1/-4
EN –
GB –

FLUX CORED WIRES FOR STAINLESS STEEL

DESCRIPTION & APPLICATIONS :

- SFC-409Cb is a metal-cored wire with addition of fewer ionization element to increase arc stability.
- Higher welding efficiency on thin plate; lower possibility of burn-through, higher deposition rate, better weldability and less sparkle than solid wire.
- It is suitable for AISI 409 the ferritic stainless steel and the similar alloy steels, especially for the automotive exhaust systems and mufflers.

NOTE ON USAGE :

- Use mixed gas with 80%Ar+20%CO_2 and the flow with 15~20 l/min.

WELDING POSITION :

CHEMICAL COMPOSITION (GAS SHIELD: 80%AR+20%CO_2)

C	Mn	Si	P	S	Cr	Nb
0.038	0.78	0.65	0.015	0.006	12.70	0.70

MECHANICAL PROPERTY (GAS SHIELD: 80%AR+20%CO_2)

TENSILE STRENGTH $N/mm^2(Kgf/mm^2)$	ELONGATION RATE %	HEAT TREATMENT
480(49.0)	16	780°C×2hr

SIZE AND RECOMMENDED CURRENT RANGE : DC(+)

Parameters \ Diameter (mm)	1.2
	F , H
Voltage (Volt)	28-32
Current (Amp)	200-240

SFC-439Ti

AWS A5.22 EC439T1-1/-4
EN –
GB –

FLUX CORED WIRES FOR STAINLESS STEEL

DESCRIPTION & APPLICATIONS :

- SFC-439Ti is a metal-cored wire with addition of fewer ionization element to increase arc stability.
- Advantage of the corrosion resistance on the welding seam(joint), higher welding efficiency on thin plate, lower possibility of burn-through, higher deposition rate, better weldability and less sparkle than solid wire.
- It is suitable for AISI 439 the stainless steel and the similar alloy steels, especially for the automotive exhaust systems and mufflers.

NOTE ON USAGE :

- Use mixed gas with 80%Ar+20%CO_2, and the flow with 15~20 l/min.

WELDING POSITION :

CHEMICAL COMPOSITION (GAS SHIELD: 80%AR+20%CO_2)

C	Mn	Si	P	S	Ni	Cr	Ti
0.033	0.30	0.10	0.018	0.012	0.15	18.80	0.9

MECHANICAL PROPERTY (GAS SHIELD: 80%AR+20%CO_2)

TENSILE STRENGTH $N/mm^2(Kgf/mm^2)$	ELONGATION RATE %
508(51.8)	37

SIZE AND RECOMMENDED CURRENT RANGE : DC(+)

Parameters \ Diameter (mm)	1.2
	F , H
Voltage (Volt)	28-32
Current (Amp)	200-240

SELECTION RECOMMENDATION

Specification of Stainless Steel solid wire and rod welding according to AWS A5.9: It is based on composition and welding wire types. The information of the tensile strength is not shown on specification. It generally consists of ERXXX in the specification, for instance, ECXXX representing the composite welding wire or stranded welding wire; the EQ representing the welding band.

WELDING OPERATION

◆ (1)Storage Management:

Relevant to storage management, please refer to the instructions of solid wires in carbon steel.

◆ (2)Welding Precausion:

①Stainless steel solid wire is based on GMAW welding with the gas shield of either 98%Ar + 2%O_2 or 95~98%Ar + 2~5%CO_2. It may cause the carbon content increased in the weld when use CO_2 as gas shield; the worse corrosion resistance, and whereas it reaches high penetration in the weld by using with mixed gas of argon and helium.

②Welding current polarity mainly uses DC(+) on GMAW welding. When take shallow penetration into consideration, the DC(-) is the selection as the same as GTAW welding.

③When the arc transition is carried under spraying arc move on GMAW welding, the recommended welding voltage is set in the condition of the arc height at 5mm. The shorter arc height is easy to cause blowholes in the weld, and whereas the longer easily causes the weld undercut and poor expansion of the weldpool.

④In GMAW welding, the protective measure of the weld blowholes should be taken when the wind speed is greater than 0.5 m/s.

⑤When weld the full penetration of the bottom welding in GTAW welding method, it should pay attention to the matchup of the welding current and the length extension of the tungsten rod. Besides, it is also required backing protection in order to reach the bottom with full penetration. Firstly, it needs to break the root of the groove face by arc and then fill it up. In case, it is recommended to use flux-cored TIG for the bottom welding with full penetration if the backing not available on site.

⑥GTAW mainly uses 100% Ar for gas shield, the welding current in 100~200A with the recommended flow setting at 8~15 l/min, and whereas the flow setting at 12~15 l/min if the current in 200~300A.

⑦The rest, refer to the precautions of stainless steel flux-cored wire.

MEMO

STAINLESS STEEL

Brand	Spec			Typical Mechanical Properties of Weld Metal			
	AWS A5.9	EN ISO 14343-A	GB YB/T5092	TENSILE STRENGTH (N/mm^2)	Elongation %	C	Mn
SMG-307Si	–	–	–	600	40	0.07	6.74
STG-307Si							
SMG-308L	ER308L	G/W 19 9 L	H03Cr21Ni10Si	580	42	0.018	1.65
STG-308L							
SMG-308LSi	ER308LSi	19 9 L Si	H03Cr21Ni10Si1	590	42	0.021	1.88
STG-308LSi							
SMG-308H	ER308H	G/W 19 9 H	H08Cr21Ni10Si	630	41	0.059	1.55
STG-308H							
SMG-309L	ER309L	G/W 23 12 L	H03Cr24Ni13Si	590	40	0.015	1.51
STG-309L							
SMG-309LSi	ER309LSi	G/W 23 12 L Si	H03Cr24Ni13Si1	587	39	0.017	1.81
STG-309LSi							
SMG-309MoL	ER309LMo	G/W 23 12 2 L	H03Cr24Ni13Mo2	615	41	0.026	1.78
STG-309MoL							
SMG-310	ER310	G/W 25 20	H12Cr26Ni21Si	610	41	0.09	1.53
STG-310							
SMG-312	ER312	G/W 29 9	H15Cr30Ni9	750	21	0.09	1.71
STG-312							
SMG-316L	ER316L	G/W 19 12 3 L	H03Cr19Ni12Mo2Si	610	34	0.02	1.45
STG-316L							
SMG-316LSi	ER316LSi	G/W 19 12 3 L Si	H03Cr19Ni12Mo2Si1	620	35	0.018	1.51
STG-316LSi							
SMG-317L	ER317L	G/W 18 15 3 L	H03Cr19Ni14Mo3	600	41	0.012	1.32
STG-317L							
SMG-347	ER347	G/W 19 9 Nb	H08Cr20Ni10Nb	620	36	0.03	1.38
STG-347							
SMG-409Cb	ER409Cb	–	–	460	26	0.03	0.65
SMG-410	ER410	G/W 13	H12Cr13	620	25	0.09	0.48
STG-410							
SMG-410NM	ER410NiMo	G/W 13 4	H06Cr12Ni4Mo	900	21	0.016	0.52
STG-410NM							
SMG-420	ER420	–	–	1000	35	0.31	0.42
STG-420							
SMG-430	ER430	G/W 17	H10Cr17	530	25	0.06	0.42
STG-430							
SMG-439Ti	ER439	–	–	505	40	0.03	0.65
STG-439Ti							
SMG-630	ER630	–	H05Cr17Ni4CuNb	950	10	0.03	0.61
STG-630							
SMG-2209	ER2209	G/W 22 9 3 N L	H03Cr22Ni8Mo3N	770	27	0.02	1.63
STG-2209							
SMG-2594	ER2594	G/W 25 9 4 N L	–	860	35	0.013	0.60
STG-2594							

Typical Chemical Composition of Weld Metal					Applications
Si	Ni	Cr	Mo	Others	
0.7	8.92	19.5	0.12	–	For 18%Cr-8%Ni-4Mn stainless steel welding. Suitable for high stress work piece or root passing for hardfacing usage.
0.42	10.3	20.2	–	–	For low carbon 18%Cr-8%Ni stainless steel welding. With good crack and corosion resistance.
0.78	10.4	19.9	–	–	For low carbon 18%Cr-8%Ni stainless steel welding. It selivers high deposition rate. Nice weldinb bead apperance, good crack and corrosion resistance.
0.54	9.27	19.6	–	–	For 18%Cr-8%Ni stainless steel welding. Suitable for petro chemical industry and pressure vessel.
0.45	13.0	23.2	–	–	For low carbon 22%Cr-12%Ni stainless steel and dissimilar base metal welding. With good crack and corrosion resistance.
0.74	13.5	23.3	–	–	For low carbon 22%Cr-12%Ni stainless steel and dissimilar base metal welding. Nice welding bead apperance, good crack and corrosion resistance.
0.5	13.19	23.72	2.51	–	For low carbon 22%Cr-12%Ni-2%Mo stainless steel and disssimilar base metal welding. With good crack and corrosion resistance.
0.49	21.5	27	–	–	For 25%Cr-20%Ni stainless steel welding. With good heat and corrosion resistance. Excellent mechanical properties.
0.48	8.81	30.1	–	–	For 29%Cr-9%Ni stainless steel and dissimilar welding.
0.51	11.5	18.2	2.3	–	For 18%Cr-12%Ni-2.5%Mo stainless steel welding. With good heat and corrosion resistance.
0.83	11.6	18.6	2.4	–	For low carbon 18%Cr-12%Ni-2.5%Mo stainless steel. Nice welding bead apperanc, good heat and corrosion resistance.
0.53	13.5	19.6	3.2	–	Low carbon 18%Cr-12%Ni-3.5%Mo stainless steel. With better corrosion resistance than SMG-316L.
0.50	9.31	19.4	–	Nb:0.48	For 18%Cr-9%Ni-Ti stainless steel. Add Nb alloy element with corrosion resistnace feature. With better corrosion resistance and strength at high temperature.
0.50	0.32	11.3	–	Nb:0.45	For common use on vehicle pipe welding. Suitable for AISI 409 grade or similar stainless steel plates.
0.39	0.41	12.5	–	–	For 13%Cr stainless steel. Suitable for AISI 410 or 420 grade steel plates.
0.38	4.55	12.23	0.41	–	For AISI CA6NM austantic stainless steel plates.
0.38	0.32	13.1	–	–	For high carbon 13%Cr stainless steel. Suitable for corrosion demand.
0.34	0.38	16.2	–	–	For 17%Cr stainless steel. Suitable for AISI/SUS 409, 430 steel grade or similar alloy steel.
0.40	0.18	18.3	–	Ti:0.50	For welding of 18%Cr stainless steel. Suitable for AISI/SUS 409, 430, 436, 440 steel grade or similar alloy steel.
0.45	4.83	16.4	–	Cu:3.6 Nb:0.23	For welding of 17%Cr-4%Ni precipitation stainless steel. Suitable for ATSM 564/630, SUS630, 17-4PH steel grade.
0.45	9.78	22.01	3.15	N:0.12	Suitable for UNS S31803(ALLO8 2205) steel grade.
0.40	9.0	24.8	4.0	N:0.25	For welding Alloy 2507 duplex stainless steel with resistance to pitting corrosion and crack.

SELECTION RECOMMENDATION

There is no particular regulation in AWS for the stainless steel SAW as it is judged and specified according to AWS A5.9 for the wire.

WELDING OPERATION

◆ **(1)Storage Management:**

Relevant to storage management, please refer to the instructions of SAW in carbon steel.

◆ **(2)Welding Precausion:**

①Heat input should not be overheated for SAW, in order to avoid the weld cracking and carbide formation that of reducing the corrosion resistance.

②When use SAW for the bottom welding, the setting of the welding conditions should be paid attention to the issue of the excessive dilution for the weld alloy content reaching the expected setting. The welding condition, formation, and penetration may refer to the material selection and recommendation of SAW.

③Stainless steel band welding is mainly classified into SAW and ESW. The SAW welding is melting the band by arc, and whereas the ESW is melting the slags. Deeper penetration, higher dilution rate and welding speed are the features of SAW, but the weld flatness for ESW.

④SAW is using DC electricity for welding but the phenomenon of arc blow is easily caused to affect the weld deviation and the edge of toe. It is required to check the ground connection that connects to each side of the workpiece at least, the longer workpiece recommends more ground connections.

⑤The rest, refer to the precautions of stainless steel submerged arc welding and covered electrode.

SF-30xSW-308/308L

AWS A5.39 ER308/308L
EN ISO 14343-A S 19 9 L
GB –

SUBERED ARC WELDING WIRE AND FLUX FOR STAINLESS STEEL

DESCRIPTION & APPLICATIONS :

- SW-308L is low carbon 18%Cr-8%Ni, designed for welding SUS304 grade stainless steel.
- With appropriate contents of ferrite in weld metal, due to that the characteristic of great crack and corrosion resistibility, excellent slag removal and smooth bead appearance.

NOTE ON USAGE :

- SF-30 is an agglomerated flux. Rebake flux at 350°C for 1hour after opening use.
- Appropriate new flux is required to add with the recycling used flux to maintain welding quality.

TYPICAL CHEMICAL COMPOSITION OF WELD METAL :

C	Mn	Si	P
0.02	1.58	0.60	0.017
S	Ni		Cr
0.009	9.60		19.60

TYPICAL MECHANICAL PROPERTIES OF WELD METAL :

TENSILE STRENGTH $N/mm^2(Kgf/mm^2)$	
570(58.2)	
ELONGATION RATE %	IMPACT VALUES -196°C J(Kgf-m)
40	33(3.4)

SF-30xSW-309/309L

AWS A5.39 ER309/309L
EN ISO 14343-A S 23 12 L
GB –

SUBERED ARC WELDING WIRE AND FLUX FOR STAINLESS STEEL

DESCRIPTION & APPLICATIONS :

- SW-309L is low carbon 22%Cr-12%Ni, designed for welding SUS309S grade stainless steel and groove root passing.
- With high contents of ferrite in weld metal.

NOTE ON USAGE :

- SF-30 is an agglomerated flux. Rebake flux at 350°C for 1hour after opening use.
- Appropriate new flux is required to add with the recycling used flux to maintain welding quality.

TYPICAL CHEMICAL COMPOSITION OF WELD METAL :

C	Mn	Si	P
0.02	1.48	0.62	0.021
S	Ni		Cr
0.010	13.32		23.25

TYPICAL MECHANICAL PROPERTIES OF WELD METAL :

TENSILE STRENGTH $N/mm^2(Kgf/mm^2)$	ELONGATION RATE %
567(57.9)	41

SF-30xSW-316/316L

AWS A5.39 ER316/316L
EN ISO 14343-A S 19 12 3 L
GB –

SUBERED ARC WELDING WIRE AND FLUX FOR STAINLESS STEEL

DESCRIPTION & APPLICATIONS :

- SW-316L is low carbon 18%Cr-12%Ni-2.5%Mo, designed for welding SUS316 grade stainless steel.
- With appropriate contents of ferrite and Molybdenum(Mo) in weld metal, due to that the characteristic of excellent corrosion resistibility, excellent slag removal and smooth bead appearance.

NOTE ON USAGE :

- SF-30 is an agglomerated flux. Rebake flux at 350°C for 1hour after opening use.
- Appropriate new flux is required to add with the recycling used flux to maintain welding quality.

TYPICAL CHEMICAL COMPOSITION OF WELD METAL :

C	Mn	Si	P
0.02	1.50	0.41	0.023
S	Ni	Cr	Mo
0.008	11.21	19.11	2.60

TYPICAL MECHANICAL PROPERTIES OF WELD METAL :

TENSILE STRENGTH $N/mm^2(Kgf/mm^2)$	
550(56.1)	
ELONGATION RATE %	IMPACT VALUES -196°C J(Kgf-m)
40	40(4.1)

SF-33xSW-2209

AWS A5.39 ER2209
EN ISO 14343-A S 22 9 3 N L
GB –

SUBERED ARC WELDING WIRE AND FLUX FOR STAINLESS STEEL

DESCRIPTION & APPLICATIONS :

- SW-2209 is low carbon 22%Cr-9%Ni-3%Mo-N, designed for welding UNS S31803(Alloy2205) grade stainless steel.
- With appropriate contents of austenitic and ferrite. It can obtain better impact toughness and excellent corrosion resistibility.

NOTE ON USAGE :

- SF-33 is an agglomerate flux. Rebake flux at 300°C for 1hour after opening use.
- Lower current is recommended and temperature of interpass controlled under 120°C.
- Appropriate new flux is required to add with the recycling used flux to maintain welding quality.

TYPICAL CHEMICAL COMPOSITION OF WELD METAL :

C	Mn	Si	P	S
0.03	1.27	0.49	0.026	0.010
Ni	Cr	Mo	N	
8.94	22.04	2.85	0.14	

TYPICAL MECHANICAL PROPERTIES OF WELD METAL :

TENSILE STRENGTH $N/mm^2(Kgf/mm^2)$	ELONGATION RATE %
815(83.2)	25

SFB-S300 × SB-308L / SB-309L / SB-316L

AWS A5.39 EQ308L
AWS A5.39 EQ309L
AWS A5.39 EQ316L

SUBMERGED ARC WELDING STRIP AND FLUX FOR STAINLESS STEEL

DESCRIPTION & APPLICATIONS :

- SFB-S300 is an agglomerated flux designed for combination with SB-308L, SB-309L and SB-316L strips.
- It can provide excellent weldability, easy slag removal, smooth bead appearance and excellent corrosion resistance.
- Suitable for petrochemical, urea and nuclear equipment and offshore platform.

NOTE ON USAGE :

- Rebake flux at 300~350°C for 1hour after opening use.
- Appropriate new flux is required to add with the recycling used flux to maintain welding quality.
- Recommended keep welding position between horizontal to 1° from work piece.
- Thickness of build up layer between 4~5mm. Once thickness over than 5mm, welding bead would be get under cut easily.

TYPICAL CHEMICAL COMPOSITION OF WELD METAL :

Item / Composition		C	Mn	Si	P	S	Ni	Cr	Mo
SB-309L	Strip	0.016	1.84	0.32	0.017	0.008	13.75	23.51	-
	1st layer	0.024	1.25	0.53	0.021	0.005	11.83	20.22	-
SB-308L	Strip	0.015	1.86	0.29	0.020	0.007	9.43	21.08	-
	2nd layer	0.025	1.43	0.65	0.022	0.006	9.86	19.25	-
SB-316L	Strip	0.018	1.91	0.26	0.019	0.008	13.11	19.12	2.61
	2nd layer	0.020	1.41	0.53	0.021	0.009	12.61	19.13	2.27

SIZE AND RECOMMENDED CURRENT RANGE : (DC+)

Strip size (mm)	Current (Amp)	Voltage (Volt)	W.F.S. (mm/min)	Stickout (mm)
0.5×60	700~1000	28~32	140~220	30~40
0.4×50	550~800	28~32	140~220	30~40

SELECTION RECOMMENDATION

There is no particular regulation in AWS for the stainless steel ESW as it is judged and specified according to AWS A5.9 for the band comprised of EQXXX as specification.

WELDING OPERATION

◆ (1)Storage Management:

①Band should be properly protected and stacked, in order to avoid the matters of collision or conduction in terms of wire feeding.

②Relevant to storage management, please refer to the instructions of SAW in carbon steel.

◆ (2)Welding Precausion:

①Workpiece should be placed horizontally or ≤0.5°C the slight up-inclination; the welding in the flat position.

②Collect the remaining flux after welding for recycling treatment, no need to cover all flux up.

③It is due to the shallow penetration in EGW welding. It recommends to use SAW for the bottom weld when consider the matter of hydrogen delamination.

SFB-E300X

SB-308L
SB-309L
SB-316L

AWS A5.39 EQ308L
AWS A5.39 EQ309L
AWS A5.39 EQ316L

SUBMERGED ARC WELDING STRIP AND FLUX FOR STAINLESS STEEL

DESCRIPTION & APPLICATIONS：

- SFB-E300 is an agglomerated flux with low dilution characteristic. It is designed for combination with SB-308L,SB-309L,SB-316L strips.
- Suitable for petrochemical, urea and nuclear equipment and offshore platform.

NOTE ON USAGE：

- Rebake flux at 300~350˚C for 1hour after opening use.
- Appropriate new flux is required to add with the recycling used flux to maintain welding quality.
- Recommended keep welding position between horizontal to 1° from work piece.
- Thickness of build up layer between 4~5mm. Once thickness over than 5mm, welding bead would be get under cut easily.
- Do not spread flux on the slag behind the welding direction.

TYPICAL CHEMICAL COMPOSITION OF WELD METAL：

Item / Composition		C	Mn	Si	P	S	Ni	Cr	Mo
SB-309L	Strip	0.016	1.84	0.32	0.017	0.008	13.75	23.51	-
	1st layer	0.023	1.32	0.45	0.019	0.004	12.58	20.72	-
SB-308L	Strip	0.015	1.86	0.29	0.020	0.007	9.43	21.08	-
	2nd layer	0.019	1.33	0.42	0.021	0.005	11.83	20.45	-
SB-316L	Strip	0.018	1.91	0.26	0.019	0.008	13.11	19.12	2.61
	2nd layer	0.021	1.45	0.42	0.020	0.006	12.73	19.25	2.42

SIZE AND RECOMMENDED CURRENT RANGE：(DC+)

Strip size (mm)	Current (Amp)	Voltage (Volt)	W.F.S. (mm/min)	Stickout (mm)	Thickness (mm)
0.5×60	700~1000	24~30	140~220	30~40	20~30
0.4×50	550~800	24~30	140~220	30~40	15~25

MEMO

Hardfacing

INTRODUCTION OF HARD-FACED WEAR-RESISTANT SUBMERGED ARC WELDING MATERIALS

Base metal introduction

As the base metal for hard surface surfacing welding, there are usually general carbon steel, medium and high carbon steel, tool steel, cast iron, high manganese steel, stainless steel and other materials, so several levels of problems must be considered in welding:

◆(1)Carbon equivalent of base metal: Carbon equivalent of base metal will affect the effectiveness of welding, and also determine the setting of preheating and inter-track temperature. Therefore, evaluation before welding should be carried out.

◆(2)The use environment state of the workpiece: Evaluate the hard-faced welding material according to whether there are friction, impact, high temperature, corrosion and other factors in the use environment of the workpiece.

◆(3)Expected service life: It will affect the type of welding material selected and the number of welding layers.

◆(4)Selection of transition layer: If high carbon-high alloy hard surface welding material is directly welded on the base metal, there will be serious risk of cracking and peeling. It is recommended to weld the transition layer welding material before welding the hard surface layer.

◆(5)Selection of hard surface layer: Appropriate hard surface welding material shall be selected according to the hardness requirements of engineering design, allowable welding thickness, workpiece type, whether heat treatment is required, workpiece use environment state (temperature & corrosivity & wear type, etc.), whether weld bead is allowed to have cracks, etc.

Welding method and Specifications

The main consideration of hard surface welding is that the hard surface layer can be effectively attached to the workpiece, and the degree of cracks is reduced to the lowest or no cracks, so as to give full play to the maximum function of hard surface welding. In order to achieve this goal, welding procedure, temperature management and selection and matching of welding materials are very important. The following suggestions are made on several welding points:

◆ (1)The surface condition of the base metal:

Before welding, determine whether the base metal is a repeated welded workpiece or a new workpiece? If it is a workpiece repaired repeatedly, the residual welding layer before should be evaluated whether it should be processed or backed with welding material of transition layer (buffer layer); If it is a new workpiece, check the oxide layer, pit condition and surface residue on the surface of the base metal before welding.

◆ (2)Preheating and channel temperature control:

Preheating and control of weld temperature can effectively prevent or reduce weld crack. The following suggestions are made on various common base metal types and welding temperature:

Base metal steel grade	Carbon equivalent %	Preheating and inter-channel temperature
Carbon steel, Low alloy steel	≤0.3	≤100°C
	0.3~0.4	≥100°C
	0.4~0.5	≥150°C
	0.5~0.6	≥200°C
	0.6~0.7	≥250°C
	0.7~0.8	≥300°C
	≥0.8	≥350°C
High manganese steel (13% Mn)		No preheating, channel temperature ≤ 200°C or workpiece for water cooling
Vosten iron series stainless steel		≤150°C
High alloy steel (high carbon-high chromium series, etc.)		

Note: Carbon equivalent (%) = $C + \frac{1}{6}Mn + \frac{1}{24}Si + \frac{1}{5}Cr + \frac{1}{4}Mo + \frac{1}{15}Ni$

◆ (3)Post-heating:

For thick plate welding, high carbon equivalent, high carbon and high chromium materials, it is recommended to carry out post-heating treatment at 200 ~ 350°C * 0.5 ~ 1 hour after welding, so as to slow down the cooling rate of weld bead and avoid the risk of excessive cracks or peeling of weld bead.

◆ (4)Post-heat treatment:

Post-welding heat treatment is carried out at 550°C ~ 750°C to prevent cold cracks, eliminate internal stress and quenching and tempering treatment, but the influence of heat treatment conditions on hardness must be evaluated.

◆ (5)Selection of welding materials for transition layer:

The commonly used transition layer will use welding materials of "carbon steel low hydrogen system" or "Vostian iron stainless steel system". Generally, carbon steel-low alloy steel base metal will use carbon steel welding materials as backing transition, while high manganese steel-Vostian iron stainless steel-high alloy steel will use Vostian iron stainless steel welding materials as backing transition.

The selection of transition welding material is not only based on the type of base metal, but also the matching with the material of hard surface welding layer. For example, if 410NM grade welding material is selected in hard surface layer, 309L or 309MoL grade welding material is recommended as transition layer.

◆ (6)Consideration of dilution rate and welding thickness:

The material of hard surface welding is usually different from the composition of base metal, so considering the dilution rate, welding cost, the limitation of welding layer thickness, crack degree and other factors, the design of welding procedure is very important.

INTRODUCTION OF HARD-FACED WEAR-RESISTANT WELDING MATERIALS-COVERED WELDING ROD

SELECTION RECOMMENDATION

AWS has relevant specifications for hard-faced welding materials, such as A5.13 hard-faced covered metal arc welding, A5.21 hard-faced bare welding wire and welding rod, to define materials. However, in general practical application, welding materials rarely define corresponding international specification class numbers. Therefore, in the selection of welding materials, the content of dissolved gold composition, hardness value and application occasions recommended by manufacturers are used as materials.

This kind of material attaches great importance to the design of welding procedure, that is, what kind of welding material to use, preheating temperature, inter-track temperature, number of welding layers, whether to do post-heating, whether to do post-heat treatment, whether there is a transition layer and other important factors will determine the success or failure and service life of a hard-surface welding workpiece.

◆(1)For various environments with different working attributes, the recommended hard surface welding materials are as follows:

Workspace Properties	Hard-faced welding material category	Reference wear rate (%)	Reference hardness value (HRC)
High friction	High carbon-high chromium, high special alloys (W, Nb, V, Co, etc.)	0.05~0.2	50~75
Medium friction + medium impact	Semi-Voss Tian Tie, Voss Tian Tie + Matian Scattered Tie, Matian Scattered Tie, Bolai Tie	0.2~8.0	20~60
High impact	Vosten iron, high manganese steel, medium carbon low alloy steel	6.0~20.0	5~55

◆(2)According to the classification of each hard surface welding material according to the organization type, the recommended application occasions are as follows:

Welding method / Welding structure	Reference hardness (HRC)	Application occasion	Covered weld	Charged wire	Submerged arc welding material
Bolai iron system	10~40	Couplers for gears, shafts, rolls, rolling mills, automatic coupling machines for vehicles, foot peripheral fittings of bulldozers and track head surfaces, etc.	SH-26R, SH-35R, SH-45, SH-45R	SFH-25G, SFH-35G, SFH-45G, SFH-35-O, SFH-41-O	SFH-17S*SF-80
Matian scattered iron series	35~65	Rollers or sprockets of bulldozers, idlers or track shoes, digging edges, rollers, bucket end edges, mixing blades, cutting tools and shells of dredgers, etc.	SH-50, SH-50N4, SH-60, SH-80 series,SH-90	SFH-42MG, SFH-58G, SFH-59G, SFH-63G, SFH-51-O, SFH-56-O	SFH-12S*SF-80, SFH-31S*SF-80, SFH-42S*SF-80, SFH-53S*SF-80, SFH-55S*SF-80

Welding method / Welding structure	Reference hardness (HRC)	Application occasion	Covered weld	Charged wire	Submerged arc welding material
High manganese Vosten iron series	45~50	Blade or roller of crusher, hammer of crusher, claw of excavator and track frog	SH-MN	SFH-MNG, SFH-MN-O	--
High carbon-high chromium system	55~68	Coal pulverizer, coal pulverizer rotor, sand pump shell and pump blade, ghost tooth, receiving tooth, blast furnace cover, grinder, etc.	SH-95HC, SH-95HN	SFH-61GM, SFH-61NbGM, SFH-62GM, SFH-67NMG, SFH-61-O, SFH-65-O, SFH-67-O, SFH-70-O	--
Tungsten carbide system	58~65	Blades of bulldozers, lining tools, relieving teeth, cutting tools, concrete cutters and earth drills, etc.	SH-W, SH-WM	SFH-66WG	--
Cobalt-chromium-tungsten alloy system	30~55	Bushing of high-pressure pump, moving wheel sleeve, sliding surface of high-pressure valve, turbine blade and various cutters, cutting edge for paper industry, valve seat ring of internal combustion engine, high-temperature and high-pressure valve, injection eye mold, etc.	Stellite weld	--	--

WELDING OPERATION

◆ (1)Storage management of welding rod:

Suggestions for Carbon Steel Covered Welders.

◆ (2)Precautions for welding:

①During the cooling process, high carbon-high chromium hard-faced welding materials are especially prone to weld bead cracking. In order to reduce the number of cracks and avoid weld bead peeling, preheating, wire temperature, post-heating control or transition layer as backing shall be carried out according to the manufacturer's recommendations.

②Most hard-faced welding materials have a certain amount of alloy. It is suggested to avoid high heat input during welding to reduce excessive burning loss of alloy and control the weaving amplitude within 3 times of the rod diameter.

③The rest shall be in accordance with the recommendations of carbon steel coated welders.

SH-26R

AWS –
EN –
GB –

SMAW WELDING FOR HARD SURFACE WEAR RESISTANCE

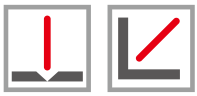
DESCRIPTION & APPLICATIONS :

- SH-26R is a titanium ore series electric welding rod, and the filler metal group is Bolai iron, which is easy to be machined by mechanical cutting.
- It is good to restart arc during welding, and is suitable for light wear between runner, sprocket, axle center, gear and wheel metal.

NOTE ON USAGE :

- Before welding, the weld shall be dried at 120 ˚C for 60 minutes. When in use, a small amount shall be taken out and put into a heat preservation drying cylinder. The maximum amount of weld carried out shall be the same day.
- For multi-layer heap welding of low alloy steel or high carbon steel, the base metal should be preheated above 150°C first.

WELDING POSITION :



TYPICAL CHEMICAL COMPOSITION OF WELD METAL (wt%) :

C	Mn	Si	Cr
0.21	0.48	0.53	1.42

TYPICAL MECHANICAL PROPERTIES OF WELD METAL :

Condition	Vicker's (HV)	Rockwell's (HRC)	Shores's (HS)
Layer temprature 150 ˚ Cunder	300	30	42
pile up welding	270	26	38

SIZE AND RECOMMENDED CURRENT RANGE : AC or DC(+)

Diameter (mm)	3.2	4.0	5.0	5.0
Length (mm)	350	400	400	350
Current (Amp)	70-120	110-170	160-220	130-170

SH-35R

AWS –
EN –
GB –

SMAW WELDING FOR HARD SURFACE WEAR RESISTANCE

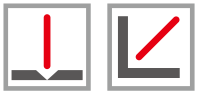
DESCRIPTION & APPLICATIONS :

- SH-35R is a titanium ore series electric welding rod, which has good arc restarting performance during welding.
- It can be machined and can resist impact and light wear.
- It is suitable for welding and mending transmission gears, idlers, pulleys, crawlers, gravel rollers, mud shovels, mud buckets, chains, axles and other parts.

NOTE ON USAGE :

- Before welding, the weld shall be dried at 120°C for 60 minutes. When in use, a small amount shall be taken out and put into a heat preservation drying cylinder. The maximum amount of weld carried out shall be the same day.

WELDING POSITION :



TYPICAL CHEMICAL COMPOSITION OF WELD METAL (wt%) :

C	Mn	Si	Cr
0.3	0.45	0.40	1.90

TYPICAL MECHANICAL PROPERTIES OF WELD METAL :

Condition	Vicker's (HV)	Rockwell's (HRC)	Shores's (HS)
Layer temprature150°Cunder	355	36	48
pile up welding	280	27	40

SIZE AND RECOMMENDED CURRENT RANGE : AC or DC(+)

Diameter (mm)	3.2	4.0	5.0
Length (mm)	350	400	400
Current (Amp)	70-120	110-170	160-220

SH-45

AWS –
EN –
GB –

SMAW WELDING FOR HARD SURFACE WEAR RESISTANCE

DESCRIPTION & APPLICATIONS :

- SH-45 is a low-hydrogen electric welder, and the structure of the filler metal is fertilizer grain iron plus snow carbon iron.
- It is suitable for transmission gears, idlers, pulleys, crawlers, gravel rollers, mud shovels, mud buckets, chains, axles and other parts.

NOTE ON USAGE :

- Before welding, the weld should be dried at 300 ~ 350°C for 30 ~ 60 minutes. When in use, a small amount should be taken out and put into a drying cylinder at 100 ~ 150°C. The maximum amount of weld carried out should be the same day.
- It is suggested to preheat the base metal above 150 °C first.

WELDING POSITION :

TYPICAL CHEMICAL COMPOSITION OF WELD METAL (wt%) :

C	Mn	Si	Cr
0.2	2.1	0.55	2.90

TYPICAL MECHANICAL PROPERTIES OF WELD METAL :

Condition	Vicker's (HV)	Rockwell's (HRC)	Shores's (HS)
Layer temprature 150 °C under	450	45	61
pile up welding	380	39	52
900° C water quenching	470	47	63

SIZE AND RECOMMENDED CURRENT RANGE : AC or DC(+)

Diameter (mm)	3.2	4.0	5.0
Length (mm)	350	400	400
Current (Amp)	70-120	110-170	160-220

SH-45R

AWS –
EN –
GB –

SMAW WELDING FOR HARD SURFACE WEAR RESISTANCE

DESCRIPTION & APPLICATIONS :

- SH-45R is a titanium ore series electric welding rod, and the structure of the filler metal is fertilizer grain iron plus snow carbon iron.
- It is suitable for transmission gear, idler, pulley, crawler, gravel roller, mud shovel, mud bucket, chain, axle and other parts.

NOTE ON USAGE :

- Before welding, the welding rod should be dried at 120°C for 60 minutes, and a small amount should be taken out and put into heat preservation at 100 ~ 150°C when in use. In the drying cylinder, the maximum amount of weld carried out should be the same day.
- It is suggested to preheat the base metal above 150°C first.

WELDING POSITION :

TYPICAL CHEMICAL COMPOSITION OF WELD METAL (wt%) :

C	Mn	Si	Cr
0.24	1.28	0.36	2.43

TYPICAL MECHANICAL PROPERTIES OF WELD METAL :

Condition	Vicker's (HV)	Rockwell's (HRC)	Shores's (HS)
Layer temprature150°Cunder	410	42	56
pile up welding	380	39	52
900° C water quenching	470	47	63

SIZE AND RECOMMENDED CURRENT RANGE : AC or DC(+)

Diameter (mm)	3.2	4.0	5.0
Length (mm)	350	400	400
Current (Amp)	80-120	120-170	160-210

SH-50

AWS –
EN –
GB –

SMAW WELDING FOR HARD SURFACE WEAR RESISTANCE

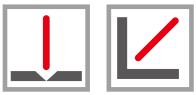
DESCRIPTION & APPLICATIONS :

- SH-50 belongs to titanium oxide low hydrogen electric welding rod, and the dissolved gold component is Matian loose iron structure.
- Because of its high hardness, it is suitable to preheat and relieve stress, avoid cracking, have good corrosion resistance and acid resistance, and have excellent impact wear resistance at high temperature.
- It is suitable for repairing conveyor runner, transmission steel wheel, steel nail and other workpieces.

NOTE ON USAGE :

- The rust layer, moisture, oil stain, dust, etc. of the welded part shall be removed.
- Before welding, the weld should be dried at 300 ~ 350°C for 30 ~ 60 minutes. When in use, a small amount should be taken out and put into a drying cylinder at 100 ~ 150°C. The maximum amount of weld carried out should be the same day.
- It is recommended that the workpiece be preheated above 200°C.

WELDING POSITION :



TYPICAL CHEMICAL COMPOSITION OF WELD METAL (wt%) :

C	Mn	Si	Ni	Cr
0.21	0.30	0.65	0.18	14.20

TYPICAL MECHANICAL PROPERTIES OF WELD METAL :

Condition		Vicker's (HV)		Rockwell's (HRC)		Shores's (HS)
Layer temprature 150 °C under		545		52		70
pile up welding		500		49		66
After harden		595		55		74
High temperature hardness	Temprarture(°C)	200	300	400	500	–
	Vicker's (HV)	460	400	290	160	–

SIZE AND RECOMMENDED CURRENT RANGE : AC or DC(+)

Diameter (mm)	3.2	4.0	5.0
Length (mm)	350	350	350
Current (Amp)	80-120	120-170	160-210

SH-50N4

AWS -
EN -
GB -

SMAW WELDING FOR HARD SURFACE WEAR RESISTANCE

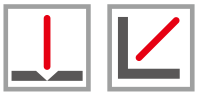
DESCRIPTION & APPLICATIONS :

- SH-50N4 belongs to titanium oxide low hydrogen electric welding rod. The dissolved gold component is Matian loose iron structure and contains nickel (Ni), molybdenum (Mo) and other elements.
- Strong toughness, excellent heat resistance, corrosion resistance and cracking resistance, great effect on resisting thermal fatigue cracking, and excellent wear resistance to reheating at high temperature.
- Applicable to water wheel blades, heat exchanger wings, eye masks, unpopular seats, etc.

NOTE ON USAGE :

- Before welding, the weld should be dried at 150 ~ 200°C for 30 ~ 60 minutes. When in use, a small amount should be taken out and put into a drying cylinder at 100 ~ 150°C. The maximum amount of weld carried out should be the same day.
- It is suggested that the base metal should be preheated above 150 °C.
- Backing welding adopts low hydrogen welding material or Vosten iron stainless steel welding material.

WELDING POSITION :



TYPICAL CHEMICAL COMPOSITION OF WELD METAL (wt%) :

C	Mn	Si	Ni	Cr	Mo
0.15	0.24	0.65	3.81	12.69	0.69

TYPICAL MECHANICAL PROPERTIES OF WELD METAL :

Condition	Vicker's (HV)	Rockwell's (HRC)	Shores's (HS)
Layer temprature 150 °C under	497	51	68

SIZE AND RECOMMENDED CURRENT RANGE : AC or DC(+)

Diameter (mm)	3.2	4.0	5.0
Length (mm)	350	350	350
Current (Amp)	80-120	120-170	160-210

SH-58HC

AWS –
EN –
GB –

SMAW WELDING FOR HARD SURFACE WEAR RESISTANCE

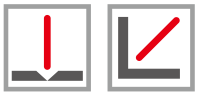
DESCRIPTION & APPLICATIONS :

- SH-58HC is a low-hydrogen electric welder, and the dissolved gold is a primary carbide and eutectic structure.
- The content of chromium carbide is high, and the hardness has little downward trend at high temperature, so the high temperature wear resistance and corrosion resistance are excellent.
- Suitable for mixing blades, cutters, sievers, etc.

NOTE ON USAGE :

- Before welding, the weld should be dried at 300 ~ 350°C for 30 ~ 60 minutes. When in use, a small amount should be taken out and put into a drying cylinder at 100 ~ 150°C. The maximum amount of weld carried out should be the same day.
- The base metal is preheated at a temperature above 400 °C.
- It is preferable that the number of welded layers should not exceed 2 or 3 layers.

WELDING POSITION :



TYPICAL CHEMICAL COMPOSITION OF WELD METAL (wt%) :

C	Mn	Si	Cr
3.7	1.35	0.69	34.77

TYPICAL MECHANICAL PROPERTIES OF WELD METAL :

Condition	Vicker's (HV)	Rockwell's (HRC)	Shores's (HS)
Layer temprature 150 °C under	680	59	80
pile up welding	660	58	79

SIZE AND RECOMMENDED CURRENT RANGE : AC or DC(+)

Diameter (mm)	3.2	4.0	5.0
Length (mm)	350	400	400
Current (Amp)	90-140	140-180	190-220

SH-60

AWS -
EN -
GB -

SMAW WELDING FOR HARD SURFACE WEAR RESISTANCE

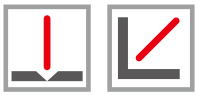
DESCRIPTION & APPLICATIONS :

- SH-60 is a low-hydrogen electric welder, and the filler metal structure is Matian loose iron.
- It is a self-hardening wear-resistant welder, which has good effect on moderate impact and wear, and is difficult to cut mechanically.
- It is suitable for welding and repairing the wear between metal contact surfaces such as wheel chain, stone crusher, connecting ring, bucket, gravel plate, earth stacker, earth stacker, vehicle guide, shovel tooth, crawler, pump barrel, blade, etc.

NOTE ON USAGE :

- Before welding, the weld shall be dried at 300 ~ 350°C for 60 minutes. When in use, a small amount shall be taken out and put into a drying cylinder at 100 ~ 150°C. The maximum amount of weld carried out shall be the same day.
- The base metal should be preheated above 150°C first, and it is suggested to use low hydrogen welder as backing.

WELDING POSITION :



TYPICAL CHEMICAL COMPOSITION OF WELD METAL (wt%) :

C	Mn	Si	Cr
0.31	1.20	0.29	3.0

TYPICAL MECHANICAL PROPERTIES OF WELD METAL :

Condition	Vicker's (HV)	Rockwell's (HRC)	Shores's (HS)
Layer temprature 150°C under	450	45	61
pile up welding	380	39	52
600°C water quenching	355	36	49

SIZE AND RECOMMENDED CURRENT RANGE : AC or DC(+)

Diameter (mm)	3.2	4.0	5.0
Length (mm)	350	400	400
Current (Amp)	80-120	120-170	160-210

SH-80

AWS –
EN –
GB –

SMAW WELDING FOR HARD SURFACE WEAR RESISTANCE

DESCRIPTION & APPLICATIONS :

- SH-80 is a low hydrogen electric welder with self-hardening Matian loose iron structure.
- It is most suitable for repairing and heap welding of mechanical parts with high wear resistance requirements, with excellent workability and welding slag peeling, and difficult machining.
- It is suitable for pump barrel, cutter, pump barrel vane, earth stacker and other parts.

NOTE ON USAGE :

- Before welding, the weld should be dried at 300 ~ 350°C for 30 ~ 60 minutes. When in use, a small amount should be taken out and put into a drying cylinder at 100 ~ 150°C. The maximum amount of weld carried out should be the same day.
- The base metal is preheated at a temperature above 200°C.
- Low hydrogen welding material is used for backing welding.

WELDING POSITION :

TYPICAL CHEMICAL COMPOSITION OF WELD METAL (wt%) :

C	Mn	Si	Cr	Mo
0.59	1.12	1.00	9.20	0.60

TYPICAL MECHANICAL PROPERTIES OF WELD METAL :

Condition		Vicker's (HV)		Rockwell's (HRC)		Shores's (HS)	
Layer temprature 150°C under		600		55		74	
pile up welding		560		53		71	
High temperature hardness	Temprarture(°C)	200	300	400	500	600	700
	Vicker's (HV)	520	480	430	420	210	95

SIZE AND RECOMMENDED CURRENT RANGE : AC or DC(+)

Diameter (mm)	3.2	4.0	5.0
Length (mm)	350	400	400
Current (Amp)	80-120	120-170	160-210

SH-80R

AWS –
EN –
GB –

SMAW WELDING FOR HARD SURFACE WEAR RESISTANCE

DESCRIPTION & APPLICATIONS :

- SH-80R belongs to titanium ore series electric welding rod, which is self-hardening Matian loose iron structure.
- It has good arc restart during welding, and is suitable for pump barrel, cutter, pump barrel vane, earth stacker and other parts.

NOTE ON USAGE :

- Before welding, the weld should be dried at 120°C for 60 minutes. When in use, a small amount should be taken out and put into a drying cylinder with a heat preservation of 100 ~ 150°C. The maximum amount of weld carried out should be the same day.
- The base metal should be preheated above 150°C first.

WELDING POSITION :

TYPICAL CHEMICAL COMPOSITION OF WELD METAL (wt%) :

C	Mn	Si	Cr
0.37	0.48	0.52	5.41

TYPICAL MECHANICAL PROPERTIES OF WELD METAL :

Condition	Vicker's (HV)	Rockwell's (HRC)	Shores's (HS)
Layer temprature150°Cunder	600	55	74
pile up welding	500	49	66
900° C water quenching	635	57	77

SIZE AND RECOMMENDED CURRENT RANGE : AC or DC(+)

Diameter (mm)	3.2	4.0	5.0
Length (mm)	350	400	400
Current (Amp)	80-120	120-170	160-210

SH-80W

AWS –
EN –
GB –

SMAW WELDING FOR HARD SURFACE WEAR RESISTANCE

DESCRIPTION & APPLICATIONS :

- SH-80W is a low hydrogen electric welder with self-hardening Matian loose iron structure.
- It is most suitable for repairing and heap welding of mechanical parts with high wear resistance requirements, with excellent workability and welding slag peeling, and difficult machining.
- Applicable to pump drum, screw conveyor, sugarcane knife, sugarcane, earth stacker parts, etc.

NOTE ON USAGE :

- Before welding, the weld should be dried at 300 ~ 350°C for 30 ~ 60 minutes. When in use, a small amount should be taken out and put into a drying cylinder at 100 ~ 150°C. The maximum amount of weld carried out should be the same day.
- The base metal is preheated at a temperature above 200°C.
- Low hydrogen welding material is recommended for backing welding material.

WELDING POSITION :

TYPICAL CHEMICAL COMPOSITION OF WELD METAL (wt%) :

C	Mn	Si	Cr	Mo	W
0.67	1.18	1.26	7.10	1.42	2.30

TYPICAL MECHANICAL PROPERTIES OF WELD METAL :

Condition		Vicker's (HV)		Rockwell's (HRC)		Shores's (HS)	
Layer temprature 150°C under pile up welding		680		59		80	
		660		58		79	
High temperature hardness	Temprarture(°C)	200	300	400	500	600	700
	Vicker's (HV)	530	490	440	430	210	100

SIZE AND RECOMMENDED CURRENT RANGE : AC or DC(+)

Diameter (mm)	3.2	4.0	5.0
Length (mm)	350	400	400
Current (Amp)	80-120	120-170	160-210

SH-80B

AWS -
EN -
GB -

SMAW WELDING FOR HARD SURFACE WEAR RESISTANCE

DESCRIPTION & APPLICATIONS :

- SH-80B is a low hydrogen electric welder with self-hardening Matian loose iron structure.
- It is most suitable for repairing and heap welding of mechanical parts with high wear resistance requirements, and has excellent workability and welding slag peeling property, Machining is difficult.
- It is suitable for welding repair of medium carbon steel, low alloy, sand wear, pump barrel blades, stirring blades, etc.

NOTE ON USAGE :

- Before welding, the weld should be dried at 300 ~ 350°C for 30 ~ 60 minutes. When in use, a small amount should be taken out and put into a drying cylinder at 100 ~ 150°C. The maximum amount of weld carried out should be the same day.
- The base metal is preheated at a temperature above 200°C.
- In multi-layer heap welding, the hardening property is higher than that of the base metal, so it is advisable to use low hydrogen electric welding rod for bottom welding first.

WELDING POSITION :

TYPICAL CHEMICAL COMPOSITION OF WELD METAL (wt%) :

C	Mn	Si	Cr	B
1.29	1.11	0.99	6.99	0.29

TYPICAL MECHANICAL PROPERTIES OF WELD METAL :

Condition	Vicker's (HV)	Rockwell's (HRC)	Shores's (HS)
Layer temprature 150 °C under	660	58	79
pile up welding	620	56	75

SIZE AND RECOMMENDED CURRENT RANGE : AC or DC(+)

Diameter (mm)	3.2	4.0	5.0
Length (mm)	350	400	400
Current (Amp)	80-120	120-170	160-210

SH-90

AWS –
EN –
GB –

SMAW WELDING FOR HARD SURFACE WEAR RESISTANCE

DESCRIPTION & APPLICATIONS :

- SH-90 is a low hydrogen electric welding rod, which forms a hard self-hardening Matian loose iron structure due to carbide precipitation.
- High hardness, slightly poor toughness, no heat treatment, no mechanical cutting, but can maintain the best wear property, suitable for low impact, intense wear parts.
- Suitable for civil construction machinery, dredging machinery, buckets, sand suction pumps, etc.

NOTE ON USAGE :

- Before welding, the weld shall be dried at 300 ~ 350°C for 60 minutes. When in use, a small amount shall be taken out and put into a drying cylinder at 100 ~ 150°C. The maximum amount of weld carried out shall be the same day.
- Base metal preheating and layer temperature should be controlled above 300°C.
- Low hydrogen welding material is recommended for backing welding material.

WELDING POSITION :

TYPICAL CHEMICAL COMPOSITION OF WELD METAL (wt%) :

C	Mn	Si	Cr	Mo
0.63	1.07	1.0	7.60	0.93

TYPICAL MECHANICAL PROPERTIES OF WELD METAL :

Condition	Vicker's (HV)	Rockwell's (HRC)	Shores's (HS)
Layer temprature 150 °C under pile up welding	665	58	78
	620	56	75

SIZE AND RECOMMENDED CURRENT RANGE : AC or DC(+)

Diameter (mm)	3.2	4.0	5.0
Length (mm)	350	400	400
Current (Amp)	80-120	120-170	160-210

SH-90HS

AWS –
EN –
GB –

SMAW WELDING FOR HARD SURFACE WEAR RESISTANCE

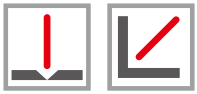
DESCRIPTION & APPLICATIONS :

- SH-90HS is a low-hydrogen electric welding rod, and the filler metal is Mo high-speed tool steel.
- Excellent high-temperature hardness, can withstand working temperature to 550 ˚C, and can obtain extremely stable hardness and toughness after quenching and tempering heat treatment.
- Suitable for welding and repairing cutting tools, dies, high speed steel, hot stamping dies, etc.

NOTE ON USAGE :

- Before welding, the weld shall be dried at 300 ~ 350°C for 60 minutes. When in use, a small amount shall be taken out and put into a drying cylinder at 100 ~ 150°C. The maximum amount of weld carried out shall be the same day.
- Please perform heat treatment according to the following recommendations:
  Quenching: oil quenching at 1200 ~ 1250°C
  Tempering: air cooling at 540 ~ 570°C

WELDING POSITION :



TYPICAL CHEMICAL COMPOSITION OF WELD METAL (wt%) :

C	Mn	Si	Cr	Mo	V	W
1.30	0.33	0.60	5.60	4.60	2.80	8.50

TYPICAL MECHANICAL PROPERTIES OF WELD METAL :

Condition		Vicker's (HV)	Rockwell's (HRC)	Shores's (HS)
Layer temprature 150 ˚C under pile up welding		670	61	83
		660	58	79
High temperature hardness	1200~1250° C oil hardening	200	400	600
	540~570° C air cooling			

SIZE AND RECOMMENDED CURRENT RANGE : AC or DC(+)

Diameter (mm)	3.2	4.0	5.0
Length (mm)	350	400	400
Current (Amp)	80-120	120-170	160-210

SH-95HC

AWS –
EN –
GB –

SMAW WELDING FOR HARD SURFACE WEAR RESISTANCE

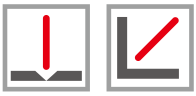
DESCRIPTION & APPLICATIONS :

- SH-95HC is a low-hydrogen electric welder, and the dissolved gold is a primary carbide and eutectic structure.
- The content of chromium carbide is high, and the hardness has little downward trend at high temperature, so it has good high temperature wear resistance and excellent corrosion resistance, and is suitable for stirring blades, cutters, sieves, etc.

NOTE ON USAGE :

- Before welding, the weld should be dried at 300 ~ 350°C for 30 ~ 60 minutes. When in use, a small amount should be taken out and put into a drying cylinder at 100 ~ 150°C. The maximum amount of weld carried out should be the same day.
- The base metal is preheated at a temperature above 400°C.
- It is preferable that the number of welded layers should not exceed 2 or 3 layers.

WELDING POSITION :



TYPICAL CHEMICAL COMPOSITION OF WELD METAL (wt%) :

C	Mn	Si	Cr
5.13	3.00	0.20	26.5

TYPICAL MECHANICAL PROPERTIES OF WELD METAL :

Condition		Vicker's (HV)		Rockwell's (HRC)		Shores's (HS)	
Layer temprature 150 °C under		700		60		81	
pile up welding		680		59		80	
High temperature hardness	Temprarture(°C)	200	300	400	500	600	700
	Vicker's (HV)	610	440	400	310	210	95

SIZE AND RECOMMENDED CURRENT RANGE : AC or DC(+)

Diameter (mm)	3.2	4.0	5.0
Length (mm)	350	400	400
Current (Amp)	90-140	140-180	190-220

SH-95HN

AWS –
EN –
GB –

SMAW WELDING FOR HARD SURFACE WEAR RESISTANCE

DESCRIPTION & APPLICATIONS :

- SH-95HN is a low hydrogen electric welding rod, and the dissolved gold component contains chromium (Cr), niobium (Nb), molybdenum (Mo), tungsten (W), vanadium (V) and other elements.
- Excellent wear resistance at high temperature and excellent wear resistance in high temperature corrosion environment, suitable for sandblasting nozzle, pump body, pump vane, combustion nozzle, etc.

NOTE ON USAGE :

- Before welding, the weld should be dried at 300 ~ 350°C for 30 ~ 60 minutes. When in use, a small amount should be taken out and put into a drying cylinder at 100 ~ 150°C. The maximum amount of weld carried out should be the same day.
- The base metal is preheated at a temperature above 250°C.
- Avoid spalling of molten gold during multi-layer welding, and it is better to weld with cross hollow lattice.

WELDING POSITION :

TYPICAL CHEMICAL COMPOSITION OF WELD METAL (wt%) :

C	Mn	Si	Cr	Mo	Nb	W	V
5.37	1.28	2.41	21.5	4.74	6.47	1.81	0.9

TYPICAL MECHANICAL PROPERTIES OF WELD METAL :

Condition		Vicker's (HV)		Rockwell's (HRC)		Shores's (HS)
Layer temprature 150 °C under		800		64		88
pile up welding		700		60		81
High temperature hardness	Temprarture(°C)	300	400	500	600	–
	Vicker's (HV)	730	650	580	460	–

SIZE AND RECOMMENDED CURRENT RANGE : AC or DC(+)

Diameter (mm)	3.2	4.0	5.0
Length (mm)	350	400	400
Current (Amp)	70-120	110-170	160-220

SH-W

AWS –
EN –
GB –

SMAW WELDING FOR HARD SURFACE WEAR RESISTANCE

DESCRIPTION & APPLICATIONS :

- SH-W is a low-hydrogen electric welding rod, and the dissolved gold component contains high tungsten (W) element.
- It produces tungsten carbide structure with high hardness, has excellent wear resistance, is suitable for places with slight impact but intense wear, is easy to produce cracks, and is not suitable for multi-layer welding.
- Suitable for bulldozer, drill top, concrete cutter, cutting blade, pump impeller blade, etc.

NOTE ON USAGE :

- Before welding, the weld should be dried at 300 ~ 350°C for 30 ~ 60 minutes. When in use, a small amount should be taken out and put into a drying cylinder at 100 ~ 150°C. The maximum amount of weld carried out should be the same day.
- The base metal is preheated at a temperature above 300°C, welded and subjected to post-heat treatment at 600°C.
- Avoid spalling of molten gold during multi-layer welding, and it is better to weld with cross hollow lattice.

WELDING POSITION :

TYPICAL CHEMICAL COMPOSITION OF WELD METAL (wt%) :

C	Mn	Si	W
2.50	1.67	1.00	41.58

TYPICAL MECHANICAL PROPERTIES OF WELD METAL :

Condition	Vicker's (HV)	Rockwell's (HRC)	Shores's (HS)
Layer temprature 150°C under	780	63	87
pile up welding	660	58	79

SIZE AND RECOMMENDED CURRENT RANGE : AC or DC(+)

Diameter (mm)	3.2	4.0	5.0
Length (mm)	350	400	400
Current (Amp)	80-120	120-170	160-210

SH-WM

AWS -
EN -
GB -

SMAW WELDING FOR HARD SURFACE WEAR RESISTANCE

DESCRIPTION & APPLICATIONS :

- SH-WM is a low-hydrogen electric welding rod, and the dissolved gold component contains molybdenum (Mo) and tungsten (W) elements.
- The tungsten carbide structure with high hardness is produced, which has excellent wear resistance. Its composition contains molybdenum (Mo), which can increase its toughness and prevent cracking due to segregation of tungsten carbide.
- Suitable for cutters, bucket teeth, stirring spiral blades, scrapers, etc.

NOTE ON USAGE :

- Before welding, the weld should be dried at 300 ~ 350°C for 30 ~ 60 minutes. When in use, a small amount should be taken out and put into a drying cylinder at 100 ~ 150°C. The maximum amount of weld carried out should be the same day.
- The base metal is preheated at a temperature above 300°C.

WELDING POSITION :

TYPICAL CHEMICAL COMPOSITION OF WELD METAL (wt%) :

C	Mn	Si	Mo	W
2.50	1.3	1.10	3.50	35.5

TYPICAL MECHANICAL PROPERTIES OF WELD METAL :

Condition	Vicker's (HV)	Rockwell's (HRC)	Shores's (HS)
Layer temprature150°Cunder	750	62	85

SIZE AND RECOMMENDED CURRENT RANGE : AC or DC(+)

Diameter (mm)	3.2	4.0	5.0
Length (mm)	350	400	400
Current (Amp)	80-120	120-170	160-210

SH-MN

AWS A5.13 EFeMn-A
EN –
GB –

SMAW WELDING FOR HARD SURFACE WEAR RESISTANCE

DESCRIPTION & APPLICATIONS :

- The filler metal of SH-MN is 13% Mn-4% Ni, which shows stable Vostian iron structure and excellent crack resistance.
- It has high work hardening property and good strength and toughness, and is suitable for heavy impact wear.
- It is suitable for heap welding of crusher cone body, crusher punch, etc. and nest burying repair welding of 13 Mn cast steel.

NOTE ON USAGE :

- Before welding, the weld should be dried at 300 ~ 350°C for 30 ~ 60 minutes. When in use, a small amount should be taken out and put into a drying cylinder at 100 ~ 150°C. The maximum amount of weld carried out should be the same day.
- The welding of 13 Mn steel does not need preheating, and low current should be used to prevent the base metal from overheating.

WELDING POSITION :

TYPICAL CHEMICAL COMPOSITION OF WELD METAL (wt%) :

C	Mn	Si	Ni
0.67	15.20	0.18	3.00

TYPICAL MECHANICAL PROPERTIES OF WELD METAL :

Condition	Vicker's (HV)	Rockwell's (HRC)	Shores's (HS)
Layer temprature 150 °C under	460	46	62

SIZE AND RECOMMENDED CURRENT RANGE : AC or DC(+)

Diameter (mm)	3.2	4.0	5.0
Length (mm)	350	400	400
Current (Amp)	80-120	120-170	160-210

SELECTION RECOMMENDATION

AWS has relevant specifications for hard-faced welding materials, such as A5.13 hard-faced covered metal arc welding, A5.21 hard-faced bare welding wire and welding rod, to define materials. However, in general practical application, welding materials rarely define corresponding international specification class numbers. Therefore, in the selection of welding materials, the content of dissolved gold composition, hardness value and application occasions recommended by manufacturers are used as materials.

This kind of material attaches great importance to the design of welding procedure, that is, what kind of welding material to use, preheating temperature, inter-track temperature, number of welding layers, whether to do post-heating, whether to do post-heat treatment, whether there is a transition layer and other important factors will determine the success or failure and service life of a hard-surface welding workpiece.

◆(1)For various environments with different working attributes, the recommended hard surface welding materials are as follows:

Workspace Properties	Hard-faced welding material category	Reference wear rate (%)	Reference hardness value (HRC)
High friction	High carbon-high chromium, high special alloys (W, Nb, V, Co, etc.)	0.05~0.2	50~75
Medium friction + medium impact	Semi-Voss Tian Tie, Voss Tian Tie + Matian Scattered Tie, Matian Scattered Tie, Bolai Tie	0.2~8.0	20~60
High impact	Vosten iron, high manganese steel, medium carbon low alloy steel	6.0~20.0	5~55

◆(2)According to the classification of each hard surface welding material according to the organization type, the recommended application occasions are as follows:

Welding method / Welding structure	Reference hardness (HRC)	Application occasion	Covered weld	Charged wire	Submerged arc welding material
Bolai iron system	10~40	Couplers for gears, shafts, rolls, rolling mills, automatic coupling machines for vehicles, foot peripheral fittings of bulldozers and track head surfaces, etc.	SH-26R, SH-35R, SH-45, SH-45R	SFH-25G, SFH-35G, SFH-45G, SFH-35-O, SFH-41-O	SFH-17S*SF-80
Matian scattered iron series	35~65	Rollers or sprockets of bulldozers, idlers or track shoes, digging edges, rollers, bucket end edges, mixing blades, cutting tools and shells of dredgers, etc.	SH-50, SH-50N4, SH-60, SH-80 series, SH-90	SFH-42MG, SFH-58G, SFH-59G, SFH-63G, SFH-51-O, SFH-56-O	SFH-12S*SF-80, SFH-31S*SF-80, SFH-42S*SF-80, SFH-53S*SF-80, SFH-55S*SF-80

Welding method / Welding structure	Reference hardness (HRC)	Application occasion	Covered weld	Charged wire	Submerged arc welding material
High manganese Vosten iron series	45~50	Blade or roller of crusher, hammer of crusher, claw of excavator and track frog	SH-MN	SFH-MNG, SFH-MN-O	--
High carbon-high chromium system	55~68	Coal pulverizer, coal pulverizer rotor, sand pump shell and pump blade, ghost tooth, receiving tooth, blast furnace cover, grinder, etc.	SH-95HC, SH-95HN	SFH-61GM, SFH-61NbGM, SFH-62GM, SFH-67NMG, SFH-61-O, SFH-65-O, SFH-67-O, SFH-70-O	--
Tungsten carbide system	58~65	Blades of bulldozers, lining tools, relieving teeth, cutting tools, concrete cutters and earth drills, etc.	SH-W, SH-WM	SFH-66WG	--
Cobalt-chromium-tungsten alloy system	30~55	Bushing of high-pressure pump, moving wheel sleeve, sliding surface of high-pressure valve, turbine blade and various cutters, cutting edge for paper industry, valve seat ring of internal combustion engine, high-temperature and high-pressure valve, injection eye mold, etc.	Stellite weld	--	--

WELDING OPERATION

◆ **(1)Storage management of welding rod:**

Recommendations for the same type of carbon steel coated welding wire.

◆ **(2)Precautions for welding:**

①The hard breaded welding wire can be divided into welding slag type and metal type welding wire according to whether there is welding slag. If there is no shielding gas, it can be divided into gas shielded or self-shielded welding wire.

②Metal type flux-coated welding wires are mostly hard-surfaced materials with higher alloy content. This product has lower smoke and dust, higher slag spray, and poorer handling than slag-type flux-coated welding wires.

③The wire diameter of the gas shielded hard bread welding wire is mostly designed to be 1.2~1.6mm, and the wire diameter of the self-shielding coated welding wire is mostly designed to be 1.6~2.8mm; the self-shielding hard surface welding wire is for special applications The welding consumables developed by the demand for large fillers are worse than gas shielded welding wires in terms of slag spray volume, smoke volume and controllability.

④Pay attention to the matching of current and voltage to avoid excessive penetration of the bottom channel and cause excessive dilution rate.

SFH-MNG

AWS –
EN –
GB –

FCAW WELDING FOR HARD SURFACE WEAR RESISTANCE

DESCRIPTION & APPLICATIONS :

- SFH-MNG is a gas-shielded work-hardening hard bread welding wire with excellent crack resistance.
- It has high work hardening property and good strength and toughness, and is suitable for heavy impact wear.
- It is suitable for heap welding of crusher cone body, crusher punching, etc. and nest burying repair welding of 13Mn cast steel.

NOTE ON USAGE :

- The rust layer, moisture, oil stain, dust, etc. of the welded part shall be removed.
- The welding of base metal 13Mn steel does not need preheating, and low current should be used to prevent the base metal from overheating.
- Using CO_2 as protective gas, the purity of CO_2 gas is over 99.8%, and the flow rate is 15 ~ 25 l/min.

Typical Chemical Composition Of Weld Metal (wt%):

C	Mn	Si	Ni
0.71	12.75	0.20	4.0

HARDNESS :

Hardness	18~22
Hardness after work hardening (HRC)	44~48

Size And Recommended Current Range : DC(+)

Diameter (mm)	Voltage (V)
1.2	25-36
1.6	25-35
Current (A)	**Gas flow (l/min)**
200-300	15-25
250-400	15-25

SFH-25G

AWS –
EN –
GB –

FCAW WELDING FOR HARD SURFACE WEAR RESISTANCE

DESCRIPTION & APPLICATIONS :

- SFH-25G is a gas shielded hard bread welding wire, which can be used as a hard surface welding material for backing or general abrasion.
- It is suitable for transmission gears, idlers, pulleys, crawlers, gravel rollers, mud shovels, mud buckets, chains, axles and other parts.

NOTE ON USAGE :

- Using CO_2 as protective gas, the purity of CO_2 gas is over 99.8%, and the flow rate is 15 ~ 25 l/min.

Typical Chemical Composition Of Weld Metal (wt%):

C	Mn	Si	Cr	Mo
0.121	1.73	0.68	1.18	0.45

HARDNESS :

Layers	2nd layer	3rd layer	4th layer
Hardness (HRC)	22	23	25

Size And Recommended Current Range : DC(+)

Diameter (mm)	Voltage (V)
1.2	25-36
1.6	25-35
Current (A)	**Gas flow (l/min)**
200-300	15-25
250-400	15-25

SFH-35G

AWS –
EN –
GB –

FCAW WELDING FOR HARD SURFACE WEAR RESISTANCE

DESCRIPTION & APPLICATIONS :

- SFH-35G is a gas shielded hard bread welding wire, which can be used as a hard surface welding material for general wear resistance consumption.
- It is suitable for transmission gears, idlers, pulleys, crawlers, gravel rollers, mud shovels, mud buckets, chains, axles and other parts.

NOTE ON USAGE :

- Using CO_2 as protective gas, the purity of CO_2 gas is over 99.8%, and the flow rate is 15 ~ 25 l/min.

Typical Chemical Composition Of Weld Metal (wt%):

C	Mn	Si	Cr	Mo
0.20	1.90	0.72	1.70	0.53

HARDNESS :

Layers	2nd layer	3rd layer	4th layer
Hardness (HRC)	32	36	39

Size And Recommended Current Range : DC(+)

Diameter (mm)	Voltage (V)
1.2	25-36
1.6	25-35
Current (A)	Gas flow (l/min)
200-300	15-25
250-400	15-25

SFH-42MG

AWS –
EN –
GB –

FCAW WELDING FOR HARD SURFACE WEAR RESISTANCE

DESCRIPTION & APPLICATIONS :

- SFH-42MG is a gas-shielded hard welding wire with 13% Cr-1% Mo in dissolved gold.
- It is suitable for corrosion-resistant and soil-resistant applications, such as mixing propellers, stamping dies, digging shovels, valve seats, bulldozer components, turbine blades, and hard-faced welding of conveying spirals.

NOTE ON USAGE :

- It is suggested that the preheating and interlayer temperature should exceed 200 °C and be cooled to room temperature after welding.
- Using CO_2 as protective gas, the purity of CO_2 gas is over 99.8%, and the flow rate is 15 ~ 25 l/min.

Typical Chemical Composition Of Weld Metal (wt%):

C	Mn	Si	Cr	Mo
0.28	0.42	0.43	12.61	0.75

HARDNESS :

Layers	4th layer
Hardness (HRC)	52-56

Size And Recommended Current Range : DC(+)

Diameter (mm)	Voltage (V)
1.2	25-32
1.6	28-38
Current (A)	Gas flow (l/min)
150-300	15-25
200-400	15-25

SFH-45G

AWS –
EN –
GB –

FCAW WELDING FOR HARD SURFACE WEAR RESISTANCE

DESCRIPTION & APPLICATIONS :

- SFH-45G is a gas shielded hard bread welding wire.
- It is suitable for transmission gears, idlers, pulleys, crawlers, gravel rollers, mud shovels, mud buckets, chains, axles and other parts.

NOTE ON USAGE :

- Preheating and interlayer temperature need to exceed 300 ℃.
- Using CO_2 as protective gas, the purity of CO_2 gas is over 99.8%, and the flow rate is 15 ~ 25 l/min.

Typical Chemical Composition Of Weld Metal (wt%):

C	Mn	Si	Cr
0.30	1.90	0.70	3.00

HARDNESS :

Layers	2nd layer	3rd layer	4th layer
Hardness (HRC)	42	46	50

Size And Recommended Current Range : DC(+)

Diameter (mm)	Voltage (V)
1.2	25-36
1.6	25-35
Current (A)	**Gas flow (l/min)**
200-300	15-25
250-400	15-25

SFH-50G

AWS –
EN –
GB –

FCAW WELDING FOR HARD SURFACE WEAR RESISTANCE

DESCRIPTION & APPLICATIONS :

- SFH-50G is a gas shielded hard bread welding wire.
- It is suitable for hard surface welding of bulldozer blades, bucket lips, dumping teeth and propeller components subject to severe soil friction.

NOTE ON USAGE :

- Preheating and interlayer temperature need to exceed 300 ℃.
- Using CO_2 as protective gas, the purity of CO_2 gas is over 99.8%, and the flow rate is 15 ~ 25 l/min.

Typical Chemical Composition Of Weld Metal (wt%):

C	Mn	Si	Cr	Mo	Ti
0.26	1.83	0.52	6.21	0.52	0.14

HARDNESS :

Layers	2nd layer	3rd layer	4th layer
Hardness (HRC)	49	52	54

Size And Recommended Current Range : DC(+)

Diameter (mm)	Voltage (V)
1.2	25-36
1.6	25-35
Current (A)	**Gas flow (l/min)**
200-300	15-25
250-400	15-25

SFH-55G

AWS –
EN –
GB –

FCAW WELDING FOR HARD SURFACE WEAR RESISTANCE

DESCRIPTION & APPLICATIONS :

- SFH-55G is a gas shielded hard bread welding wire.
- It is suitable for hard surface welding of bulldozer blades, bucket lips, dumping teeth and propeller components subject to severe soil friction.

NOTE ON USAGE :

- Preheating and interlayer temperature need to exceed 300 °C.
- Using CO_2 as protective gas, the purity of CO_2 gas is over 99.8%, and the flow rate is 15 ~ 25 l/min.

Typical Chemical Composition Of Weld Metal (wt%):

C	Mn	Si	Cr	Mo	Ti
0.42	0.70	2.30	8.00	0.62	0.14

HARDNESS :

Layers	2nd layer	3rd layer	4th layer
Hardness (HRC)	52	54	55

Size And Recommended Current Range : DC(+)

Diameter (mm)	Voltage (V)
1.2	25-36
1.6	25-35
Current (A)	Gas flow (l/min)
200-300	15-25
250-400	15-25

SFH-58G

AWS –
EN –
GB –

FCAW WELDING FOR HARD SURFACE WEAR RESISTANCE

DESCRIPTION & APPLICATIONS :

- SFH-58G is a gas shielded hard bread welding wire. Its dissolved gold has high hardness and is superior in wear resistance due to its tungsten (W) content.
- It is suitable for hard surface welding of bulldozer blades, bucket lips, dumping teeth and propeller components subject to severe soil friction.

NOTE ON USAGE :

- Preheating and interlayer temperature need to exceed 300 °C.
- Using CO_2 as protective gas, the purity of CO_2 gas is over 99.8%, and the flow rate is 15 ~ 25 l/min.

Typical Chemical Composition Of Weld Metal (wt%):

C	Mn	Si	Cr	W
0.50	0.58	0.90	8.0	0.5

HARDNESS :

Layers	2nd layer	3rd layer	4th layer
Hardness (HRC)	55	56	58

Size And Recommended Current Range : DC(+)

Diameter (mm)	Voltage (V)
1.2	25-36
1.6	25-35
Current (A)	Gas flow (l/min)
200-300	15-25
250-400	15-25

SFH-58GM

AWS –
EN –
GB –

FCAW WELDING FOR HARD SURFACE WEAR RESISTANCE

DESCRIPTION & APPLICATIONS :

- SFH-58GM is a gas shielded metal mold hard bread flux welding wire. Its dissolved gold has high hardness and excellent wear resistance at normal temperature.
- It is suitable for hard surface welding of bulldozer blades, bucket lips, dumping teeth and propeller components subject to severe soil friction.

NOTE ON USAGE :

- The rust layer, moisture, oil stain, dust, etc. of the welded part shall be removed.
- Preheating and interlayer temperature need to exceed 300 ℃.
- Using CO_2 as protective gas, the purity of CO_2 gas is over 99.8%, and the flow rate is 15 ~ 25 l/min.

Typical Chemical Composition Of Weld Metal (wt%):

C	Mn	Si	Cr	Mo
0.60	1.18	0.70	6.00	0.60

HARDNESS :

Layers	2nd layer	3rd layer	4th layer
Hardness (HRC)	55	56	59

Size And Recommended Current Range : DC(+)

Diameter (mm)	Voltage (V)
1.2	25-36
1.6	25-35
Current (A)	**Gas flow (l/min)**
200-300	15-25
250-400	15-25

SFH-59G

AWS –
EN –
GB –

FCAW WELDING FOR HARD SURFACE WEAR RESISTANCE

DESCRIPTION & APPLICATIONS :

- SFH-59G is a gas shielded hard bread welding wire. Its dissolved gold contains special metals, so its wear performance is excellent.
- It is suitable for hard surface welding of bulldozer blades, bucket lips, dumping teeth and propeller components subject to severe soil friction.

NOTE ON USAGE :

- Preheating and interlayer temperature need to exceed 300 ℃.
- Using CO_2 as protective gas, the purity of CO_2 gas is over 99.8%, and the flow rate is 15 ~ 25 l/min.

Typical Chemical Composition Of Weld Metal (wt%):

C	Mn	Si	Cr	Ti	B
0.70	0.98	0.68	8.50	0.22	0.38

HARDNESS :

Layers	2nd layer	3rd layer	4th layer
Hardness (HRC)	57	60	63

Size And Recommended Current Range : DC(+)

Diameter (mm)	Voltage (V)
1.2	25-36
1.6	25-35
Current (A)	**Gas flow (l/min)**
200-300	15-25
250-400	15-25

SFH-61GM

AWS –
EN –
GB –

FCAW WELDING FOR HARD SURFACE WEAR RESISTANCE

DESCRIPTION & APPLICATIONS :

- SFH-61GM is a gas shielded metal mold hard welding wire, which dissolves gold and contains special alloys, and has excellent wear resistance.
- It is suitable for hard surface welding of bulldozer blades, bucket lips, dumping teeth and propeller components subject to severe soil friction.

NOTE ON USAGE :

- Preheating and interlayer temperature need to exceed 300 °C.
- Using CO_2 as protective gas, the purity of CO_2 gas is over 99.8%, and the flow rate is 15 ~ 25 l/min.

Typical Chemical Composition Of Weld Metal (wt%) :

C	Mn	Si	Cr	Nb	W	B
2.93	0.72	1.12	25.70	0.19	0.25	0.18

HARDNESS :

Layers	1st layer	2nd layer	3rd layer
Hardness (HRC)	57	59	61

SIZE AND RECOMMENDED CURRENT RANGE : DC(+)

Diameter (mm)	Voltage (V)
1.2	25-36
1.6	25-35
Current (A)	**Gas flow (l/min)**
200-300	15-25
250-400	15-25

SFH-61NbGM

AWS –
EN –
GB –

FCAW WELDING FOR HARD SURFACE WEAR RESISTANCE

DESCRIPTION & APPLICATIONS :

- SFH-61NbGM is a gas shielded metal mold hard flux welding wire, which has excellent wear resistance at high temperature due to its niobium (Nb) content.
- It is suitable for hard surface welding of bulldozer blades, bucket lips, dumping teeth and propeller components subject to severe soil friction.

NOTE ON USAGE :

- Preheating and interlayer temperature need to exceed 300 °C.
- Using CO_2 as protective gas, the purity of CO_2 gas is over 99.8%, and the flow rate is 15 ~ 25 l/min.

Typical Chemical Composition Of Weld Metal (wt%) :

C	Mn	Si	Cr	Nb
5.34	0.59	1.56	21.24	2.49

HARDNESS :

Layers	1st layer	2nd layer	3rd layer
Hardness (HRC)	59	61	63

Size And Recommended Current Range : DC(+)

Diameter (mm)	Voltage (V)
1.2	25-36
1.6	25-35
Current (A)	**Gas flow (l/min)**
200-300	15-25
250-400	15-25

SFH-62GM

AWS –
EN –
GB –

FCAW WELDING FOR HARD SURFACE WEAR RESISTANCE

DESCRIPTION & APPLICATIONS :

- SFH-62GM is a gas shielded metal mold hard flux welding wire. Its dissolved gold contains high chromium alloy and has excellent wear performance.
- It is suitable for hard surface welding of bulldozer blades, bucket lips, dumping teeth and propeller components subject to severe soil friction.

NOTE ON USAGE :

- Preheating and interlayer temperature need to exceed 300 ˚C.
- Using CO_2 as protective gas, the purity of CO_2 gas is over 99.8%, and the flow rate is 15 ~ 25 l/min.

Typical Chemical Composition Of Weld Metal (wt%):

C	Mn	Si	Cr	Ni	V	B
3.8	0.66	1.00	25.50	0.17	0.08	0.30

HARDNESS :

Layers	1st layer	2nd layer	3rd layer
Hardness (HRC)	58	60	64

SIZE AND RECOMMENDED CURRENT RANGE : DC(+)

Diameter (mm)	Voltage (V)
1.2	25-36
1.6	25-35
Current (A)	**Gas flow (l/min)**
200-300	15-25
250-400	15-25

SFH-63G

AWS –
EN –
GB –

FCAW WELDING FOR HARD SURFACE WEAR RESISTANCE

DESCRIPTION & APPLICATIONS :

- SFH-63G is a chemical-coated welding wire for gas shielding hard surface. Its dissolved gold has high hardness and excellent wear property.
- It is suitable for hard surface welding of bulldozer blades, bucket lips, dumping teeth and propeller components subject to severe soil friction.

NOTE ON USAGE :

- Preheating and interlayer temperature need to exceed 300 ˚C.
- Using CO_2 as protective gas, the purity of CO_2 gas is over 99.8%, and the flow rate is 15 ~ 25 l/min.

Typical Chemical Composition Of Weld Metal (wt%):

C	Mn	Si	Cr	B
0.71	0.95	0.59	7.81	0.38

HARDNESS :

Layers	1st layer	2nd layer	3rd layer
Hardness (HRC)	59	61	63

Size And Recommended Current Range : DC(+)

Diameter (mm)	Voltage (V)
1.2	25-36
1.6	25-35
Current (A)	**Gas flow (l/min)**
200-300	15-25
250-400	15-25

SFH-66WG

AWS –
EN –
GB –

FCAW WELDING FOR HARD SURFACE WEAR RESISTANCE

DESCRIPTION & APPLICATIONS :

- SFH-66WG is a gas shielded hard welding wire. Its dissolved gold contains special alloys such as niobium, vanadium and tungsten, so it has high wear resistance.
- It is suitable for hard surface welding of bulldozer blades, bucket lips, dumping teeth and propeller components subject to severe soil friction.

NOTE ON USAGE :

- Preheating and interlayer temperature need to exceed 300 ˚C.
- Using CO_2 as protective gas, the purity of CO_2 gas is over 99.8%, and the flow rate is 15 ~ 25 l/min.

TYPICAL CHEMICAL COMPOSITION OF WELD METAL (wt%) :

C	Mn	Si	Cr	Ni	Mo	Nb	V	W
4.91	0.41	1.78	21.44	0.11	0.38	2.61	0.34	2.45

HARDNESS :

Layers	1st layer	2nd layer	3rd layer
Hardness (HRC)	60	63	63.5

SIZE AND RECOMMENDED CURRENT RANGE : DC(+)

Diameter (mm)	Voltage (V)	Current (A)	Gas flow (l/min)
1.2	25-36	200-300	15-25
1.6	25-35	250-400	15-25

SFH-67NMG

AWS –
EN –
GB –

FCAW WELDING FOR HARD SURFACE WEAR RESISTANCE

DESCRIPTION & APPLICATIONS :

- SFH-67NMG is a gas shielded hard bread welding wire containing high chromium and high carbon structure, which has excellent resistance to strong soil and sand wear and high temperature wear.
- Applicable occasions for liner, spiral impeller, crusher parts and other hard surface repair.

NOTE ON USAGE :

- No matter whether it is preheated or post-heat treated, cracks are easy to occur, so multi-layer heap welding is not suitable.

Typical Chemical Composition Of Weld Metal (wt%):

C	Mn	Si	Cr	Mo	Nb
6.02	0.39	2.05	22.68	1.75	2.74

HARDNESS :

4th layer Hardness (HRC)	65-68

Size And Recommended Current Range : DC(+)

Diameter (mm)	Voltage (V)
1.2	28-32
1.6	34-38
Current (A)	
250-280	
320-370	

SFH-MN-O

AWS –
EN –
GB –

FCAW WELDING FOR HARD SURFACE WEAR RESISTANCE

DESCRIPTION & APPLICATIONS :

- SFH-MN-O is a work hardening self-shielding welding wire with excellent crack resistance.
- It has high work hardening property and good strength and toughness, and is suitable for heavy impact wear.
- It is suitable for heap welding of crusher cone body, crusher punching, etc., or transition layer.

NOTE ON USAGE :

- The welding of base metal 13Mn steel does not need preheating, and low current should be used to prevent the base metal from overheating.

Typical Chemical Composition Of Weld Metal (wt%):

C	Mn	Si	Cr	Ni
0.22	17.05	0.35	18.4	1.00

HARDNESS :

Hardness	18~22
Hardness after work hardening (HRC)	44~48

Size And Recommended Current Range : DC(+)

Diameter (mm)	Voltage (V)
2.8	27-30
Current (A)	Stickout (mm)
250-400	50-70

SFH-35-O

AWS –
EN –
GB –

FCAW WELDING FOR HARD SURFACE WEAR RESISTANCE

DESCRIPTION & APPLICATIONS :

- SFH-35-O is a low chromium alloy self-shielding hard bread welding wire, which can be used for general low wear welding or transition priming.
- It is especially suitable for regenerating workpieces worn by impact or shoveling, such as crawlers, guide wheels, sprockets, idlers, etc. in excavators or conveying roller axes in steel mills.

NOTE ON USAGE :

- If the workpiece is carbon steel, low alloy steel or cast iron, it should be preheated to 200 ˚C first.
- Stress relief annealing at 450 ˚C after welding can avoid cracks caused by excessive stress.

Typical Chemical Composition Of Weld Metal (wt%):

C	Mn	Si	Cr	Al
0.18	2.52	0.55	1.25	1.7

HARDNESS :

Layers	1st layer	2nd layer	3rd layer
Hardness (HRC)	23-29	27-32	31-36

Size And Recommended Current Range : DC(+)

Diameter (mm)	Voltage (V)
2.8	27-30
Current (A)	Stickout (mm)
250-400	50-70

SFH-41-O

AWS –
EN –
GB –

FCAW WELDING FOR HARD SURFACE WEAR RESISTANCE

DESCRIPTION & APPLICATIONS :

- SFH-41-O low chromium alloy steel self-shielding hard welding wire is especially suitable for metal-to-metal wear.
- Applicable occasions include hard surface or backing repair of crawler, guide wheel, dredger parts, gears and other workpieces.

NOTE ON USAGE :

- If the base metal is high carbon steel or alloy steel, please apply preheating and interlayer temperature of 150 ~ 250 ˚C.
- After welding, post-heat treatment at about 450 ˚C is applied to eliminate internal stress.

Typical Chemical Composition Of Weld Metal (wt%):

C	Mn	Si	Cr	Mo
0.25	2.50	0.35	1.10	0.40

HARDNESS :

Layers	1st layer	2nd layer	3rd layer
Hardness (HRC)	28-34	39-44	42-47

Size And Recommended Current Range : DC(+)

Diameter (mm)	Voltage (V)
2.8	27-30
Current (A)	Stickout (mm)
250-400	50-70

SFH-51-O

AWS –
EN –
GB –

FCAW WELDING FOR HARD SURFACE WEAR RESISTANCE

DESCRIPTION & APPLICATIONS :

- SFH-51-O self-shielding hard bread welding wire fused gold is high carbon Votian iron and eutectic structure, with high hardness and excellent wear resistance.
- Suitable occasions include coal grinding wheel, coal shovel, dredger cutter, coal rolling tooth and many other hard surface welding workpieces.

NOTE ON USAGE :

- After welding, the molten gold cannot be machined and can only be ground with grinding wheels.
- If the workpiece is carbon steel, low alloy steel or cast iron, it should be preheated to 200 ˚C, or the transition layer should be made before hard surface heap welding.

Typical Chemical Composition Of Weld Metal (wt%):

C	Mn	Si	Cr
3.23	1.26	1.57	13.18

HARDNESS :

Layers	1st layer	2nd layer
Hardness (HRC)	54-58	55-60

Size And Recommended Current Range : DC(+)

Diameter (mm)	Voltage (V)
2.8	27-30
Current (A)	Stickout (mm)
250-400	50-70

SFH-56-O

AWS –
EN –
GB –

FCAW WELDING FOR HARD SURFACE WEAR RESISTANCE

DESCRIPTION & APPLICATIONS :

- SFH-56-O is a self-shielding hard bread welding wire with excellent wear resistance and general impact wear resistance.
- After welding, the appearance of the welding channel is smooth, and the number of welding and repairing layers should not exceed two layers. It is suitable for welding and repairing the hard surface of new products or recycled workpieces of carbon steel, low alloy steel and manganese steel, such as shaft sleeves, cement mixers, top edges of dredging knives or digging knives, bulldozer stacking shovels and many other workpieces.

NOTE ON USAGE :

- After welding, the molten gold cannot be machined and can only be ground with grinding wheels.
- During repair, if the workpiece is high carbon steel or alloy steel, and the surface curvature is too large, the thickness is too thick or the shape is too complex, the welded bead is easy to generate high internal stress to cause cracking after welding. Therefore, the preheating temperature and interlayer temperature should be controlled at 150 ~ 250 ˚C, and slow cooling treatment should be carried out after welding.
- When the weld height reaches more than 6mm (no more than two layers), stress relief at a temperature of 420 ~ 480 ˚C shall be applied after welding.

TYPICAL CHEMICAL COMPOSITION OF WELD METAL (wt%) :

C	Mn	Si	Cr	Mo
0.48	1.25	0.68	6.23	0.85

HARDNESS :

Hardness (HRC) 2nd layer	52-60

SIZE AND RECOMMENDED CURRENT RANGE : DC(+)

Diameter (mm)	Voltage (V)	Current (A)	Stickout (mm)
2.8	27-30	250-400	50-70

SFH-61-O

AWS –
EN –
GB –

FCAW WELDING FOR HARD SURFACE WEAR RESISTANCE

DESCRIPTION & APPLICATIONS :

- SFH-61-O is a self-shielding hard bread welding wire. The dissolved gold is primary carbide and eutectic structure. It has high hardness and excellent wear resistance.
- It is suitable for welding and mending many workpieces such as coal pulverizer, cement mixer, dredger cutter, bulldozer shovel and so on.

NOTE ON USAGE :

- The number of welding layers should not exceed two. If the workpiece is carbon steel, low alloy steel or cast iron, it should be preheated to 200 ℃ first.
- After welding, the molten gold cannot be machined and can only be ground with grinding wheels.

Typical Chemical Composition Of Weld Metal (wt%):

C	Mn	Si	Cr
3.00	0.73	1.10	22.00

HARDNESS :

Layers	1st layer	2nd layer
Hardness (HRC)	54-57	57-61

Size And Recommended Current Range : DC(+)

Diameter (mm)	Voltage (V)
2.8	27-30
Current (A)	Stickout (mm)
250-400	50-70

SFH-65-O

AWS –
EN –
GB –

FCAW WELDING FOR HARD SURFACE WEAR RESISTANCE

DESCRIPTION & APPLICATIONS :

- SFH-65-O is a self-shielding hard bread welding wire with high chromium carbide precipitation and high temperature alloy elements.
- Applicable occasions are hard surface repair with high wear and low impact, such as coal roller, ghost tooth, blast coal cover, grinder parts, etc.

NOTE ON USAGE :

- After welding, the hardness of molten gold is extremely high, which cannot be machined only by grinding wheels.
- Do not do heat treatment for welded gold.

Typical Chemical Composition Of Weld Metal (wt%):

C	Mn	Si	Cr
4.86	0.40	0.50	17.5
Mo	W	Nb	V
4.90	1.20	5.23	0.80

HARDNESS :

Hardness (HRC)	常温硬度	高温硬度 600°C
2nd layer	62-65	52-56

Size And Recommended Current Range : DC(+)

Diameter (mm)	Voltage (V)
2.8	27-32
Current (A)	Stickout (mm)
250-400	50-70

SFH-67-O

AWS –
EN –
GB –

FCAW WELDING FOR HARD SURFACE WEAR RESISTANCE

DESCRIPTION & APPLICATIONS :

- SFH-67-O is a self-shielding hard bread welding wire containing chromium carbide and boride precipitation.
- There are usually stress release cracks in welding beams, and the hardness of dissolved gold after welding is extremely high, which cannot be machined by machining, but only grinding wheels can be used for grinding.
- Applicable occasions are hard surface repair with high wear and low impact, such as coal roller, ghost tooth, receiving tooth, blast coal cover, grinder parts, etc.

NOTE ON USAGE :

- For hard surface welding of high carbon steel or low alloy steel, Austenite iron stainless steel welding material can be used as backing transition layer.
- It is suggested that the number of welding layers should be controlled within 2 to avoid peeling off the welding layer.

Typical Chemical Composition Of Weld Metal (wt%):

C	Mn	Si	Cr	B
5.24	0.46	0.67	36.74	1.62

HARDNESS :

Hardness (HRC)	63-66

Size And Recommended Current Range : DC(+)

Diameter (mm)	Voltage (V)
2.8	26-32
Current (A)	
250-400	

SFH-70-O

AWS –
EN –
GB –

FCAW WELDING FOR HARD SURFACE WEAR RESISTANCE

DESCRIPTION & APPLICATIONS :

- SFH-70-O is a self-shielding hard bread welding wire containing chromium carbide and boride precipitation.
- There are usually stress release cracks in welding beads, and the hardness of molten gold after welding is extremely high, which cannot be machined and can only be ground by grinding wheels.
- Applicable occasions are hard surface repair with high wear and low impact, such as coal roller, ghost tooth, receiving tooth, blast coal cover, grinder parts, etc.

NOTE ON USAGE :

- For hard surface welding of high carbon steel or low alloy steel, Austenite iron stainless steel welding material can be used as backing transition layer.
- It is suggested that the number of welding layers should be controlled within 2 layers to avoid peeling off the welding layer.

Typical Chemical Composition Of Weld Metal (wt%):

C	Mn	Si	Cr	B
5.43	0.60	0.50	28.9	0.35

HARDNESS :

Hardness (HRC) 2nd layer	64-68

Size And Recommended Current Range : DC(+)

Diameter (mm)	Voltage (V)
2.8	26-32
Current (A)	
250-400	

SELECTION RECOMMENDATION

AWS has no relevant specifications to define materials for submerged arc hard surface welding materials. Therefore, in the selection of welding materials, the content of dissolved gold composition, hardness value and application occasions recommended by manufacturers are used as materials.

This kind of material attaches great importance to the design of welding procedure, that is, what kind of welding material to use, preheating temperature, inter-track temperature, number of welding layers, whether to do post-heating, whether to do post-heat treatment, whether there is a transition layer and other important factors will determine the success or failure and service life of a hard-surface welding workpiece.

◆(1)For various environments with different working attributes, the recommended hard surface welding materials are as follows:

Workspace Properties	Hard-faced welding material category	Reference wear rate (%)	Reference hardness value (HRC)
High friction	High carbon-high chromium, high special alloys (W, Nb, V, Co, etc.)	0.05~0.2	50~75
Medium friction + medium impact	Semi-Voss Tian Tie, Voss Tian Tie + Matian Scattered Tie, Matian Scattered Tie, Bolai Tie	0.2~8.0	20~60
High impact	Vosten iron, high manganese steel, medium carbon low alloy steel	6.0~20.0	5~55

◆(2)According to the classification of each hard surface welding material according to the organization type, the recommended application occasions are as follows:

Welding method / Welding structure	Reference hardness (HRC)	Application occasion	Covered weld	Charged wire	Submerged arc welding material
Bolai iron system	10~40	Couplers for gears, shafts, rolls, rolling mills, automatic coupling machines for vehicles, foot peripheral fittings of bulldozers and track head surfaces, etc.	SH-26R, SH-35R, SH-45, SH-45R	SFH-25G, SFH-35G, SFH-45G, SFH-35-O, SFH-41-O	SFH-17S*SF-80
Matian scattered iron series	35~65	Rollers or sprockets of bulldozers, idlers or track shoes, digging edges, rollers, bucket end edges, mixing blades, cutting tools and shells of dredgers, etc.	SH-50, SH-50N4,SH-60, SH-80 series,SH-90	SFH-42MG, SFH-58G, SFH-59G, SFH-63G, SFH-51-O, SFH-56-O	SFH-12S*SF-80, SFH-31S*SF-80, SFH-42S*SF-80, SFH-53S*SF-80, SFH-55S*SF-80
High manganese Vosten iron series	45~50	Blade or roller of crusher, hammer of crusher, claw of excavator and track frog	SH-MN	SFH-MNG, SFH-MN-O	--

Welding method / Welding structure	Reference hardness (HRC)	Application occasion	Covered weld	Charged wire	Submerged arc welding material
High carbon-high chromium system	55~68	Coal pulverizer, coal pulverizer rotor, sand pump shell and pump blade, ghost tooth, receiving tooth, blast furnace cover, grinder, etc.	SH-95HC, SH-95HN	SFH-61GM, SFH-61NbGM, SFH-62GM, SFH-67NMG, SFH-61-O, SFH-65-O, SFH-67-O, SFH-70-O	--
Tungsten carbide system	58~65	Blades of bulldozers, lining tools, relieving teeth, cutting tools, concrete cutters and earth drills, etc.	SH-W, SH-WM	SFH-66WG	--
Cobalt-chromium-tungsten alloy system	30~55	Bushing of high-pressure pump, moving wheel sleeve, sliding surface of high-pressure valve, turbine blade and various cutters, cutting edge for paper industry, valve seat ring of internal combustion engine, high-temperature and high-pressure valve, injection eye mold, etc.	Stellite weld	--	--

WELDING OPERATION

◆ (1)Storage management of welding rod:

Suggestions for submerged arc welding materials of the same carbon steel.

◆ (2)Precautions for welding:

①Hard-faced submerged arc welding wires are mostly coated welding wires, so the lower compaction degree of the wire feeding wheel should not be too large to avoid abrasion of the conductive nozzle (TIP) caused by crushing the welding wires.

②Attention should be paid to the matching of current, voltage, extension length and migration speed to avoid welding bead formation caused by excessive dilution rate and relevant welding conditions. Please refer to the Recommendations for Selection of Submerged Arc Welding Materials for Carbon Steel.

③The alloy content of hard surface welding material is higher, and the internal stress after welding is also higher. As far as possible, the overlap between welds should cover at least half of the width of the previous weld, so as to avoid the occurrence of wavy weld, so as to reduce cracks and weld peeling due to stress concentration.

SFH-12SxSF-80

AWS -
EN -
GB -

SAW WELDING FOR HARD SURFACE WEAR RESISTANCE

DESCRIPTION & APPLICATIONS :

- SFH-12S welding wire with SF-80 basic welding flux can produce dissolved gold similar to that of hot working tool steel (H12).
- Due to the design ratio of chromium and carbon content, SFH-12S has excellent adhesion wear resistance and can still maintain a certain hardness at high temperature.
- It is applied to pinch rollers in iron and steel mills and other occasions that generally need to bear sliding wear between metals.

NOTE ON USAGE :

- The preheating temperature during welding is 200 ~ 250°C, and the interlayer temperature is controlled at 300 ~ 400°C.
- To avoid cracking, the workpiece should be slowly cooled and heat treated after welding.

TYPICAL CHEMICAL COMPOSITION OF WELD METAL (wt%) :

C	Mn	Si	Cr	Mo	V	W
0.30	1.50	0.68	6.40	1.1	0.30	1.1

HARDNESS :

Layers	3rd layer	4th layer	5th layer
Hardness (HRC)	48	53	52

SIZE AND RECOMMENDED CURRENT RANGE : DC(+)

Diameter (mm)	Voltage (V)	Current (A)	Stickout (mm)
2.8	26-32	220-350	25-35
3.2	28-32	350-450	25-30

SFH-17SxSF-80

AWS -
EN -
GB -

SAW WELDING FOR HARD SURFACE WEAR RESISTANCE

DESCRIPTION & APPLICATIONS :

- SFH-17S is used for submerged arc welding with hard bread welding wire and SF-80 alkaline welding flux.
- In addition to resisting metal-to-metal wear, it also has excellent impact resistance, good compressive strength and plastic deformation resistance.
- For multi-layer welding, it can be welded to 20mm without cracks. After welding, mechanical processing or flame cutting can be carried out.
- Used for hard surface repair of backing, crown wheel, rolling wheel, idler wheel and mining wheel.

NOTE ON USAGE :

- When the surface curvature of the workpiece is too large, the thickness is too thick or the shape is too complex, the weld bead after welding is easy to produce high internal stress.
- It causes cracking after welding, so preheating at 200 ~ 400°C and interlayer temperature are required. Slow cooling treatment is recommended after welding.
- When the stress relief annealing temperature exceeds 480°C, the hardness of molten gold will decrease.

TYPICAL CHEMICAL COMPOSITION OF WELD METAL (wt%) :

C	Mn	Si	Cr	Mo
0.09	3.00	0.57	2.70	0.80

HARDNESS :

Layers	1st layer	2nd layer	3rd layer
Hardness (HRC)	29	36	38

SIZE AND RECOMMENDED CURRENT RANGE : DC(+)

Diameter (mm)	Voltage (V)	Current (A)	Stickout (mm)
2.8	26-32	220-350	25-30
3.2	28-32	350-450	25-30

SFH-22S×SF-82

AWS -
EN -
GB -

SAW WELDING FOR HARD SURFACE WEAR RESISTANCE

DESCRIPTION & APPLICATIONS :

- SFH-22S is used for submerged arc welding, and the molten gold obtained by matching SF-82 alkaline welding flux is ferrous iron structure.
- Molten gold itself has good cracking resistance and tempering softening resistance, as well as good pitting corrosion resistance. It can be used for buffer layers (S45C, SUJ2 ⋯, etc.) of base metal with high carbon content, and welding slag is easy to peel off. It is suitable for multi-layer welding and welding of small diameter rollers. After welding, it can also be machined.
- Its applications include backing and heap welding of rollers in iron and steel plants, repair and regeneration of roller shaft tail, buffer layer of high carbon base metal, and hard surface repair of crown wheels, rolling wheels, idler wheels and mining wheels.

NOTE ON USAGE :

- When the surface curvature of the workpiece is too large, the thickness is too thick or the shape is too complex, the weld bead after welding is easy to produce high internal stress Force, causing cracking after welding, so preheating at 350 ~ 400°C and interlayer temperature are required, and slow cooling is recommended after welding Handle.
- When the stress relief annealing temperature exceeds 480°C, the hardness of molten gold will decrease.

TYPICAL CHEMICAL COMPOSITION OF WELD METAL (wt%) :

C	Mn	Si	Cr	Mo
0.09	1.99	0.60	1.00	2.00

HARDNESS :

Layers	2nd layer	3rd layer
Hardness (HRC)	29~33	30~34

SIZE AND RECOMMENDED CURRENT RANGE : DC(+)

Diameter (mm)	Voltage (V)	Current (A)	Stickout (mm)
3.2	28-32	350-450	25-40

SFH-31SxSF-80

AWS -
EN -
GB -

SAW WELDING FOR HARD SURFACE WEAR RESISTANCE

DESCRIPTION & APPLICATIONS :

- SFH-31S submerged arc welding uses hard flux welding wire with SF-80 alkaline flux.
- The molten gold is low carbon and low alloy Matian loose iron structure, which can be machined, forged and hardened after welding.
- It is used for backing before repairing the hard surface of roller wheel, idler wheel, trunnion or plate, or for welding and repairing the final cover of rails, shafts and journals with medium hardness and requiring machining.

NOTE ON USAGE :

- Before welding, remove the dust, grease and moisture on the surface of the base metal.
- Please use DC (+) polarity when welding, and AC polarity can be used in some special automatic occasions.

TYPICAL CHEMICAL COMPOSITION OF WELD METAL (wt%) :

C	Mn	Si	Mo
0.10	2.10	0.40	0.30

HARDNESS :

Layers	1st layer	2nd layer	3rd layer
Hardness (HRC)	16	24	28

SIZE AND RECOMMENDED CURRENT RANGE : DC(+)

Diameter (mm)	Voltage (V)	Current (A)	Stickout (mm)
2.8	23-28	220-350	25-30
3.2	28-32	350-450	25-30

SFH-42SxSF-80

AWS -
EN -
GB -

SAW WELDING FOR HARD SURFACE WEAR RESISTANCE

DESCRIPTION & APPLICATIONS :

- SFH-42S is a hard flux welding wire for submerged arc welding of stainless steel Matian loose iron structure, which is matched with SF-80 alkaline welding flux.
- The welder has good crack resistance, and the welding slag is easy to peel off, and the number of layers is unlimited.
- It is suitable for regeneration and repair of continuous casting roller wheel, blast furnace coal cover, printing roller steel wheel, trunnion and other workpieces.

NOTE ON USAGE :

- When the carbon content of the base metal reaches 0.8% or the carbon content of the low alloy steel exceeds 0.35%, the base metal is preheated to 300-400°C.
- When the surface curvature of the workpiece is too large, the thickness is too thick or the shape is too complex, the weld bead after welding is easy to produce high internal stress.
- It causes cracking after welding, so preheating at 200 ~ 420°C and interlayer temperature are required. Slow cooling treatment is recommended after welding.

TYPICAL CHEMICAL COMPOSITION OF WELD METAL (wt%) :

C	Mn	Si	Cr
0.22	1.42	0.53	13.0

HARDNESS :

Layers	1st layer	2nd layer	3rd layer
Hardness (HRC)	43	46	49

SIZE AND RECOMMENDED CURRENT RANGE : DC(+)

Diameter (mm)	Voltage (V)	Current (A)	Stickout (mm)
2.8	26-32	220-350	25-30
3.2	28-32	350-450	25-30

SFH-53SxSF-80

AWS –
EN –
GB –

SAW WELDING FOR HARD SURFACE WEAR RESISTANCE

DESCRIPTION & APPLICATIONS :

- SFH-53S is a hard bread flux welding wire for submerged arc welding, which is matched with SF-80 alkaline welding flux. Its dissolved gold is Matian loose iron structure.
- Molten gold itself has excellent adhesion wear resistance and weld mark resistance, and can still maintain good high temperature red heat hardness at high temperature.
- Its applications include rollers in iron and steel mills and other occasions that generally need to bear sliding wear between metals.

NOTE ON USAGE :

- The preheating temperature during welding is 200 ~ 250°C, and the interlayer temperature is controlled at 300 ~ 400°C.
- To avoid cracking, the workpiece should be slowly cooled and heat treated after welding.
- When the weldability of the base metal is poor, it is recommended to use a layer of SF-65/SW-M12K as the buffer layer first, and then use SFH-31S/SF-80 or SFH-22S/SF-82 as the backing according to the actual welding layer thickness requirements.

TYPICAL CHEMICAL COMPOSITION OF WELD METAL (wt%) :

C	Mn	Si	Ni	Cr	Mo	V
0.20	2.07	0.50	3.2	6.61	1.84	0.45

HARDNESS :

Layers	2nd layer	3rd layer	4th layer
Hardness (HRC)	47	49	50

SIZE AND RECOMMENDED CURRENT RANGE : DC(+)

Diameter (mm)	Voltage (V)	Current (A)	Stickout (mm)
3.2	28-32	350-450	25-40

SFH-55SxSF-80

AWS -
EN -
GB -

SAW WELDING FOR HARD SURFACE WEAR RESISTANCE

DESCRIPTION & APPLICATIONS :

- SFH-55S is a hard flux welding wire for submerged arc welding, which is matched with SF-80 alkaline welding flux. Due to the design proportion of the composition, the dissolved gold surface has excellent anti-adhesion wear and anti-weld mark characteristics, and can still maintain a certain hardness at high temperature.
- It is suitable for pinch rollers in iron and steel plants and other occasions that generally need to bear sliding wear between metals.

NOTE ON USAGE :

- The preheating temperature during welding is 200 ~ 250°C, and the interlayer temperature is controlled at 300 ~ 400°C.
- To avoid cracking, the workpiece should be slowly cooled and heat treated after welding.
- The heat treatment temperature after welding is recommended to be 520°C x6hr, the heating rate is 100°C/hr, and the cooling rate is 50 °C/hr to 300°C.
- When the weldability of the base metal is poor, it is suggested that SF-65/SW-M12K should be used as the buffer layer at the bottom layer, and SFH-31S/SF-80 should be applied as the second layer transition according to the actual welding layer thickness requirements.

TYPICAL CHEMICAL COMPOSITION OF WELD METAL (wt%) :

C	Mn	Si	Ni	Cr	Mo	V
0.19	1.97	0.65	3.1	3.85	1.50	0.35

HARDNESS :

Layers	2nd layer	3rd layer	4th layer
Hardness (HRC)	47	49	51

SIZE AND RECOMMENDED CURRENT RANGE : DC(+)

Diameter (mm)	Voltage (V)	Current (A)	Stickout (mm)
2.8	26-32	220-350	25-30
3.2	28-32	350-450	25-30

SF-80

AWS –
EN –
GB –

SAW WELDING FLUX FOR HARD SURFACE STEEL

DESCRIPTION & APPLICATIONS :

- SF-80 is an alkaline submerged arc welding flux, which is used for hard surface heap welding.
- With all kinds of hard bread welding wires SFH-12S, SFH-17S, SFH-31S, SFH-42S, SFH-53S and SFH-55S.

NOTE ON USAGE :

- After unpacking, please put it in the furnace and dry it at 350°C for 1 hour. Pay attention to keep it dry to prevent pores.
- When the welding flux is recycled and reused, please add a proper amount of new welding flux for mixed use to ensure good quality of weld.

SF-82

AWS –
EN –
GB –

SAW WELDING FLUX FOR HARD SURFACE STEEL

DESCRIPTION & APPLICATIONS :

- SF-82 is an alkaline submersible arc welding flux, which is used for hard surface heap welding.
- With hard bread welding wire SFH-22S.

NOTE ON USAGE :

- After unpacking, please put it in the furnace and dry it at 350°C for 1 hour. Pay attention to keep it dry to prevent pores.
- When the welding flux is recycled and reused, please add a proper amount of new welding flux for mixed use to ensure good quality of weld.

Nickel and Nickel Alloy

INTRODUCTION OF NICKEL-BASED ALLOY STEEL WELDING MATERIAL

Base metal introduction

Nickel-based alloy steel has more corrosion resistance, heat resistance and low temperature resistance than stainless steel. It is widely used in special equipment and workpieces in petrochemical industry, power plant and aviation industry. The following are the categories and applications of common nickel-based alloy steel:

Category	Main alloy	Representative Materials	Application occasion
Solution strengthened alloy	Pure nickel	Nickel 200, Nickel 201	Food equipment, charged alkali slings, laboratory crucibles, chemical transport drums and electrical and electronic accessories, etc.
	Nickel copper	Alloy400, MONEL R-405	Industrial acid and alkali resistant environment, seawater equipment, chlorine-containing environment, etc.
	Nickel chromium	Alloy600, 601, 690, 214, 230, G-30, RA-330	Chloride stress corrosion resistant environment, phosphoric acid resistant environment, nuclear energy, aircraft gas turbine, high temperature environment, etc.
	Nickel-iron-chromium	Alloy800, 800HT, 825, 20Cb3, N-155, 556	Chloride ion stress corrosion resistant environment, high temperature environment, etc
	Nickel molybdenum	AlloyB, B-2, N, W	Gas turbine, aviation, chemical industry, hydrochloric acid, phosphoric acid and sulfuric acid environment, etc.
	Nickel chromium molybdenum	Alloy C-22, C-276, G, S, X, 622, 625, 686	Chemical, petrochemical, chlorine-containing environment, flue gas desulfurization, pulp and paper making, environmental protection equipment, turbine blades, turbocharger rotors, nuclear energy, etc.
	Cobalt chromium nickel tungsten	Alloy L-605, 188, S-816, 54Co-26Cr (R31233)	Military and commercial gas turbine engines
Precipitation hardening (strengthening) alloy	Nickel copper	K-500	Oil well detection equipment, electronic accessories
	Ni-Cr-Al-Ti	Alloy 713C, X-750, U-500, R-41, Waspalloy, Alloy 718, Alloy 706	Gas turbine fittings, aircraft fittings and spacecraft
	Nickel-iron-chromium	Alloy 901	Energy, General Industry
Dispersion strengthened alloy	Nickel chromium	TM-220, TM-303, TMO-2	Environment requiring high temperature latent strength
Cast alloy	Ni-Cr-Mo-Cu	HW, HX, CY-40,CW-12M-1, CZ-100,M-35-1, N-12M-1	Gas turbines, corrosion resistant valves, etc

Welding method and Specifications

The metallographic structure of nickel-based alloy is similar to that of steel, and the welding cognition of all-Votian iron system should be taken as the basis. The common welding problem is high temperature crack. Impure substances such as phosphorus (P), sulfur (S), lead (Pb), tin (Sn), zinc (Zn) and the like generated in the base metal composition, welding material composition, and adhesion at the welding part need to be controlled and reduced, which is an effective method to avoid high temperature cracks.

In terms of workability, nickel-based welding materials are worse than stainless steel welding materials in terms of arc force, slag removal and molten iron fluidity. Therefore, special attention should be paid to the solubility and cleanliness of welding beads to avoid the problems of poor solubility and slag inclusion.

In terms of temperature management, it is recommended to control the welding heat of nickel-based welding material to ≤ 15 kJ/cm and the inter-track temperature ≤ 150 °C (preferably below 100 °C).

INTRODUCTION TO NICKEL-BASED ALLOY STEEL ELECTRODESS-COATED ELECTRODES

SELECTION RECOMMENDATION

The selection of nickel-based welding materials mainly depends on the alloy composition of base metal, the application properties of workpieces, the design type of workpieces, working temperature, environmental corrosion and other factors to select suitable welding materials and welding methods.

According to the classification of specifications and class numbers of AWS A5.11 "Code for Arc Welding of Nickel and Nickel Alloy Shielded Metals", the classification is based on the main components of dissolved gold. The information of tensile strength grade will not be displayed on the specifications. The welding current of such materials is mostly DC (+) design, and a small part of welding materials can be designed as AC polarity to reduce the phenomenon of welding magnetic arc bias. The relevant classification and application are summarized as follows:

Specification Class Number	Characteristic or application
ENi1	Pure nickel forgings or castings are welded or coated as different materials, which are commonly used in chemical industry, food and medical equipment.
ENiCr-4	It is usually used in corrosive environment of burning heavy oil and has high temperature rust resistance.
ENiCu-7	It is used for welding Ni-Cu alloy and steel with different materials or steel side coating.
ENiCrFe-X series	It can be used in ultra-low temperature to high temperature (480 ~ 980°C) environment, ENiCrFe-1/-2/-3 is usually used in high temperature environment, and ENiCrFe-4/-9/-10 is used for welding 9% Ni steel.
ENiCrFeSi-X serie	The Si content is about 2.8%, which is generally used for welding ASTM B163, B166, B167, B168 and other steel grades.
ENiMo-X Series	It is used for welding Ni-Mo alloy and steel with different materials or steel side coating. ENiMo-8/-9 is used for welding 9% Ni steel.
ENiCrMo-X serie	It is used for welding Ni-Cr-Mo alloy and steel with different materials or steel side coating, ENiiCrMo-3/-4/-6 is used for welding 9% Ni steel, and the rest is mostly used for equipment in high temperature and high corrosion environment.
ENiiCrCoMo-1	It is used for welding Ni-Cr-Co-Mo alloy and steel with different materials or steel side coating, and has high temperature strength and oxidation resistance in high temperature environment of 820 ~ 1150°C.
ENiCrWMo-1	ASTM B366, B435, B564, B572 steel grade welding, this welding material is usually used in flat welding position

WELDING OPERATION

◆(1)Storage management of welding rod:

①The welding rod shall be stored in a relatively dry warehouse to avoid excessive moisture absorption caused by the simultaneous existence of high humidity (≥ 80% R.H) and high heat (≥ 30°C).

②Before use, it must be dried at high temperature and placed in a heat preservation barrel or low-temperature oven on the construction site. It shall be stored at 100 ~ 150℃. A small amount of it shall be taken each time to reduce the moisture content of the weld and avoid the problem of weld channel pores. Please refer to the instructions in the appendix for drying conditions.

◆(2)Precautions for welding:

①Before operation, clean treatment shall be carried out at the welding part and the workpiece part within 50mm around it to avoid cracks or pores caused by weld pollution.

②The core wires of nickel-based coated electrodess are all made of nickel alloy, with slow heat conduction speed and high expansion coefficient. Therefore, excessive welding current will cause the resistance heat of the core wires to become higher, causing the coated electrodes to generate red heat and fall off.

③The fluidity of molten iron in nickel-based alloy is poor. For example, if the rod is transported by weaving, the weaving amplitude should be less than 3 times of the rod diameter; It is also necessary to avoid the phenomenon of hot cracking of electrodes caused by excessive heat input, especially at the position of finishing pit.

④The arc starting point of butt slotting welding is recommended to move the arc to the position of the welding starting point after arc starting is done on the slotting surface; It is suggested to stop the filler at the finishing pit before breaking the arc, so as to avoid excessive cracking of the pit; The finishing pit of the previous electrodes must be ground clean to avoid cracking, slag inclusion, air holes and other problems.

⑤Short arc welding shall be maintained to avoid air holes caused by water vapor and nitrogen dissolving into the welding channel; The arc force is usually weak, so attention should be paid to the matching of arc and molten iron flow to avoid poor dissolution or slag inclusion.

⑥The arc starting method shall be handled by the "forward and backward method", i.e. the arc starting point shall be located about 1 ~ 2cm after the welding point. After arc starting, the "forward method" shall be used to bring the arc forward to the welding point for welding operation, so as to eliminate the air hole problem at the welding point.

⑦There is no need to preheat during welding, and the temperature between tracks is suggested ≤ 150℃.

⑧Welding slag is usually thick and needs to be cleaned to avoid slag inclusion. Steel wire brushes must be made of stainless steel and avoid sharing with other materials.

SNF-1

AWS A5.11 ENiCrFe-1
EN ISO 14172 E Ni 6062
GB T13814 ENiCrFe-1

COVERE ELECTROES FOR NCKEL ALLOY STEEL

DESCRIPTION & APPLICATIONS :

- SNF-1 is a nickel-based low hydrogen electrode designed for DC current. With excellent heat and corrosion resistance. The electrode can provide reliable from low temperature till 980˚C ambient.
- It is suitable for the welding of Inconel and dissimilar metals such as Inconel to low alloy steel or stainless steel to low alloy steel.

NOTE ON USAGE :

- Rebake the electrodes at 350~400˚C for 60 minutes prior to use. Put daily use quantity in thermostat-container with 100~150˚C during usage.
- Follow the recommended welding parameters and maintain short arc length.
- Backstep is the welding method to prevent blowholes during the arc starting.

WELDING POSITION :

TYPICAL CHEMICAL COMPOSITION OF WELD METAL (wt%) :

C	Mn	Si	P	S	Ni	Cr	Fe	Nb
0.050	2.50	0.60	0.001	0.001	73.40	14.30	6.8	2.13

TYPICAL MECHANICAL PROPERTIES OF WELD METAL :

TENSILE STRENGTH $N/mm^2(Kgf/mm^2)$	ELONGATION RATE %	IMPACT VALUES -196˚C J(Kgf-m)
622(63.5)	41	86(8.8)

SIZE AND RECOMMENDED CURRENT RANGE : DC(+)

Diameter (mm)		2.6	3.2	4.0	5.0
Length (mm)		300	350	350	350
Current (Amp)	F	60-90	80-120	110-160	150-180
	V & OH	60-80	65-105	95-140	-

SNF-2

AWS A5.11 ENiCrFe-2
EN ISO 14172 E Ni 6092
GB T13814 ENiCrFe-2

COVERE ELECTROES FOR NCKEL ALLOY STEEL

DESCRIPTION & APPLICATIONS :

- SNF-2 is a nickel-based low hydrogen electrode designed for DC current. With excellent heat and corrosion resistance. The electrode can provide reliable from low temperature till 980°C ambient.
- It is suitable for LNG storage tank or 9% Ni steel welding.

NOTE ON USAGE :

- Rebake the electrodes at 350~400°C for 60 minutes prior to use. Put daily use quantity in thermostat-container with 100~150°C during usage.
- Follow the recommended welding parameters and maintain short arc length.
- Backstep is the welding method to prevent blowholes during the arc starting.

WELDING POSITION :

TYPICAL CHEMICAL COMPOSITION OF WELD METAL (wt%) :

C	Mn	Si	P	S	Ni	Cr	Mo	Fe	Nb
0.040	1.84	0.40	0.001	0.001	73.00	14.20	1.5	6.90	1.40

TYPICAL MECHANICAL PROPERTIES OF WELD METAL :

TENSILE STRENGTH $N/mm^2(Kgf/mm^2)$	ELONGATION RATE %	IMPACT VALUES -196 °C J(Kgf-m)
650(66.3)	37	140(14.3)

SIZE AND RECOMMENDED CURRENT RANGE : DC(+)

Diameter (mm)		2.6	3.2	4.0	5.0
Length (mm)		300	350	350	350
Current (Amp)	F	60-90	80-120	110-160	150-180
	V & OH	60-80	65-105	95-140	-

SNF-3

AWS A5.11 ENiCrFe-3
EN ISO 14172 E Ni 6182
GB T13814 ENiCrFe-3

COVERE ELECTROES FOR NCKEL ALLOY STEEL

DESCRIPTION & APPLICATIONS :

- SNF-3 is a nickel-based low hydrogen electrode designed for DC current. With excellent heat and corrosion resistance. The electrode can provide reliable from low temperature till 480˚C ambient.
- Suitable for pressure vessel and chemistry storage tank. Dissimilar steels welding like Inconel and low alloys, stainless steel.

NOTE ON USAGE :

- Rebake the electrodes at 350~400˚C for 60 minutes prior to use. Put daily use quantity in thermostat-container with 100~150˚C during usage.
- Follow the recommended welding parameters and maintain short arc length.
- Backstep is the welding method to prevent blowholes during the arc starting.

WELDING POSITION :

TYPICAL CHEMICAL COMPOSITION OF WELD METAL (wt%) :

C	Mn	Si	P	S	Ni	Cr	Fe	Nb
0.050	7.5	0.4	0.001	0.02	69.50	14.00	6.8	1.43

TYPICAL MECHANICAL PROPERTIES OF WELD METAL :

TENSILE STRENGTH $N/mm^2(Kgf/mm^2)$	ELONGATION RATE %	IMPACT VALUES -196˚C J(Kgf-m)
620(63.2)	39	90(9.2)

SIZE AND RECOMMENDED CURRENT RANGE : DC(+)

Diameter (mm)		2.6	3.2	4.0	5.0
Length (mm)		300	350	350	350
Current (Amp)	F	60-90	80-120	110-160	150-180
	V & OH	60-80	65-105	95-140	-

SNM-3

AWS A5.11 ENiCrMo-3
EN ISO 14172 E Ni 6625
GB T13814 ENiCrMo-3

COVERE ELECTROES FOR NCKEL ALLOY STEEL

DESCRIPTION & APPLICATIONS :

- SNM-3 is a nickel-based low hydrogen electrode designed for DC current. With excellent heat and corrosion resistance.
- It is suitable for welding nickel alloys of the same or similar type, like Inconel 625, high alloy, 9 Ni steel and mild steel.

NOTE ON USAGE :

- Rebake the electrodes at 350~400°C for 60 minutes prior to use. Put daily use quantity in thermostat-container with 100~150°C during usage.
- Follow the recommended welding parameters and maintain short arc length.
- Backstep is the welding method to prevent blowholes during the arc starting.

WELDING POSITION :

TYPICAL CHEMICAL COMPOSITION OF WELD METAL (wt%) :

C	Mn	Si	P	S	Ni	Cr	Mo	Fe	Nb
0.030	0.52	0.36	0.001	0.001	63.0	21.7	9.0	1.8	3.38

TYPICAL MECHANICAL PROPERTIES OF WELD METAL :

TENSILE STRENGTH $N/mm^2(Kgf/mm^2)$	ELONGATION RATE %	IMPACT VALUES -196 °C J(Kgf-m)
760(77.6)	39	65(6.6)

SIZE AND RECOMMENDED CURRENT RANGE : DC(+)

Diameter (mm)		2.6	3.2	4.0	5.0
Length (mm)		300	350	350	350
Current (Amp)	F	60-90	70-120	100-150	120-180
	V & OH	55-80	65-110	80-140	-

SNM-4

AWS A5.11 ENiCrMo-4
EN ISO 14172 E Ni 6276
GB T13814 ENiCrMo-4

COVERE ELECTROES FOR NCKEL ALLOY STEEL

DESCRIPTION & APPLICATIONS :

- SNM-4 is a nickel-based low hydrogen electrode. Designed for DC current with less C for reducing carbide precipitation in grain boundary.
- Suitable for welding HASTELLOY C-276, nickel alloy and mild steel.

NOTE ON USAGE :

- Rebake the electrodes at 350~400˚C for 60 minutes prior to use. Put daily use quantity in thermostat-container with 100~150˚C during usage.
- Follow the recommended welding parameters and maintain short arc length.
- Backstep is the welding method to prevent blowholes during the arc starting.

WELDING POSITION :

TYPICAL CHEMICAL COMPOSITION OF WELD METAL (wt%) :

C	Mn	Si	P	S	Ni	Cr	Mo	Fe	W
0.018	0.36	0.18	0.001	0.001	59.00	15.83	15.76	5.8	3.77

TYPICAL MECHANICAL PROPERTIES OF WELD METAL :

TENSILE STRENGTH $N/mm^2(Kgf/mm^2)$	ELONGATION RATE %
740(75.5)	40

SIZE AND RECOMMENDED CURRENT RANGE : DC(+)

Diameter (mm)		2.6	3.2	4.0	5.0
Length (mm)		300	350	350	350
Current (Amp)	F	60-90	70-120	100-150	120-180
	V & OH	55-80	65-110	80-140	-

SNM-6

AWS A5.11 ENiCrMo-6
EN ISO 14172 E Ni 6620
GB T13814 ENi6620

COVERE ELECTROES FOR NCKEL ALLOY STEEL

DESCRIPTION & APPLICATIONS :

- SNM-6 is a nickel-based electrode designed for AC/DC welding.
- It is suitable for LNG storge tanks, 5% or 9% Ni steel, i.e. ASTM A353 / A553.

NOTE ON USAGE :

- Rebake the electrodes at 350~400°C for 60 minutes prior to use. Put daily use quantity in thermostat-container with 100~150°C during usage.
- Follow the recommended welding parameters and maintain short arc length.

WELDING POSITION :

TYPICAL CHEMICAL COMPOSITION OF WELD METAL (wt%) :

C	Mn	Si	P	S	Ni	Cr	Mo	Nb	Fe	W
0.060	2.47	0.42	0.001	0.002	70.00	13.60	6.2	1.5	4.1	1.60

TYPICAL MECHANICAL PROPERTIES OF WELD METAL :

TENSILE STRENGTH $N/mm^2(Kgf/mm^2)$	ELONGATION RATE %	IMPACT VALUES -196 °C J(Kgf-m)
660(67.3)	39	60

SIZE AND RECOMMENDED CURRENT RANGE : DC(+)

Diameter (mm)		2.6	3.2	4.0	5.0
Length (mm)		300	350	350	350
Current (Amp)	F	60-90	80-130	100-170	120-180
	V & OH	55-80	65-120	80-140	-

INTRODUCTION OF NICKEL-BASED ALLOY STEEL WELDING MATERIALS-FLUX-COATED WELDING WIRE

SELECTION RECOMMENDATION

According to the specification category number classification of AWS A5.34 "Code for Arc Welding of Nickel and Nickel Alloy Charged Welding Wire", the classification is based on the main components of dissolved gold, welding posture and shielding gas. The information of tensile strength grade will not be displayed on the specification. The welding current of such materials is DC (+). The relevant classification and application are summarized as follows:

Specification Class Number	Shielding gas	Welding position
ENiXXXXT0-1	100% CO_2	Flat Welding (F), Horizontal Fillet Welding (H-Fillet)
ENiXXXXT1-1	100% CO_2	Full posture
ENiXXXXT0-3	--	Flat Welding (F), Horizontal Fillet Welding (H-Fillet)
ENiXXXXT0-4	75-80% Ar+20-25% CO_2	Flat Welding (F), Horizontal Fillet Welding (H-Fillet)
ENiXXXXT1-4	75-80% Ar+20-25% CO_2	Full posture

Classification is made according to component content, and its related application is as follows:

Principal component category	Specification Class Number	Characteristic or application
Nickel-chromium	ENiCr3Tx-y	It is used for welding Ni-Cr-Fe alloy or steel side coating welding when welding with different materials of steel. It is generally welded with ASTM B163, B166, B167, B168 and other steel grades.
Nickel-chromium-iron	ENiCrFe1Tx-y	Same as above.
	ENiCrFe2Tx-y	It has better crack resistance than ENiCrFe1Tx-y, and is used for welding Ni-Cr-Fe alloy, or side coating welding of steel when welding with different materials of steel, 9Ni steel, or welding with different materials of other steel grades.
	ENiCrFe3Tx-y	The crack resistance is the best welding material in NiCrFe series, which is used for welding Ni-Cr-Fe alloy or Ni-Cr alloy, or welding with different materials of other steel grades.
Nickel-chromium-molybdenum	ENiCrMo2Tx-y	It is used for welding Ni-Cr-Mo alloy or welding with different materials of steel. It is generally welded with ASTM B435, B572, B619, B622, B626 and other steel grades.
	ENiCrMo3Tx-y	Used for welding nickel-chromium-molybdenum alloy or nickel-iron-molybdenum alloy, generally welded with ASTM B443, B444, B446, B407, B409, B5l4, B564 and other steel grades.
	ENiCrMo4Tx-y	Used for low carbon Ni-Cr-Mo alloy welding, generally with ASTM B574, B575, B619, B622, B626 and other steel grades welding.
	ENiCrMo10Tx-y	Used for welding nickel-chromium-molybdenum alloy, generally with ASTM B574, B575, B619, B622, B626 and other steel grades.
Nickel-chromium-cobalt-molybdenum	ENiCrCoMo1Tx-y	It is used for welding Ni-Cr-Co-Mo alloy and steel with different materials or steel side coating, and has high temperature strength and oxidation resistance in high temperature environment of 820 ~ 1150°C.
Nickel-molybdenum	ENiMo13-Tx-y	It is commonly used for welding 9Ni steel, and is generally welded with ASTM A333, A334, A353, A522, A553 and other steel grades.

WELDING OPERATION

◆(1)Storage management of welding rod:

Please refer to the description of carbon steel welding wire for storage management.

◆(2)Precautions for welding:

①Before operation, clean treatment shall be carried out at the welding part and the workpiece part within 50mm around it to avoid cracks or pores caused by weld pollution.

②In general use, 75 ~ 80% Ar + 20 ~ 25% CO_2 mixture is recommended as protective gas to form an arc mode of spray arc migration, and the gas flow rate is set at 20 ~ 25 l/min.

③The oxide layer or residue on the weld surface shall be removed with special grinding wheel and stainless steel brush.

④It is suggested to stop the filler at the final melting pit before breaking the arc to avoid cracking of the welding channel melting pit.

⑤There is no need to preheat during welding, and the temperature between tracks is suggested ≤ 150℃.

SFC-625

AWS A5.34 ENiCrMo3T1-4
EN –
GB –

FLUX CORED WIRES FOR NICKEL ALLOY STEEL

DESCRIPTION & APPLICATIONS :

- SFC-625 nickel-based flux cored wire with weld metal content 60%Ni-22%Cr-9%Mo-3%Fe-3.6%Nb.
- Suitable for Ni-Cr-Mo alloy steel, carbon steel and low alloy steel welding. Such as Inconel 625, Incoloy 825 and 9% Ni steel.

NOTE ON USAGE :

- Keep forward and back-forward weaving process and fill up the melting pool. Once bead appearance crack, use grinding method for repair (DO NOT use gouging carbon).

WELDING POSITION :

TYPICAL CHEMICAL COMPOSITION OF WELD METAL (wt%) : (Shielding Gas : 75%Ar+25%CO_2)

C	Mn	Si	P	S	Ni	Cr	Mo	Fe	Nb+Ta
0.030	0.30	0.35	0.0005	0.0005	64.50	20.80	8.70	0.3	3.5

TYPICAL MECHANICAL PROPERTIES OF WELD METAL : (Shielding Gas : 75%Ar+25%CO_2)

TENSILE STRENGTH $N/mm^2(Kgf/mm^2)$	ELONGATION RATE %	IMPACT VALUES -196°C J(Kgf-m)
720(73.5)	28	60(6.1)

SIZE AND RECOMMENDED CURRENT RANGE : DC(+)

Parameters \ Diameter (mm)	1.2mm	
	F & H	V & OH
Voltage (Volt)	23-30	22-28
Current (Amp)	130-250	120-200
Stickout (m/m)	15-25	
Flow Rate (l/min)	20-25	

INTRODUCTION TO NICKEL-BASED ALLOY STEEL WELDING MATERIALS-SOLID WELDING WIRE

SELECTION RECOMMENDATION

According to AWS A5.14 "Specification for Nickel and Nickel Alloy Bare Welding Wire and Welding Rod", the classification is based on the main components of dissolved gold. The information of tensile strength grade will not be displayed on the specification. GMAW and GTAW welding methods are specified in this chapter. The relevant classification and application are summarized as follows:

Specification Class Number	Characteristic or application
ERNi-1	It is mainly used for welding pure nickel workpieces for industrial use. Due to the addition of titanium (Ti), it can prevent the generation of weld bead pores. It is generally matched with ASTM B160, B161, B162, B163.
ERNiCu-X series	It is mainly divided into ERNiCu-7 welding for nickel-copper base metal, such as: ASTM B127, B163, B164, B165; Another specification is ERNiCu-8 for welding of age-hardening nickel-copper base metal, such as ASTM F467, F468.
ERNiCr-X series	This series includes 4 welding material grades,-3 and-4 and-6 and-7. Most of them are used for nickel-chromium or nickel-chromium-iron alloy base metals, such as ASTM B163, B166, B167 and B168.
ERNiCrFe-X series	This series includes 9 welding material grades,-5 and-6 and-7 and-7A and-8 and-11 and-12 and-13 and-14. Most of them are used for nickel-chromium or nickel-chromium iron alloy base metals, such as ASTM B163, B166, B167, B168. The more special grades are:-6 and-8 can be used for age hardening treatment,-7A and-13 can resist low plastic cracking (DDC) and oxide pollution,-11 can be used in high temperature environment, and-14 can especially resist low plastic cracking (DDC). Usually combined with SAW welding method.
ERNiFeCr-X series	Application of ERNiFeCr-1 in ASTM B423 Welding; ERNiFeCr-2 can be used for age hardening treatment and welded with ASTM B637 and AMS 5589 materials.
ERNiCrFeSi-1	Generally welded with ASTM B163, B166, B167, B168, B366, B516, B517, B546, B564 materials.
ERNiCrFeAl-1	This welding material is usually used in petrochemical industry and can resist metal dusting, carbonization, vulcanization and high temperature corrosion. It is usually welded with ASTM B166, B167 and B168 materials.
ERNiMo-X series	There are 9 welding material grades in this series,-1 and-2 and-3 and-7 and-8 and-9 and-10 and-11 and-12. The more special grades are:-3 is used for nickel-based, cobalt-based and iron-based alloy welding and different materials welding,-8 and-9 is usually used for 9% Ni steel welding,-10 and-11 and-12 is usually used for ASTM B333, B335, B366, B564, B619, B622, B626 material welding or different materials welding.

Specification Class Number	Characteristic or application
ERNiCrMo-X series	There are 19 welding material grades in this series,-1 and-2 and-3 and-4 and-7 and-9 and-10 and-11 and-13 and-14 and-15 and-16 and-17 and-18 and-19 and-20 and-21 and-22. The more special grades are: -3 is used for working temperature from low temperature to 540°C, and is usually welded with ASTM B443, B444 and B446 materials. -4 is usually welded with ASTM B574, B575, B619, B622, B628 materials. -15 can be used for age hardening treatment and welded with ASTM B 805 material. -16 is commonly used in anti-corrosion heap welding, especially effective against crevice corrosion. -17 and-18 are commonly used for welding ASTM B574, B575, B619, B622, B629 materials, especially for welding different materials of super Vosten stainless steel. -20 is especially suitable for welding super dual-phase steel and has excellent low temperature toughness.
ERNiCrCoMo-1	Suitable for welding Ni-Cr-Co-Mo alloy ASTM B166 (UNS N06617).
ERNiCoCrSi-1	It is suitable for welding Ni-Cr-Co-Si alloy ASTM B435, B572, B619, B626 materials. This material will be more sensitive to iron metals. It is not recommended to weld with iron-based alloys.
ERNiCrWMo-1	Suitable for welding Ni-Cr-W-Mo-La alloy ASTM B366, B435, B564, B572 alloy.

WELDING OPERATION

◆(1)Storage management of welding rod:

Please refer to the description of carbon steel solid welded wire for storage management.

◆(2)Precautions for welding:

①Please refer to the contents of nickel-based covered weld for cleaning and temperature management.

②In GMAW welding method, 100% Ar or 80 ~ 85% Ar + 15 ~ 20% He mixture is used as shielding gas to form an arc mode of arc spraying and moving, and the gas flow rate is set at 15 ~ 20 l/min. If the mixed gas mode with He is matched, the arc force is strong, so attention should be paid to the matching of welding conditions to avoid welding corrosion.

③In GTAW welding method, 100% Ar is mostly used as shielding gas, and 100% He or Ar + He mixture is also used. Welding condition is 60 ~ 100A, shielding gas is 8 ~ 15 l/min; The welding condition is 100 ~ 150A, and the shielding gas is set at 12 ~ 20 l/min.

④In GTAW welding method, because nickel-based welding materials are all of high alloy composition, the fluidity of molten iron and arc permeability will be poor. Attention should be paid to the gap of full permeability in the bottom track and the root of the slotted surface to avoid the phenomenon of poor permeability.

SOLID WIRE FOR NICKEL ALLOY STEEL

Item	Classification			Typical mechanical properties of weld metal (wt%)			
	AWS A5.14	EN 18274	GB T15620	TS (N/mm^2)	EL %	C	Mn
SMG-751 STG-751	ERNiCr-3	SNi6082	ERNiCr-3	672	42	0.03	2.7
SMG-625 STG-625	ERNiCrMo-3	SNi6625	ERNiCrMo-3	786	42	0.01	0.03
SMG-276 STG-276	ERNiCrMo-4	SNi6276	ERNiCrMo-4	745	41	0.01	0.4
SMG-622 STG-622	ERNiCrMo-10	SNi6022	–	730	38	0.008	0.4
SMG-400 STG-400	ERNiCu-7	SNi4060	ERNiCu-7	566	41	0.018	3.5
SMG-200 STG-200	ERNi-1	SNi2061	ERNi-1	475	37	0.02	0.31

Typical chemical composition of weld metal (wt%)					TYPICAL APPLICATIONS
Si	Ni	Cr	Mo	Others	
0.11	Bal	20.03	–	Fe:1.3 Nb:2.52 Ti:0.3	It suits for Inconel, Incolloy dissimilar metals welding and overlying.
0.07	65.24	22.18	8.67	Fe:0.2 Nb:3.61 Al:0.15 Ti:0.16	For Inconel 625 and Alloy904L and dissimilar metals welding.
0.05	Bal	15.67	15.96	Fe:5.91 W:3.12	For Hastelloy C-276, Nickel alloy welding.
0.04	Bal	21.52	13.54	Fe:3.1 W:3.07	For Inconel 622 alloy and Ni-Cr-Mo corrossion resistnace alloy and dissimilar metals welding.
0.08	65.24	–	–	Fe:0.55 Al:0.08 Ti:1.56 Cu:Bal	For Monel alloy and dissimilar metals welding.
0.37	96.14	–	–	Fe:0.07 Al:0.08 Ti:2.75 Cu:0.005	For Inconel 200, 201 welding.

INTRODUCTION OF NICKEL-BASED ALLOY STEEL WELDING MATERIALS-SUBMERGED ARC WELDING MATERIALS

SELECTION RECOMMENDATION

There is no specific chapter in AWS specification for nickel-based submerged arc welding materials. The part of welding wire is mainly based on AWS A5.14 "Specification for Nickel and Nickel Alloy Bare Welding Wire and Welding Rod". Relevant contents are described as nickel-based solid welding wire.

WELDING OPERATION

◆(1)Storage management of welding rod:

Please refer to the description of submerged arc welding materials of carbon steel for storage management.

◆(2)Precautions for welding:

①Please refer to the contents of nickel-based covered weld for cleaning and temperature management.

②The welding polarity can be DC (+) or DC (-). In slotting welding, it will be set to DC (+) to obtain flatter welding channel and deeper permeability. In surface cladding welding, it will be set to DC (-) to obtain higher filling rate and reduce dilution rate.

③The heat input of submerged arc welding shall not be too large to avoid cracking of welding channel.

④Please refer to the contents of stainless steel submerged arc welding material for other matters needing attention.

SF-34xSW-276

AWS A5.39 ERNiCrMo-4
EN ISO 18274 SNi 6276
GB T15620 SNi6276

Nickel alloy SAW welding

DESCRIPTION & APPLICATIONS :

- SF-34XSW-276 is 57% Ni-16% Cr-15. 5% Mo-5. 5% Fe-4% W submerged arc welding material, suitable for Inconel 276, ASTM A553M TYPE1, UNS N10276 and other base metals.
- Welding slag has good peeling property and smooth appearance of welding channel.
- And with SF-34 welding flux, the metal content of weld bead itself will be maintained in a stable state, and excellent welding performance will be displayed.

NOTE ON USAGE :

- SF-34 belongs to alkaline welding flux. After unpacking, please put it in the furnace and dry it at 350 ˚C for 1 hour. Pay attention to keep it dry to prevent pores.
- When the bottom layer is welded, the current should not be too high to avoid cracking of weld bead.
- When the welding flux is recycled and reused, please add a proper amount of new welding flux for mixed use to ensure good quality of weld.

TYPICAL CHEMICAL COMPOSITION OF WELD METAL :

C	Mn	Si	P	S	Ni	Cr	Mo	W	Fe
0.018	0.55	0.21	0.006	0.002	56.30	15.30	16.2	3.6	6.2

TYPICAL MECHANICAL PROPERTIES OF WELD METAL :

YIELD POINT $N/mm^2(Kgf/mm^2)$	ELONGATION RATE %	IMPACT VALUES -196 ˚C J(Kgf-m)
723(73.8)	42	90(9.2)

SF-34xSW-625

AWS A5.39 ERNiCrMo-3
EN ISO 18274 SNi 6625
GB T15620 SNi6625

Nickel alloy SAW welding

DESCRIPTION & APPLICATIONS :

- SF-34 x SW-276 is a nickel-based submerged arc welding material consisting of 61% Ni, 22% Cr, 9% Mo, 3.5%NB, and Ta, suitable for welding base metals such as Inconel 625 and Incoloy 825.
- It has excellent slag detachability and produces a smooth weld bead appearance.
- When used with SF-34 flux, it ensures the metal content of the weld bead remains stable, exhibiting superior welding performance.

NOTE ON USAGE :

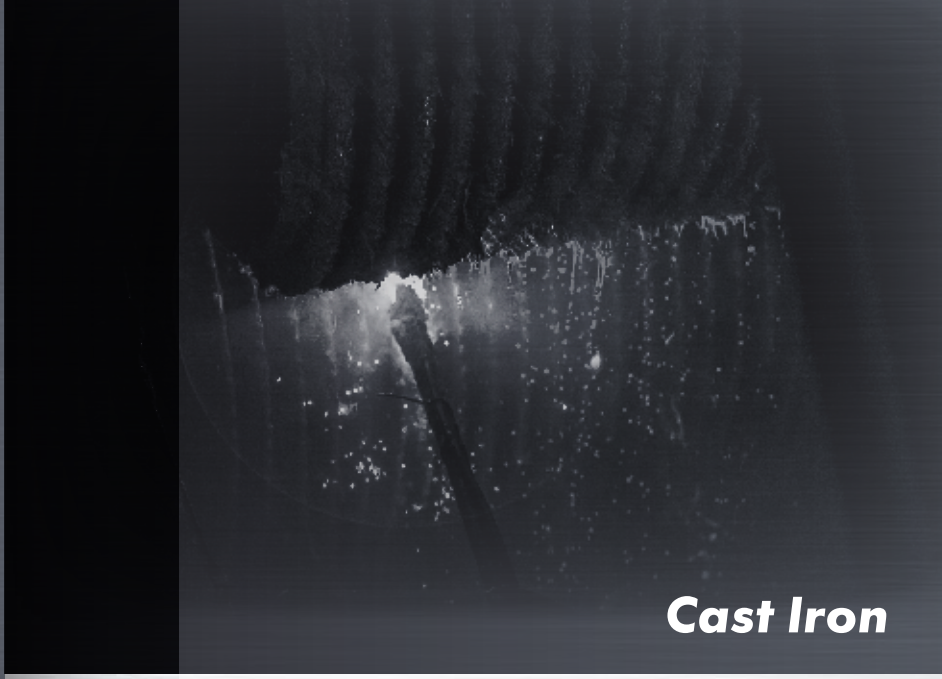
- SF-34 is a basic flux and should be dried in an oven at 350°C for 1 hour after opening.
- Ensure it is kept dry to prevent porosity. For root pass welding, avoid excessive current to prevent cracking in the weld bead.
- When reusing recovered flux, mix it with an appropriate amount of new flux to ensure good weld quality.

TYPICAL CHEMICAL COMPOSITION OF WELD METAL :

C	Mn	Si	P	S	Ni	Cr	Mo	Fe	Nb+Ta
0.02	0.26	0.42	0.001	0.001	61	21.2	8.4	2.3	3.3

TYPICAL MECHANICAL PROPERTIES OF WELD METAL :

YIELD POINT $N/mm^2(Kgf/mm^2)$	ELONGATION RATE %	IMPACT VALUES -196 °C J(Kgf-m)
770(78.6)	39	83(8.5)



Cast Iron

Base metal introduction

Cast Iron contains carbon (C): 2 ~ 4%, Si:0.5 ~ 4%, Mn:0.3 ~ 2%, P:0.05 ~ 1% ; the iron-based alloy casting. It applies for a special purpose with additional content of Mn, Si, Ni, Cr or Mo alloys, but worse toughness and weldability. Common cast iron classification is shown in the table below:

Category		JIS No.	JIS Specifications	Characteristic
Gray Cast Iron	General cast iron	G5501	FC100, FC150, FC200	①All purpose for industries, well-known named with broken surface in gray color. ②High-grade cast iron comprised of Pearlite structure; the higher strength and toughness than general cast iron.
	High-grade cast iron	G5501	FC250, FC300, FC350	
Nodular Cast Iron	Nodular cast iron	G5502	FCD350, FCD400, FCD450, FCD500, FCD600, FCD700, FCD800	①Also named ductile iron or nodular cast iron. Generally add Mg, Ce or Ca in the composition of the original spheroidizing graphite cast iron. ②Tensile strength is a 2-3 times of general cast iron; the higher elongation and well weldability.
	Austempered Ductile Iron (ADI)	G5503	FCAD900, FCAD1000, FCAD1200, FCAD1400	
	Ferritic nodular cast iron	G5504	FCAD300LT (Low temperature use)	
Malleable Cast Iron	Blackheart malleable cast iron	G5702	FCMB270, FCMB310, FCMB340, FCMB360	①Blackheart malleable cast iron is originally made of whiteheart malleable cast iron by heating at 700~900°C to dissolve Cementite into graphitization so as to be capable of toughness in Ferrite with the black broken surface. ②Whiteheat malleable cast iron is to heat the white pig iron at 850-1000°C into oxidizing phenomenon for decarbonization that improves thoughness. ③Pearlite malleable cast iron is formed into graphite and pearlite structure by heating process that performs better in cutting, wearing, strength, and quenching.
	Whiteheart malleable cast iron	G5703	FCMW300, FCMW370, FCMWP440, FCMWP490, FCMWP540	
	Pearlite malleable cast iron	G5704	FCMP440, FCMP490, FCMP540, FCMP590, FCMP690	
Alloy Cast Iron	Ni-alloy cast iron	--	--	Resistance of heat, corrosion, and wearing
	Cr-alloy cast iron	--	--	Hardening, wearing and heating resistances
	Ni-Cr alooy cast iron	--	--	Alloy cast iron is the most use, high strength, toughness, hardness, heat and corrosion resistances
	Ni-Cr-Mo alloy cast iron	--	--	High strength, fatigue and wear resistances generally use for engine crankshaft
	Ni-Cr-Si alloy cast iron	--	--	Heat resistance generally use for stove metalware
	Ni-Cr-Cu alloy cast iron	--	--	Heat and acid resistance
	Al-alloy cast iron	--	--	Heat and acid resistance generally use for boiler accessories

Welding method and Specifications

It is due to the high content of carbon, poor weldability, and even to difficultly weld for cast iron alloy. The common problems on welding are cracking and blowholes, and therefore, should avoid to.

◆(1)Hard and brittle white pig rod martensitic structure composition may cause cracking phenomenon.

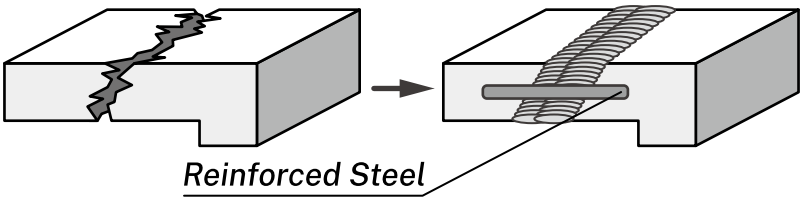
◆(2)Cementite and graphite are both dissolved and oxidized after heating with high temperature that it causes with a large amount of CO or CO_2 gas resulting in blowholes.

In Cast iron welding process, the preheat temperature can be classified high-temp. and low-temp. on welding. High temperature preheat is at 500 ~ 600°C in whole parent material and then welding afterwards. Generally, it applies for oxyacetylene welding or electrode welding; the large deformation of workpiece and longer waiting time of preheat as disadvantage. Low temperature preheat at the welding part is at 100 ~ 200°C and then welding afterwards. It applies for electrode welding, argon welding or gas metal arc welding (GMAW); the smaller deformation of workpiece but the brittleness at HAZ.

In order to weld effective combined with parent material, cast iron workpiece on welding artwork the common applications are recommended as follows:

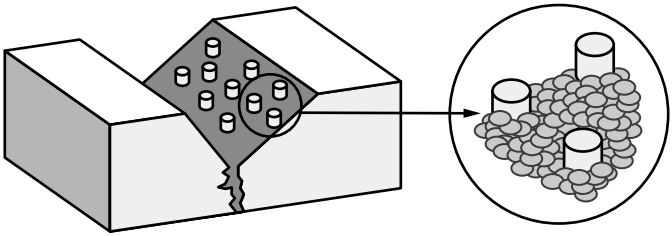
①Embedded board & Bar filling:

In order to increase the strength of the weld filling, the cast iron filling and welding parts embedded with steel material, steel bar as reinforcement; the recommended welding consumable of ENiFe-CI.



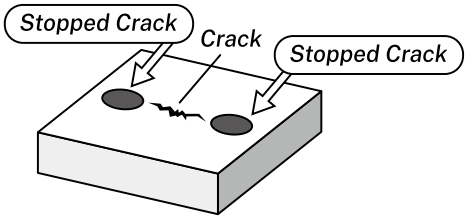
②Implant bolts:

Implant bolts prior to welding; weld the bolts around to the entire weld.



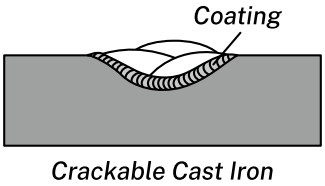
③Drilling cracking holes:

In order to prevent the cracks continuous and expanding, and therefore, it is required to drill a hole at each side of the crack and then wear it in an arc groove and fill it up.



④Coating:

The cracking is usually caused near the melting interface and HAZ. Welding a dual coatings with Eni-Ci grade material at the groove surface and then fill it up afterwards for the welding difficulty on workpieces.

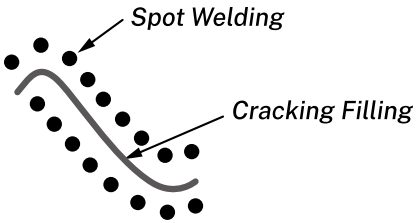


⑤Hammering:

Repeatedly hammering on the deformed weld after welding is for the stress relief. The head of the hammer must be blunt head in order to prevent the stress concentration for cracks, but not recommended for the bottom weld or surface weld.

⑥Cracks on each side of spot welding:

Gray cast iron welding is to spot welding on each side of the crack by a short distance between so as to release the stress and then weld it; grinding the spot welding part off at the end.



SELECTION RECOMMENDATION

Specification of Cast Iron welding according to AWS A5.15: It consists of OFW, GMAW, FCAW, and SMAW, the four categories welding. The following relevant classification and features.

TYPE	SPECIFICATION CLASS NUMBERS	FEATURES
Bare Rod (OFW)	RCI	Use for gray cast iron welding.
	RCI-A	Fewer content of Ni and Mo alloys, better liquidity and faster wire melting speed.
	RCI-B	Use as nodular cast iron welding for high strength gray cast iron, malleable cast iron, and nodular cast iron.
Electrode or Wire (SMAW)	ENi-CI	The content of Ni of weldmetal at 90~95% is general for gray cast iron, iron-based or non-iron based workpieces. If considers the weld strength and toughness, it recommends ENiFe-CI grade welding consumables, besides, the malleable cast iron or nodular cast iron is for processing consideration.
	ENi-CI-A	Flux design involves Al for molten iron fluidity and slag coverage improvement but the weld toughness effect.
	ENiFe-CI	The content of Ni of weldmetal at 50% is general for the most cast iron workpieces and steel iron materials on dissimilar materials welding, especial better for large or high strength on cast iron welding.
	ENiFe-CI-A	Additional content of Al in flux compared to ENiFe-CI for molten iron fluidity and slag coverage improvement but the weld toughness effect.
	ENiFeMn-CI	The content of Mn of the weldmetal about 12% is to improve molten iron fluidity, cracking resistance, strength and toughness. Use as hardfacing welding application better for ENiFe-CI.
	ENiCu-A	Similar to ENiFe-CI, ENiFe-CI-A, ENiFeMn-CI applications, use as coating welding.
	ENiCu-B	
Stick Electrode for Carbon Steel (SMAW)	ESt	Specialized in cast iron welding design for carbon steel electrodes, difference to AWS A5.1 the materials the weld difficult to cut and process. It uses smaller current to weld for the weld cracking prevent.
Welding Wir (FCAW)	ENiFeT3-CI	It is generally designed for self-shield flux-cored wire, the content of Mn about 3~5% to improve the weld cracking resistance, strength and toughness as same as ENiFe-Ci on application.
Bare rod (GMAW)	ERNi-CI	Content of Ni at 99% for coating welding.
	ERNiFeMn-CI	Suitable for high strength of nodular cast iron welding.

WELDING OPERATION

◆(1)Storage management of welding rod:

Refer to the storage management of carbon steel consumables.

◆(2)Precautions for welding:

①Cleaning the dirty, solvent, foreign materials or oil attached the surface of the workpiece by heating with gas at 400℃ upwards prior to welding for the condition of the weld blowholes.

②Preheat temperature of cast iron welding is classifying high-temp. (by heating) and low-temp. (by cooling). It estimates the cracking situation by welding consumables matchup dependent on the materials and workpiece thickness.

③Non-preheat or low temp. preheat in Nodular welding, it generally recommends ENiFe-CI grads for lower incidence of cracking.

④The groove opening angle of casting workpiece recommends in 70~90°, and the root recommends to be processed into an arc (R) to increase the penetration of the bottom weld.

⑤To avoid using carbon rod for back shoveling or removal that would cause the situation of the weld cracking by the excessive carbon deposit.

⑥Lower welding current is to avoid excessive hardening at heat affected zone (HAZ) for cracking matter.

⑦The length of each weld is limited to 50 mm under straight welding direction nor weaving welding in order to avoid excessive heat impact at HAZ.

⑧When weld a small gap of a bowl-shape workpiece, the welding direction is to be handled in the way of the vortex-like upward. The long weld welding should be in the ways of symmetrical welding and skip welding that distributes the stress evenly for welding arrangement in order for cracking matter.

⑨When cast iron welds with a dissimilar material, it firstly does coating and then joint welding. The area or width of the coating must be great than the joint weld in order to avoid the welding toe cracking nearby.

SN-55

AWS A5.15 ENiFe-CI
EN –
GB T10044 EZNiFe-1

COVERED ELECTRODES FOR CAST IRON

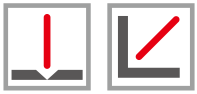
DESCRIPTION & APPLICATIONS :

- SN-55 uses Iron-Ni alloy rod, the cast iron electrode of graphite series.
- High strength, toughness, cracking resistance, smaller coefficient of expansion, slight hardening, and easy to mechanical process.
- Use for nodular ductile cast iron, general cast iron maintenance, and hardening filling.

NOTE ON USAGE :

- According to the parent materials, formation, and dimension to preheat at 300˚C and post heat treatment at 500~600˚C afterwards, and finally room cooling.
- Proceed to hammer on each weld after the welding in order to reduce the shrinkage stress.
- Cast iron the poor ductility, it therefore the welding length is no more than 70mm for cracking protection on the edge of the joint due to high temperature.
- Welding more than two coatings the symmetrical welding on each coating should be taken by tack welding method in order to balance the heat on parent material, thermal stress, and cold surface balanced.
- Weld with a short arc and low current.

WELDING POSITION :



TYPICAL CHEMICAL COMPOSITION OF WELD METAL (wt%) :

C	Mn	Si	Ni	Cr
0.70	0.70	0.75	55.0	0.05

SIZE AND RECOMMENDED CURRENT RANGE : AC or DC(+)

Diameter (mm)	2.6	3.2	4.0	5.0
Length (mm)	300	350	350	350
Current (Amp)	60-80	80-120	120-150	130-180

SN-99

AWS A5.15 ENi-CI
EN –
GB T10044 EZNi-1

COVERED ELECTRODES FOR CAST IRON

DESCRIPTION & APPLICATIONS :

- SN-99 use pure Ni-rod for the cast iron electrode of graphite series.
- Filler metal and cast iron is the smallest hardening at HAZ in cast iron electrodes, the best mechanical process.
- Use for diverse cast iron joints and repairing, for instance, cylinder cap, motor stand, and gear.

NOTE ON USAGE :

- No need preheat and post heat treatment but it depends on parent materials, formation, stress conditions that applies for post heat treatment at 150~200℃.
- Proceed to hammer on each weld after the welding in order to reduce the shrinkage stress.
- Cast iron the poor ductility, it therefore the welding length is no more than 70mm for cracking protection on the edge of the joint due to high temperature.
- Welding more than two coatings the symmetrical welding on each coating should be taken by tack welding method in order to balance the heat on parent material, thermal stress, and cold surface balanced.
- Weld with a short arc and low current.

WELDING POSITION :

TYPICAL CHEMICAL COMPOSITION OF WELD METAL (wt%) :

C	Mn	Si	Ni
0.56	0.20	0.7	94.5

SIZE AND RECOMMENDED CURRENT RANGE : AC or DC(+)

Diameter (mm)	2.6	3.2	4.0	5.0
Length (mm)	300	350	350	350
Current (Amp)	60-80	70-120	100-150	130-170

Reference

ELECTRODE REDRY CONDITIONS LIST

Steel Grades	Type of Covering	Product Name	Dry Temp (°C)	Dry Time (min)
Mild Steel	Low-hydorgen Potassium	SM-03, SL-50DR, SL-241	110~140	30~60
	High Cellulose	SC-10, SC-11	70~80	30~60
	Iron Oxide Titania Potassium	SM-10	80~100	30~60
	High Titania Potassium	SM-13		
	High Titanium	SM-26		
High Tensile Steel	Low-hydorgen Potassium	SL-241	110~140	30~60
	Low-Hydrogen	SL-50DR	110~140	30~60
		SL-50, SL-60, SL-80, SL-110, SL-120	300~350	60
	Low-Hydrogen Iron Powder	SL-50D, SL-58, SL-58M, SLH-58, SL-108M, SL-118M		
	Iron Powder	SL-56, SL-24	220~250	60
Low-alloy Heat Resistant Steel	High Cellulose	SC-70A1	70~80	30~60
	Low-Hydrogen	SR-76A1, SR-86B2, SR-96B3, SR-86B6, SR-86B8, SR-96B9, SR-591, SR-592	350~400	60
	Low-Hydrogen Iron Powder	SR-78A1, SR-88B2, SR-98B3		
Low-alloy Low Temperature Steel	Low-Hydrogen	SN-86C1, SN-86C2, SN-86C3, SN-86G	350~400	60
	Low-Hydrogen Iron Powder	SN-88C1, SN-88C2, SN-88C3, SN-88G, SN-98G		
Low-alloy Atmospheric Corrosion Resistant Steel	Low-Hydrogen Iron Powder	SW-78W1, SW-88W2	350~400	60

Steel Grades	Type of Covering	Product Name	Dry Temp (°C)	Dry Time (min)
Stainless Steel	***Low-Hydrogen Titanium Oxide***	SS-307, SS-307HM, SS-308, SS-308H, SS-308L, SS-308LT, SS-309, SS-309L, SS-309MoL, SS-309Nb, SS-310, SS-312, SS-316, SS-316L, SS-316LT, SS-317L, SS-318, SS-347, SS-385, SS-410, SS-410NM, SS-430, SS-2209, SS-2594, SS-2595	300~350	60
Cast Iron	***Graphite***	SN-55, SN-99	250~300	30~60
Nickel Alloy Steel	***Low-Hydrogen***	SNF-1, SNF-2, SNF-3, SNM-3, SNM-4, SNM-6	350~380	60
Hardfacing Wear Resistance	***Rutile***	SH-26R, SH-35R, SH-45R, SH-80R	110~140	30~60
	Low-Hydrogen	SH-45, SH-50, SH-60, SH-80, SH-80W, SH-80B, SH-90, SH-90HS, SH-95HC, SH-95HN, SH-W, SH-WM, SH-MN, SH-58HC	300~350	30~60
	Low-Hydrogen Titanium Oxide	SH-50N4	150~200	30~60
Submerged Arc Welding	***Agglomerated Flux***	SF-30, SF-33, SF-38, SF-65, SF-66, SF-68, SF-75, SF-78, SF-80, SF-82 SFB-S300, SFB-E300	300~350	60

APPROVALS OF SOREX PRODUCTS

TYPE	Brand Name	AWS Code	Shield Gas	Inspection Institute		
				ABS	BV	CCS
Stick Electrode	SM-13	E6013	–			
	SL-50	E7016	–	AWS A5.1 E7016		
	SL-58	E7018	–	3Y H5		
	SLH-58	E7018-1H4	–	4YQ420 H5		
	SR-86B2	E8016-B2	–	AWS A5.5 E8016-B2		
	SR-96B3	E9016-B3	–	AWS A5.5 E9016-B3		
	SN-55	ENiFe-C1	–			
	SN-88C1	E8018-C1	–			
	SN-99	ENi-C1	–			
	SL-108M	E10018-M	–			
Stainless Stick Electrode	SS-308L	E308L-16	–	AWS A5.4 E308L-16		
	SS-309L	E309L-16	–	AWS A5.4 E309L-16		
	SS-312	E312-16	–			
	SS-316L	E316L-16	–	AWS A5.4 E316L-16		
	SS-2209	E2209-16	–			
Carbon Steel Flux Cored Wires	SFC-71	E71T-1C	C	3Y400SA H5	3Y40SMH5	3YS H5
	SFC-71	E71T-1M	M	3YSA H5	S3YMH5	
	SFC-71J	E71T-1C-J	C	4YSA H5		
	SFC-71J	E71T-1M-J	M	4YSA H5		
	SFC-71M	E70C-6C/M	M/(C&M for CE Mark)	3YSA H5		
	SFC-71G	E491T-GS	–			
	SFC-71B	E491T-11	–			
	SFC-75	E71T-5C/M	C/(C&M for CE Mark)			
	SFC-70C	E70C-1C	C			
	SFC-81M	E80C-G	C			
	SFC-81M	E80C-G	M			
Low-alloy Flux Cored Wire	SFC-110	E111T1-GM	M	AWS A5.29 E111T1-GM-H4 / AWS A5.29 E111T1-K3M-JH4		
	SFC-81Ni1	E81T1-NiC	C			
	SFC-81K2	E81T1-K2C	C		5Y46S H5	
	SFC-81K2	E81T1-K2M	M			

Remark :

◆ABS : American Bureau of Shipping
◆BV : Bureau Veritas
◆CCS : China Classification Society
◆CPR-CE MARK : European Community (CE) Construction Products
◆CR : CR Classification Society
◆DNV·GL : Det Norske Veritas & Germanischer Lloyd AS GROUP

Inspection Institute								
CPR-CE MARK (LRQA)	CR	DNV-GL	LR	NK	KR	RINA	PRS	CWB
EN ISO 2560-A - E 38 0 R 1 2								
EN ISO 2560-A - E 42 3 B 1 2 H5								
EN ISO 2560-A - E 42 3 B 3 2 H5			3Ym H5					E4918-H8
EN ISO 2560-A - E 42 4 B 3 2 H5			4Y42m H5					
								ENiFe-C1
		5Y40 H5						
								ENi-C1
	CR-E698-M1(MIL-10018-M1)							
EN ISO 3581-A -E 19 9 L R 1 2			304L m					E308L-16
EN ISO 3581-A -E 23 12 L R 1 2			SS/CMn m					E309L-16
EN ISO 3581-A - E 29 9 R 1 2								E312-16
EN ISO 3581-A - E 19 12 3 L R 1 2			316L m					E316L-16
EN ISO 3581-A -E 22 9 3 N L R 1 2								
EN ISO 17632-A - T46 2 P C1 1 H5	3YSH5	III YMS(H5)	3YS H5	KSW53G (C)H5	3YSG(C) H5	3YSM H5	3YS H5	E491T1-C1A2-CS1-H8
EN ISO 17632-A - T46 2 P M21 1 H5		III YMS(H5)	3YS H5			3YSM H5	3YS H5	E491T1-M21A2-CS1-H8
EN ISO 17632-A - T46 4 P C1 1 H5		IVY42MS (H5)	4YS H5				4YS H5	
EN ISO 17632-A - T46 4 P M21 1 H5		IVY42MS (H5)	4YS H5				4YS H5	
EN ISO 17632-A - T46 4 M C1/ M21 1 H5		IVY42MS (H5)	4YS H5					
								E491TGS-AZ-G(E491T-GS)
								E491T11-AZ-CS3(E491T-11)
EN ISO 17632-A - T42 3 B C1/ M21 1 H5		III YMS(H5)	3YS H5					
		IIIYMS(H5)						
EN ISO 17632-A - T46 6 Z M C1 1 H5								
EN ISO 17632-A - T46 6 Z M M21 1 H5		V Y46MS(H5)						
EN ISO 17632-A - T46 3 1Ni P C1 1 H5		IV Y46MS(H5)						
EN ISO 17632-A - T46 6 1.5Ni P C1 1 H5		V Y46MS(H5)						
EN ISO 17632-A - T46 6 1.5Ni P M21 1 H5		V Y46MS(H5)						

APPROVALS OF SOREX PRODUCTS

TYPE	Brand Name	AWS Code	Shield Gas	Inspection Institute		
				ABS	BV	CCS
Stainless Flux Cored Wire	SFC-307	E307T1-1	C			
	SFC-308L	E308LT1-1	C/(C&M for CE Mark)	AWS A5.22 E308LT1-1	308L	304L
	SFC-309L	E309LT1-1	C/(C&M for CE Mark)	AWS A5.22 E309LT1-1	309L	309L
	SFC-309MoL	E309L-MoT1-1	C	AWS A5.22 E309LMoT1-1	309LMo	
	SFC-316L	E316LT1-1	C/(C&M for CE Mark)	AWS A5.22 E316LT1-1	316L	316L
	SFC-347L	E347LT1-1	C	AWS A5.22 E347T1-1		
	SFC-2209	E2209T1-1	C/(C&M for CE Mark)	AWS A5.22 E2209T1-1	2205	2205
	SFC-316H	E316HT1-1	C			
Carbon Steel Solid Wire	STG-50	ER70S-G	A	AWS A5.18 ER70S-G		
	STG-56	ER70S-6	A	AWS A5.18 ER70S-6		
	SMG-6	ER70S-6	C / M	3Y400SA		
	SMG-60	ER80S-G	M/(C&M for CE Mark)			
	SMG-60N	ER80S-G	M/(C&M for CE Mark)			
	SMG-101M	–	98%Ar+2% O2			
	SMG-101MZ	–	98%Ar+2% O2			
Nickel-Alloy Solid Wire	STG-625	ERNi-CrMo-3	Ar	AWS A5.14-2018 ERNi-CrMo-3		9Ni
	SMG-625	ERNi-CrMo-3	M	AWS A5.14 ERNiCrMo-3		
Stainless Steel Solid Wire	STG-308L	ER308L	Ar	AWS A5.9 ER308L		
	STG-309L	ER309L	Ar	AWS A5.9 ER309L		
	STG-316L	ER316L	Ar	AWS A5.9 ER316L		
	STG-2209	ER2209	Ar	AWS A5.9 ER2209		
	STG-2594	ER2594	Ar	AWS A5.9 -2012 ER2594		2750
	SMG-2209	ER2209	M	AWS A5.9 ER2209		
	SMG-2594	ER2594	M	AWS A5.9 ER2594		
Carbon Low-alloy Steel Submerged Arc Consumables	SF-65 x SW-M12K	F7A2-EM12K	–	3YM H10		
	SF-66 x SW-H12K	F7A8-EH12K	–			
	SF-68 x SW-60G	F8A2-EG-G	–			
	SF-66 x SW-60G	F8A8-EG-G	–			
	SF-70XSW-101M	–	–			
	SF-70XSW-101MZ	–	–			
	SF-30 x SW-309MoL	ER309LMo	–		309LMo	
	SF-30 x SW-316L	ER316L	–		A316LM	

◆LR : Lloyd' s Register Asia
◆NK : Nippon Kaiji Kyokai
◆KR : Korean Register of Shipping
◆CWB : Canadian Welding Bureau
◆RINA : Registro Italiano Navale
◆PRS : Polski Rejester Statkow
◆C : CO_2
◆M : 75-80%Ar/bal CO_2
◆A : Ar Gas
◆SFC-71 & SFC-71J diameter 0.9mm had been approved by ABS & PRS with MIX GAS only.

Inspection Institute								
CPR-CE MARK (LRQA)	CR	DNV-GL	LR	NK	KR	RINA	PRS	CWB
EN ISO 17633-A - T 19 9 L P C1/M21 2		NV 308L	304L S					E308LT1-1
EN ISO 17633-A - T 23 12 L P C1/M21 2		NV 309L	SS/CMn S					E309LT1-1
EN ISO 17633-A -T 23 12 2 L P C1 2								
EN ISO 17633-A - T 19 12 3 L P C1/M21 2		NV 316L	316L S					E316LT1-1
EN ISO 17633-A - T 22 9 3 N L P C1/M21 2		Duplex Steel						
		V Y46M(H5)						
EN ISO 14341-A-G 42 3 C1/ M21 Z H5								
EN ISO 14341-A-G 46 4 C1/ M21 Z H5								
EN ISO 14341-A-G 46 6 C1/ M21 Z H5								
	CR-E69S-1 (MIL-100S-1)							
	CR-E69S-1RC (MIL-100S-1RC)							
EN ISO 14171-A-S 42 3 AB S2Si	3YM H10	IIIYM H5	3YM H10	KAW-53MH10		3YM H5	3YM H5	
EN ISO 14171-A-S 46 6 FB S3Si		V Y46M H5						
EN ISO 14171-A-S 46 3 AB S2Mo								
	CR-E69S-1/E69S-1F (MIL-100S-1/100S-1F)							
	CR-E69S-1RC/E69S-1F (MIL-100S-1RC/100S-1F)							

HARDNEES CONVERSION

Brinell hardness (HV)	Brinell hardness (HB) ball dia 10mm load weight3000kg		Rockwell hardness		Hsiao hardness (HS)	Tensil strength (kgf/mm2)
	Standard Ball	Tungsten Carbide Ball	HRB Ball Diameter 1.6mm load weight100kg	HRC Brale Ball load weight100kg		
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	–	63.3	87	–
760	–	698	–	62.5	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	–	–
660	–	620	–	58.3	79	–
650	–	611	–	57.8	–	–
640	–	601	–	57.3	77	–
630	–	591	–	56.8	–	–
620	–	582	–	56.3	75	–
610	–	573	–	55.7	–	–
600	–	564	–	55.2	74	–
590	–	554	–	54.7	–	210
580	–	545	–	54.1	72	206
570	–	535	–	53.6	–	202
560	–	525	–	53.0	71	199
550	505	517	–	52.3	–	195
540	496	507	–	51.7	69	190
530	488	497	–	51.1	–	186
520	480	488	–	50.5	67	183
510	473	479	–	49.8	–	179
500	465	471	–	49.1	66	174
490	456	460	–	48.4	–	169
480	448	452	–	47.7	64	165
470	441	442	–	46.9	–	160
460	433	433	–	46.1	62	156
450	425	425	–	45.3	–	153
440	415	415	–	44.5	59	149
430	405	405	–	43.6	–	144
420	397	397	–	42.7	57	140
410	388	388	–	41.8	–	136
400	379	379	–	40.8	55	131
390	369	369	–	39.8	–	127
380	360	360	(110.0)	38.8	52	123

Remarks: (1)The approximate value is obtained from the conversion table of JIS Z 8413.
(2)The values in parentheses in the table are seldom used.

Brinell hardness (HV)	Brinell hardness (HB) ball dia 10mm load weight3000kg		Rockwell hardness		Hsiao hardness (HS)	Tensil strength (kgf/mm2)
	Standard Ball	Tungsten Carbide Ball	HRB Ball Diameter 1.6mm load weight100kg	HRC Brale Ball load weight100kg		
370	350	350	–	37.7	–	120
360	341	341	(109.0)	36.6	50	115
350	331	331	–	35.5	–	112
340	322	322	(108.0)	34.4	47	109
330	313	313	–	33.3	–	105
320	303	303	(107.0)	32.2	45	103
310	294	294	–	31.0	–	100
300	284	284	(105.5)	29.8	42	97
295	280	280	–	29.2	–	96
290	275	275	(104.4)	28.5	41	94
285	270	270	–	27.8	–	92
280	265	265	(103.5)	27.1	40	91
275	261	261	–	26.4	–	89
270	256	246	(102.0)	25.6	38	87
265	252	252	–	24.8	–	86
260	247	247	(101.0)	25.0	37	84
255	243	243	–	23.1	–	82
250	238	238	99.5	22.2	36	81
245	233	233	–	21.3	–	79
240	228	228	98.1	20.3	34	78
230	219	219	96.7	(18.0)	33	75
220	209	209	95.0	(15.7)	32	71
210	200	200	93.4	(13.4)	30	68
200	190	190	92.5	(11.0)	29	65
190	181	181	89.5	(8.5)	28	62
180	171	171	87.1	(6.0)	26	59
170	162	162	85.0	(3.0)	25	56
160	152	152	81.7	(0.0)	24	53
150	143	143	78.7	–	22	50
140	133	133	75.0	–	21	46
130	124	124	71.2	–	20	44
120	114	114	66.7	–	–	40
110	105	105	62.3	–	–	–
100	95	95	56.2	–	–	–
95	90	90	52.0	–	–	–
90	86	86	48.0	–	–	–
85	81	81	41.0	–	–	–

Remarks: (1)The approximate value is obtained from the conversion table of JIS Z 8413.
(2)The values in parentheses in the table are seldom used.

DISSIMILAR MATERIAL STAINLESS STEEL WELDING

Steel Grade	201,202 301,302 302B,303, 304,305, 304H,308	304L	309 309S	310 310S 314	316	316L
201,202 301,302 302B,303 304,305, 304H,308	E308	E308	E308	E308	E308	E308
304L		E308L	E308 E309	E308 E309 E310	E308	E308L E316L
309,309S			E309	E309 E316	E309 E316	E309 E316L
310,310S, 314				E310	E316 E310 E310Mo	E316 E310 E310Mo
316					E316	E316
316L						E316L
317						
317L						
321,347 348						
330						
403,405, 410,414, 416,420						
430,430F, 431,440A, 440B,440C						
446						

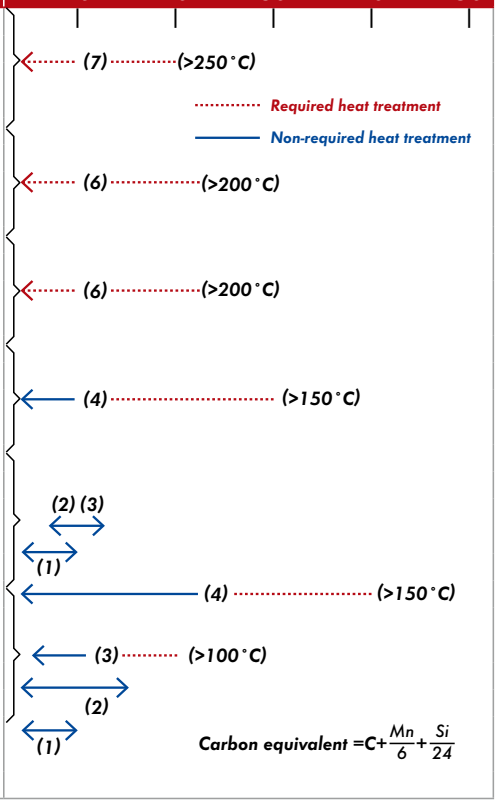
317	*317L*	*321 347 348*	*330*	*403,405, 410,412 414,420c*	*430,430F, 431,440A 440B,440C*	*446*
E308 E316 E317	E308	E308	E309	E309	E309	E310
E308 E316 E317	E308L E316L E317L	E308L E347	E309	E309	E309	E310
E309 E316	E309	E309 E347	E309	E309	E309	E309
E317 E310 E310Mo	E317 E310 E310Mo	E308 E310	E310	E309	E309	E310
E316 E317	E316 E317	E308b E316	E309	E309	E309	E310
E316	E316L E317L	E316L	E309	E309	E309	E310
E317	E317	E308b E317	E309	E309	E309	E310
	E317L	E308L E317L	E309	E309	E309	E310
		E347	E309	E309	E309	E310
			E330	E309	E309	E310
				E410	E430e	E410
					E430	E430
						E446

HEAT-RESISTANT LOW-ALLOY STEEL AND WELDING CONSUMABLES SELECTION

Steel Type	Steel Type						Welding Consumables	
	JIS			ASTM			Product	AWS Spec
	Plate	Tube	Cast	Plate	Tube	Cast		
C-½Mo	SB450M SB480M	STPA-12 STBA-12 STBA-13	SFVA F1	A204-A A204-B A204-C	A161-T1 A209-T1 A209-T1a A209-T1b A335-P1	A336-F1 A182-F1	SR-76A1 SR-78A1	E7016-A1 E7018-A1
½Cr- ½Mo	SCMV-1	STPA-20 STBA-20	SFVA F2	A387-2	A213-T2 A335 P2	A182-F2	SR-86B2 SR-88B2	E8016-B2 E8018-B2
1Cr- ½Mo, 1¼Cr-½Mo	SCMV-2	STBA-22 STPA-22	SFVA F12	A387-11	A213-T12 A335-P12	A182-F12 A336-F12	SR-86B2 SR-88B2	E8016-B2 E8018-B2
	SCMV-3	STBA-23 STPA-23	SFVA F11A SFVA F11B	A387-11	A199-T11 A200-T11 A213-T11 A335-P11	A182-F11	SR-86B2 SR-88B2	E8016-B2 E8018-B2
2¼Cr- 1Mo	SCMV-4	STBA-24 STPA-24	SFVA F22A SFVA F 22B	A387-22 A542-1	A199-T22 A200-T22 A213-T22 A335-P22	A182-F22 F336-F22 F336-22a	SR-96B3 SR-98B3	E9016-B3 E9018-B3
5Cr- ½Mo	SCMV-6	STBA-25 STPA-25	SFVA F5A SFVA F5B SFVA F5C SFVA F5D	A387-5	A199-T5 A200-T5 A213-T5 A213-T5c A335-P5 A335-P5c	A182-F5 A182-F5a A336-F5 A336-F5a	SR-86B6	E8016-B6
9Cr- 1Mo	-	STBA-26 STPA-26	SFVA F9	A387-9	A199-T9 A200-T9 A213-T9 A335-P9	A182-F9 A336-F9	SR-86B8	E8016-B8
9Cr-1Mo-V	-	STBA-28 STPA-28	-	A387-91-Cl2	A213-T91 A335-P91 A691-9Cr-Cl2	A336-F91 A182-F91	SR-96B9 SR-591	E9016-B9 E9015-B91
9Cr-0.5Mo-2WVNb	-	-	-	A1017-92 A387-92	A213-T92 A335-P92	A336-F92 A182-F92 A369-FP92	SR-592	E9015-B92

CARBON EQUIVALENT & METHOD TO DETERMINE NECESSARY PREHEAT TEMPERATURE IN STEEL WELDING

Carbon equivalent (%)	Forge steel	Steel Pipe	Cast steel
0.8	SCM440 SCM435		SCM440 SCM435
0.7			
0.6	S50C S45C		S50C SF590 S45C
0.5	SB480 SM490		SF540
0.4	SB450	STB410 STPG410 STPT410	SC480 SF490
0.3	SB410	STPG370 STPT370 STBA12	SC450 SF440 SC410
0.2	SS400 SM400 SS330	STB340	SC360 SF390 SF340



No.	Item
(1)	SM-13
(2)	SM-03
(3)	SM-10
(4)	SL-50
*(5)	SL-50, SL-80,SL-108M
*(6)	
*(7)	

*Recommended spec in accordance with tensile stretch grade for each

WELDNG MATERIALS STORAGE AND USAGE

Welding Materials Storage Management :

1.Recommended storage temperature ≥10˚C and relative humidity≤70%.

2.To differentiate management according to the welding materials type and specification in order to avoid misuse.

3.Do not fall or weigh heavily to avoid injury to the covered skin and the wire reel during the handling process.

4.The recommended stack height may not exceed two full piled-up pallet or more than 2.5 meters.

5.The welding material at the bottom layer is to keep the ground and wall at 100 mm upwards away from the humidity.

Welding Material Usage :

1.The materials may not be taken out more than half-day using amount from the storage.

2.Re-dry the electrodes according to the estimated amount with a thermostat container on-site on the day.

3.The welding wire may not be left on the wire feeder overnight, if necessary, you can cover it with a canvas.

4.Unpacking the welding wire, the wire surface should be in an upright direction while taking out. Hold the space of the spool shaft with both hands; do not take the spool in the direction of the spool shaft laid down in order to avoid the wire sunk and tripped with each other.

5.Do not touch the humid air while caring after drying.

Welding Materials damped Effect :

1.Covered Electrode :

(1)Appearance Feature: Flux skin in dark color after damping.

(2)Performance Impact: Big spatters, Arc unsteady, Weld decay, Uneven slag covering, Blowhole or Crack.

(3)Distinction : ①Easy to be caused with blowholes, big spatters, and flux skin peeled while welding.

②Unclear sound after the electrodes knocked with each other or the seriously damped flux skin that appeared white crystallized precipitate might not be an impact on welding but it should be again in the drying treatment.

③Slowly bending the electrode at an angle of 120 degree by hand, if the flux skin peeled, it was damped, otherwise, it should appear some cracks.

2.Welding Wire :

(1)Appearance Feature: Some rusty spots or dull surface on the wire.

(2)Performance Impact: Blowholes, cracks, and big spatters.

(3)Distinction : ①Easy to be caused blowholes on the weld; the rusty wire affected feedability.

②Make sure the package firm and wire surface in good condition before taking off the shrink film or Alum. pack.

3.Welding Flux :

(1)Appearance Feature: The softer fluxes, dull in appearance or even an agglomeration.

(2)Performance Impact: Blowholes, cracks, and arc stability.

(3)Distinction: Hand touch with the fluxes and judge the appearance color.

Welding Material Dry :

1.Covered Electrode :

Recommended re-dry process; the stack of the electrodes is ≤ 3 layers in order to avoid uneven by heat and water draining. The repeated dry is recommended one time no more than two times for flux skin peeling or burnt.

2.Welding Wire :

Adopting a lower temp. drying process on the damped flux-cored wire is to keep the temperature at 50-60 degree Celsius for 8 hours at least. The temperature setting may not be overhigh when uses a plastic wire spool for deformation. Rolling out two or three layers of the wire after drying when the wire seriously damped for second time drying.

3.Welding Flux :

Filtering the fluxes with a sieve after drying, the agglomerated fluxes may be crashed and then re-dry.

Overdue Welding Materials Treatment :

The overdue is to point out the quality changes in different degrees rather than the storage time expired.

1.Covered Electrode :

(1)Surface with white spots on the long-storage and damped electrodes is the precipitate of water glass that may not be an impact on welding and normally use after re-drying.

(2)Take a welding feedability test to the seriously damped electrodes the recommended drying temp. upon an requirement. Without matters of flux skin peeled, blowholes or cracks while welding, the electrodes are working in normal that may not be an impact on mechanical property.

(3)The rust issue to the core wire is usually happening at the tail of the electrode for clamping not affecting physical property.

(4)In the flux the iron powder may be oxidized by the rust phenomenon when the iron-powder-typed electrodes seriously damped, whatever taking a drying process it is easily causing a blowhole matter, and therefore, it is recommended to scrap it.

2.Welding Wire :

(1)The iron-based flux-cored wire is easily caused rust-spot on the surface by the long-storage time and damped as well as the inside fluxes of the seamed-type flux-cored wire for blowholes matter.

(2)The serious rust on the surface and inside layer of the wire is not recommended to use, otherwise, it is easily causing the wire feeding conduit blocked.

(3)If there is no rust spot and blowhole matters after rolling out the rusty layers of the wire, it may use in the secondary parts.

3.Welding Flux :

(1)Welding flux is easily formed into an agglomeration by the long-storage time and damped, it requires a drying process.

(2)It is recommended to a filtering process after the agglomerated fluxes clashing and re-drying for finer fluxes removal.

CALCULATING WELD VALUME AND WEIGHT

Determining the volume of a weld requires the relevant formulae are thus:

$$W=A\times\rho\times L\times\frac{1}{\eta}\times 1.2$$

W(g)	A(cm2)	ρ(g/cm3)	L(cm)	η	1.2
Volume of welding consumables	Sectional area	Density	bead length	deposition efficiency	Cap length measured by 20% of welding bead

Carbonsteel	7.8
Cr-NiStainlesssteel	7.9
Cr-Ni-MoStainlesssteel	8.0
Cu, Ni	8.9

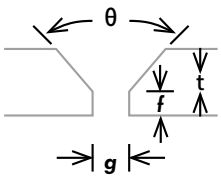
SMAW	55%
TIG, MIG	95%
FCAW	90%
SAW	99%

Section area relevant formulae are thus (A) :

(a) Groove welding

$$A=(g\times t)+(t-f)^2\tan\frac{\theta}{2}$$

θ	$\tan\frac{\theta}{\eta}$
45°	0.414
50°	0.466
60°	0.577
70°	0.7
80°	0.839
90°	1



Example :

Platethicknesst=12mm Root Gap g=2mm

Groove open θ=45° Root section f=3mm

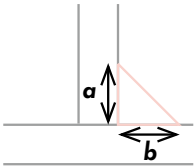
$$A=\frac{(2\times 12)+(12-3)^2\times 0.414}{100}=0.58cm^2$$

For 316 stainless steel electrode welding1mm bead length

$$W=0.58\times 8.0\times 100\times\frac{1}{0.55}\times 1.2=1012g$$

(b) Fillet welding

$$A=\frac{a\times b}{2}$$



Example :

Foot long 5mm= $A=\frac{5\times 5}{2}\times\frac{1}{100}=0.125cm^2$

For 304 stainless steel MIG wire 1m bead length

$$W=0.125\times 7.9\times 100\times\frac{1}{0.95}\times 1.2=125g$$

Fig. 1 Schaeffler's diagram

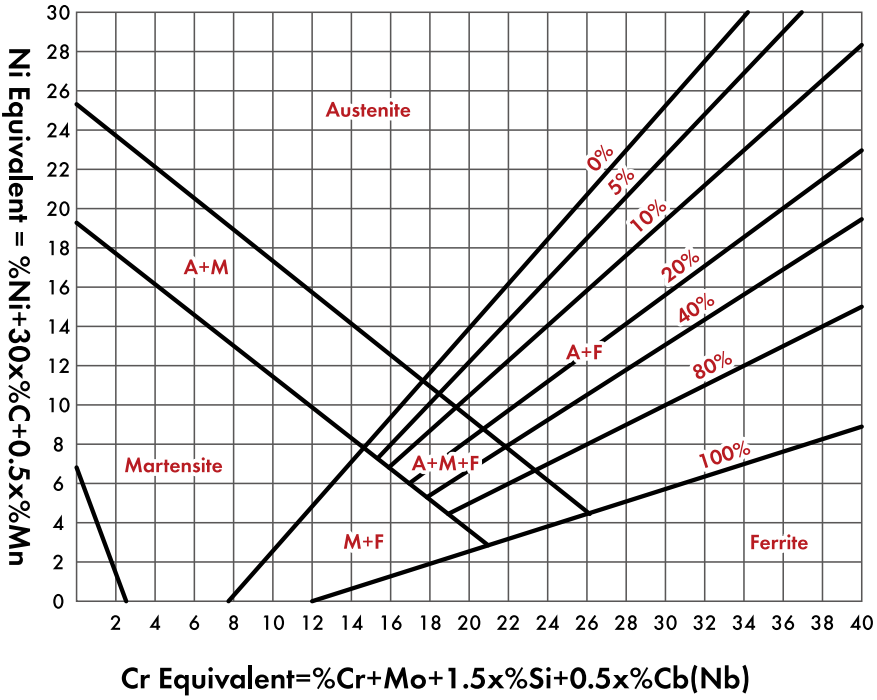
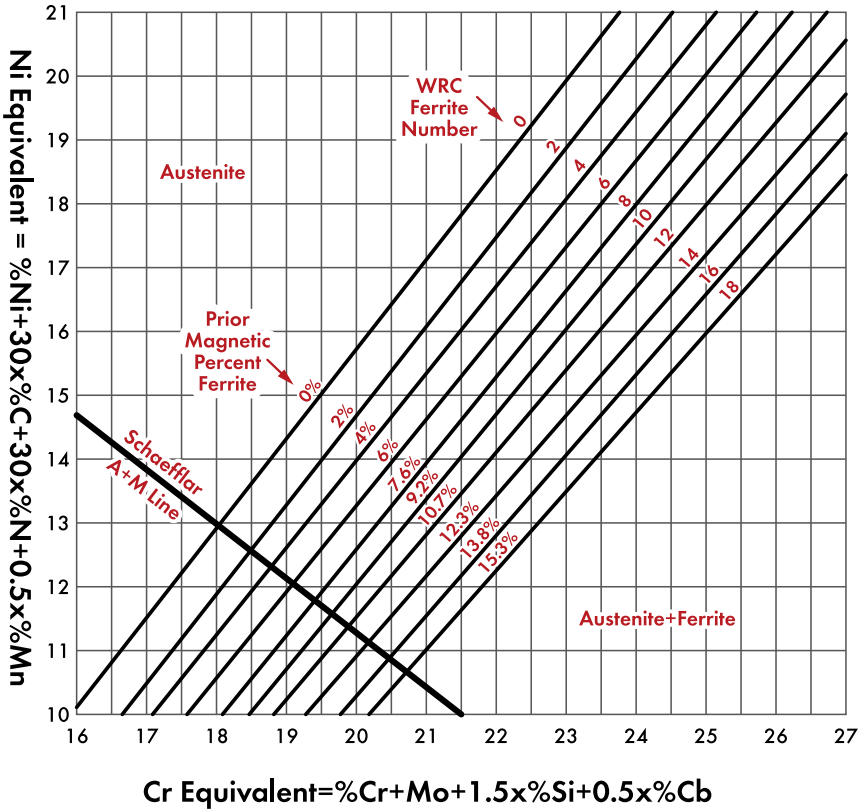


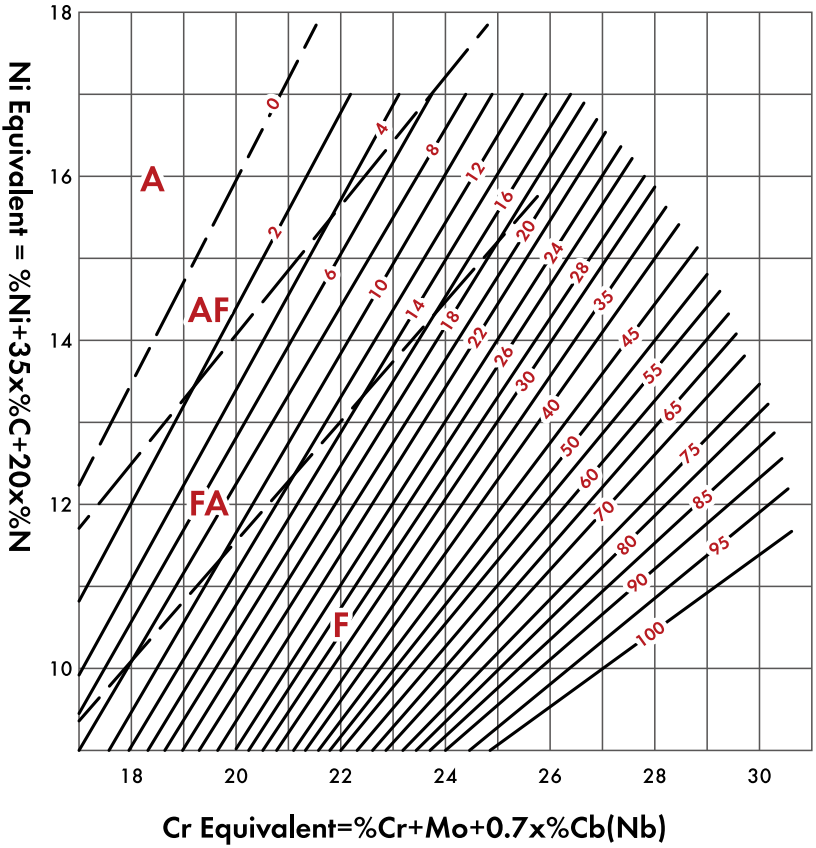
Fig. 2 DeLong's diagram

Nitrogen is included in Ni-equivalent. A ferrite content is given in FN (Ferrite Number) related to the ferrite percentage.



When use this diagram, it is desirable to use a Nitrogen percentage.
By chemical analysis. If analyzed value is no available, apply 0.03% for Nitrogen content.

Fig. 3 WRC diagram (1992)



This diagram can be used for a high-ferrite stainless weld metal such as duplex stainless. The solidification mode is useful to estimate the hot-crack sensibility.

A, AF, FA, F stand for solidification modes

A : Austeniticsinglephase(r)

AF : Primary phase (r)+ Eutectic Ferrite (δ)

FA : Primary phase(δ)+ Peritectic/Eutectic phase (r)

F : δ Single phase Solidification

COMMON WELDING DEFECTS AND SOLUTION

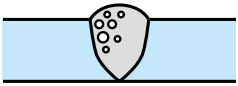
Here below are the common welding defects and countermeasures data based on the users' encountered defects on base metal, welding procedures, welding parameters, etc. This is prepared for users when they encountered any defects described as under and give them a direction or reference to cope with the defects and remove.

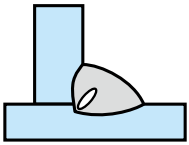
1.Poor Welding Ability

Welding Type	Defect	Why	What to do
SMAW	Poor arc strike, or re-strike	1.Coated flux damp 2.Improper arc strike 3.Unclean base metal surface or special coating	1.Proper storage and re-dry before welding 2.Arc strike by tapping or swiping 3.Clean the base metal before welding
	Coated flux melt earlier than core wire	1.Coated flux damp 2.Improper welding parameters	1.Proper storage and re-dry before welding 2.To apply with recommended welding parameters
	Arc blow	1.Improper grounding 2.Unstable electromagnetic fields on DC welding	1.Correct grounding setting and numbers 2.Improve grounding or using AC welding
	Poor weld metal liquidity	1.Toolow current 2.Unstable current output	1.To apply with recommended welding parameters 2.Stable power supply or maintenance
	spatters	1.Too long arc length 2.Too high current 3.Welding gun tilt angle too big 4.Coated flux damp 5.Unstable welding machine output	1.Proper arc length 2.To apply with recommended welding parameters 3.Less than 30 deg. Is recommended 4.Proper storage and re-dry before welding 5.Maintenance
	fumes	Base metal surface coating hinder	Clean up the surface or select less coating base metal
	Irregular weld bead	1.Unstable travel speed 2.Improper travel speed with current applied	1.Stabilize the travel speed 2.To apply with proper current and travel speed by observing weld pool
	Poor slag removal	1.Poor weld bead or convex 2.Too high inter-pass temperature	1.To apply with proper weld speed and current 2.Proper inter-pass temp. setting

Welding Type	Defect	Why	What to do
FCAW GMAW/GTAW	Poor wire feedability	1.Deformed feeding roller or press roller 2.Over-pressed wire deformed and tip blocked 3.Liner blocked 4.Excessively tip worn-out, poor conductive ro wire stuck at tip slot	1.Check and replace deformed roller regularly 2.Press the roller properly to get the wire feed smoothly without deforming 3.Replace liner regularly 4.Replace tip regularly and adopt good quality tip with high wear-out resistance
	Arc blow	1.Poor gounding 2.Unstable electromagnetic fields on DC welding	1.Correct grounding setting and numbers 2.Improve grounding or using AC welding
	Poor weld metal fluidity	1.Too low current or improper welding parameters 2.Unstable current output 3.Tip worn out, poor conductivity	1.To apply with recommended welding parameters 2.Stable power supply or maintenance 3.Replace tip regularly
	Spatters	1.Excessively voltage cause too long arc length 2.Too high current 3.Welding gun silt angle too big 4.Excessively tip worn-out, poor conductive 5.Unstable welding machine ourput	1.Lower the voltage 2.To apply with recommended current 3.45 deg. Welding gun tilt angle is recommended 4.To replace tip regularly if deformed 5.Welding machine maintenance
	Fumes	Base metal surface coating hinder	Clean up the surface or select less coating base metal
	Irregular weld bead	1.Unstable wire travel speed 2.Improper travel speed with current applied 3.Excessively tip worn-out, poor conductive 4.Poor wire feedability	1.Stabilize the travel speed 2.To apply with proper current and travel speed by observing weld pool 3.To replace tip regularly if deformed 4.To follow countermeasure of poor wire feedability
	poor slag removal	1.Poor weld bead or convex 2.Too high inter-pass temperature	1.To adjust proper welding parameters and travel speed 2.Proper inter-pass temperature control and keep on
SAW	Irregular weld bead	1.Deformed feeding roller or press roller 2.Improper welding parameters taken onto travel speed 3.Excessively tip worn-out, poor conductive 4.Magnetic arc blow	1.Check and replace deformed roller regularly 2.To follow the recommended parameters 3.To replace tip regularly if deformed 4.To adjust the position of ground, or increase the number of ground
	Poor slag removal	1.Poor weld bead or convex 2.Too high inter-pass temperature	1.To adjust proper welding parameters and travel speed 2.Proper inter-pass temperature control and keep on

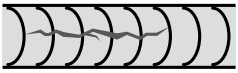
2.Blowhole (pinhole, wormhole, porosity)

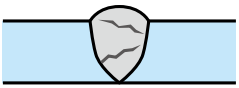




Welding Type	Why	What to do
SMAW	1.Improper consumables adopted 2.Coated flux damped 3.Workpiece is rusted or contained oil 4.Damp workpiece 5.Too high travel speed, the gas of the bead cannot move out 6.Too long arc length 7.Too windy where welding occurs	1.To adopt proper welding consumables 2.Proper storage condition 3.Make sure the workpiece is clean 4.To dry (remove damp content) the workpiece before use 5.To lower the travel speed 6.To lower the arc length 7.Proper protection and shelter from wind
FCAW GMAW/GTAW	1.Improper consumables adopted 2.Rusted wires 3.Workpiece is rusted or contained oil 4.Damp workpiece 5.Too high travel speed, the gas of the bead cannot move out 6.Too long arc length 7.Too windy where welding occurs 8.Spatters in nozzle disturb the shielding gas flow 9.Impure gas content and damp 10.Tack welding contains blowhole	1.To adopt proper welding consumables 2.Proper storage condition 3.Make sure the workpiece is clean 4.to dry (remove damp content) the workpiece before use 5.To lower the travel speed 6.To lower the voltage 7.Proper protection and shelter from wind 8.To clean the spatter out from nozzle and use anti-spatter gel 9. To adopt 99.95% CO_2 gas, and damp content ≤0.005% 10.To avoid blowhole occurs while tack welding
SAW	1.Improper consumables adopted 2.Rusted wires 3.Reccled flux contaminated 4.Workpiece is rusted or contained oil 5.Damp workpiece 6.Too high travel speed, the gas ing the bead cannot move out 7.Flux height cannot cover and arc leaked, less protection on bead 8.Cover flux over height, bead gas cannot move out	1.To adopt proper welding consumables 2.Proper storage condition 3.To avoid welding work near the area of debris mixed flux among 4.To clean the workpiece 5.to dry (remove damp content) the workpiece before use 6.To lower the travel speed 7.To increase the height of flux feeding hose 8.To lower the height of flux feeding hose, not to have leaked arc

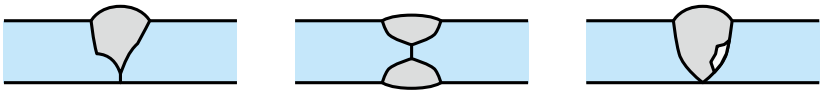
3.Crack





Welding Type	Why	What to do
SMAW	1.Base metal contains too much alloy or C-equivalent 2.Base metal contains too much P&S 3.Over thickness of base metal or over cooling rate 4.Too high restraint intensity 5.Improper consumables adopted 6.Damp coated flux, hydrogen content increased in bead 7.Improper welding procedure 8.Bead width/depth ratio too big or small 9.Groove angle is too small, pear-shaped crack occurs	1.Preheat base metal and adopt high basicity consumables 2.To adopt high nickel and low P&S consumables 3.Preheat base metal, slow cooling and adopt high basicity consumables 4.To weld symmetrically, and bead post heat treating 5.To adopt proper consumables 6.To adopt low hydrogen consumable and re-dry before welding and post heat treatment 7.Be aware fo the welding and procedure and temperature control 8.Adjust the welding parameters and avoid weld bead too narrow or too wide 9.Adjust proper welding parameters or increase the groove angle
FCAW GMAW/GTAW	1.Base metal contains too much alloy or C-equivalent 2.Base metal contains too much P&S 3.Over thickness of base metal or over cooling rate 4.Too high restraint intensity 5.Improper consumables adopted 6.Damp coated flux, hydrogen content increased in bead 7.Improper welding procedure 8.Bead width/depth ratio too big or small 9.Groove angle is too small, pear-shaped crack occurs	1.Preheat base metal and adopt high basicity consumables 2.To adopt high nickel and low P&S consumables 3.Preheat base metal, slow cooling and adopt high basicity consumables 4.To weld symmetrically, and bead post heat treating 5.To adopt proper consumables 6.To adopt low hydrogen consumable and re-dry before welding and post heat treatment 7.Be aware fo the welding and procedure and temperature control 8.Adjust the welding parameters and avoid weld bead too narrow or too wide 9.Adjust proper welding parameters or increase the groove angle
SAW	1.Base metal contains too much alloy or C-equivalent 2.Base metal contains too much P&S 3.Over thickness of base metal or over cooling rate 4.Too high restraint intensity 5.Improper consumables adopted 6.Improper welding procedure 7.Bead width/depth ratio too big or small 8.Groove angle is too small, pear-shaped crack occurs	1.Preheat base metal and adopt high basicity consumables 2.To adopt high basicity and low P&S consumables 3.Preheat base metal, slow cooling and adopt high basicity consumables 4.To weld symmetrically, and bead post heat treating 5.To adopt proper consumables 6.Be aware fo the welding and procedure and temperature control 7.Adjust the welding parameters and avoid weld bead too narrow or too wide 8.Adjust proper welding parameters or increase the groove angle

4.Incomplete penetration



Welding Type	Why	What to do
SMAW	1.Improper consumables adopted 2.Choose too big dia. Consumables for narrow groove welding 3.Too low current 4.Too high travel speed 5.Arc strength cannot penetrate effectively upon too low travel speed but increased slag thickness	1.To adopt higher penetration consumable 2.To increase groove opening or root gap or to adopt smaller dia. consumables 3.To apply proper current 4.To adjust proper travel speed 5.To apply proper travel speed
FCAW GMAW/GTAW	1.Too low current 2.Too high voltage, too long arc length 3.Not suffice groove opening	1.To apply proper current 2.To apply proper voltage 3.To increase the groove opening

5.Slag inclusion

Welding Type	Why	What to do
SMAW	1.Too low current 2.Slag fell into weld pool and included in the bead because of too low travel speed 3.Weaving range too high 4.Slag was not clean completely 5.Narrow groove	1.To apply proper current 2.To apply proper travel speed or enlarge angle 3.To lower weaving range 4.To clean up slag 5.To apply proper groove opening or enlarge root gap
GMAW/GTAW	1.Too low current 2.Slag fell into weld pool and included in the bead because of too low travel speed 3.Weaving range too high 4.Slag was not clean completely 5.Narrow groove	1.To apply proper current 2.To apply proper travel speed or enlarge angle 3.To lower weaving range 4.To clean up slag 5.To apply proper groove opening or enlarge root gap
SAW	1.Too low current 2.Unstable arc or magnetic arc blow 3.Too high voltage applied at the top pass, slag overflow to the front bead 4.Wire getting too close to the groove edge	1.To apply proper current 2To check the welding machine, wire feeder, and the condition of grounding 3.To lower voltage or to increase travel speed or weld pass numbers 4.Ensue the distance between consumable and groove edge is bigger than consumable dia

6.Other Weld Defects

Defect	Why	What to do
Overlap	1.Too slow travel speed; weld melt falling 2.Too low current or too low voltage	1.To apply proper travel speed 2.To apply proper welding parameters
Workpiece deform	1.Improper welding sequence 2.Too fast cooling speed on workpiece 3.Workpiece overheating 4.Improper bead design 5.Too many pass numbers	1.To apply symmetrical welding or concrete fixed fixture 2.To slow down the cooling speed on workpiece 3.Control inter-pass temperature or heat input 4.To apply proper groove opening and less root gap 5.To increase the current or adopt bigger dia. Consumables
Burn out	1.Improper welding methods or consumables dia. adopted 2.Too high current 3.Improper bead design	1.To adopt low heat input welding method or small dia. consumables 2.To apply proper current 3.To increase root thickness or lower bead gap
TIP Wire stick on	1.Wire feed resistance too much; arc length increase 2.Too high voltage, arc length increased 3.Tip length to long, too close to the base metal 4.Too many spatters	1.To follow countermeasure of poor wire feedability 2.To apply with proper voltage 3.To adopt shorter tip or proper E.S.O 4.Adjust the welding current and voltage settings appropriately

PERSONAL PROTECTIVE EQUIPMENT AND CLOTHING

During welding process might be caused serious injury without appropriate personal protective. Such as burns, noises, fumes and intense light. The chart below summarized the types of personal protective equipment that can be used when welding.

Risks	Reasons	Recommended Equimpent
Burns	***Heat from working pieces and welding guns***	Welding hand shield, flame resistant clothing and aprons.
Noises	***Chipping and grinding proces***	Ear muffs, ear plugs.
Fumes	***Coating from base metal surface***	1.Respirators recommended. 2.Use welding helmet ventilation system. 3.Keep ventilation well during welding.
Radiation	***Intense Light from welding arc***	1.Filter lens are available in different shade numbers ranging from no. 10-13 as common usage. The higher the number, the darker the filter and the less light passes through the lens. 2.Insulated gloves and flame resistant clothing. 3.Selected correct filter shade.