

S-800WT X M-12K

SUBMERGED ARC WELDING CONSUMABLES
FOR WELDING OF Mild & 490MPa CLASS
HIGH TENSILE STEEL



❖ Specification

AWS A5.17

F7A8-EM12K

EN 760

SA FB 1

EN756

S 42 5 FB S2Si



❖ Applications

The flux is widely used for the welding of thick section components in the offshore, pressure vessel industries.

❖ Characteristics on Usage

S-800WT is the agglomerated fluoride-basic and neutral type flux for wind-tower. It can be obtained good weldability and high notch toughness of weld metal at low temperature down to -60°C in combination with the electrode M-12K. As the low hydrogen content of weld metal is extremely low, it provides excellent resistance to crack

❖ Note on Usage

1. Dry the flux at $300\sim 350^{\circ}\text{C}$ ($572\sim 662^{\circ}\text{F}$) for 60minutes before use.
2. Remove rust, scales, oil, paint, water, dirt and slag of tack welds from the groove to obtain sound weld metal.
3. Use welding current and speed as low as possible at the first layer of groove to avoid cracking.
4. Preheat at $50\sim 100^{\circ}\text{C}$ ($122\sim 212^{\circ}\text{F}$) according to base metal and plate thickness. Keep interpass temperature at $100\sim 250^{\circ}\text{C}$ ($212\sim 482^{\circ}\text{F}$).



Welding consumable for test

❖ Flux

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

Consumable	Particle Size (Mesh)	Type of Flux	B.I	H ₂ O _{1000℃} /CO ₂ (%)
S-800WT	12 × 60	Agglomerated/ Fluoride basic	3.0	0.05/0.8

❖ Electrode

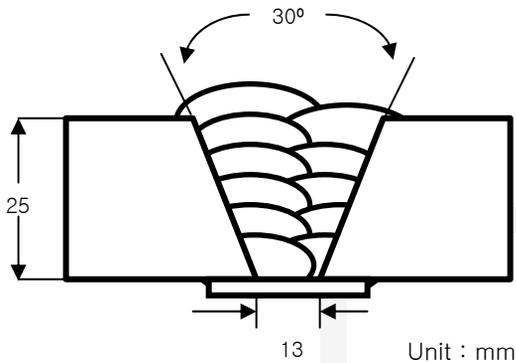
Consumable	Dia. (mm)	Chemical Composition, wt%				
		C	Si	Mn	P	S
M-12K	4.0	0.09	0.20	1.02	0.016	0.006
AWS A5.17-EM12K		0.05-0.15	0.10-0.35	0.80-1.25	≤0.030	≤0.030



Mechanical Properties & Chemical Composition of All Weld Metal

❖ Welding Conditions

Method by AWS Spec.



[Joint Preparation & Layer Details]

Base metal	: A 36
Particle size	: 12 X 60
Flux type	: Agglomerated
Amp./ Volt./cpm	: 550 / 30 / 40
Stick-Out(mm)	: 30
Pre-Heat(°C)	: R.T .
Interpass Temp.(°C)	: <150
Polarity	: AC

❖ Mechanical Properties of All weld metal

Consumables	PWHT Condition	Tensile Test			CVN Impact Test (Joule)	
		YS(MPa)	TS(MPa)	EI(%)		
S-800WT X M-12K	As-welded	563	587	29.0	-62°C	118
AWS A5.17 F7A8-EM12K	-	≥ 400	490~660	≥ 22	≥ 27J at -62°C	

❖ Chemical Analysis of All weld metal(wt%)

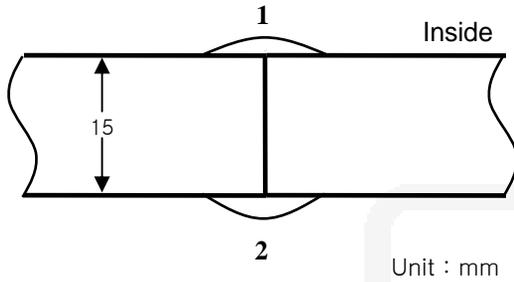
Consumables	C	Si	Mn	P	S
S-800WT X M-12K	0.09	0.35	1.40	0.023	0.006

This information is provided solely for the purpose of confirming product conformance with applicable standards. The serviceability of a product or structure utilizing this type of information is and must be the sole responsibility of the builder/user. Many variables beyond the control of HYUNDAI WELDING CO., LTD. affect the results obtained in applying this type of information. These variables include, but are not limited to, welding procedure, shielding gas, plate chemistry and temperature, weldment design, fabrication methods and service requirements.



Two-run Welding Test (15t)

❖ Welding Conditions



Base metal	: S355NL
Particle size	: 12 X 60 (ASME)
Flux type	: Agglomerated
Stick-Out(mm)	: 30
Pre-Heat(°C)	: R.T.
Interpass Temp.(°C)	: -
Polarity	: DC+

[Joint Preparation & Layer Details]

❖ Welding Conditions

Position	Pass No.	W/D Process	Filler Metal		Current Type/ Polarity	Welding Parameter			Interpass Temp. (°C)
			AWS Class	Size (mm)		Ampere (A)	Voltage (V)	Speed (CPM)	
Face	1	SAW	EM12K	4.0	DC+	700	34	50	-
Root	2	SAW	EM12K	4.0	DC+	700	34	50	

❖ Mechanical Properties of All weld metal

Consumables	Butt Tensile Test		Side Bend Test	CVN Impact Test (Joule)					
	TS (MPa)	Fraction Location		Temp. (°C)	Location	X1	X2	X3	Avg.
S-800WT X M-12K	542	Base metal	Good	-30°C	Center	77	70	66	71

❖ Chemical Analysis of All weld metal(wt%)

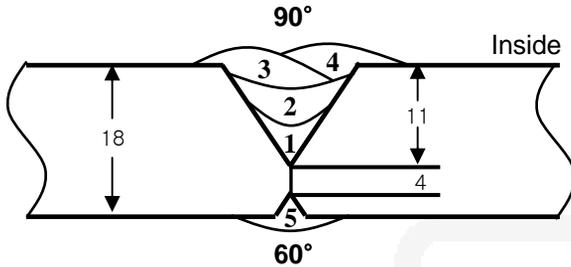
Consumables	C	Si	Mn	P	S
S-800WT X M-12K	0.116	0.36	1.45	0.019	0.006

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Multi-run Welding Test (18t)

❖ Welding Conditions



Unit : mm

Base metal	: S355NL
Particle size	: 12 X 60 (ASME)
Flux type	: Agglomerated
Stick-Out(mm)	: 30
Pre-Heat(°C)	: R.T .
Interpass Temp.(°C)	: ≤150
Polarity	: DC+

[Joint Preparation & Layer Details]

❖ Welding Condition

Position	Pass No.	W/D Process	Filler Metal		Current Type/ Polarity	Welding Parameter			Interpass Temp. (°C)
			AWS Class	Size (mm)		Ampere (A)	Voltage (V)	Speed (CPM)	
Face	1	SAW	EM12K	4.0	DC+	500	28	40	≤ 150
	2-4	SAW	EM12K	4.0	DC+	600	32	40	
Root	5	SAW	EM12K	4.0	DC+	650	33	40	

❖ Mechanical Properties of All weld metal

Consumables	Butt Tensile Test		Side Bend Test	CVN Impact Test (Joule)					
	TS (MPa)	Fraction Location		Temp. (°C)	Location	X1	X2	X3	Avg.
S-800WT X M-12K	542	Base metal	Good	-30°C	Inside	91	118	76	95
					Outside	82	89	95	89

❖ Chemical Analysis of All weld metal(wt%)

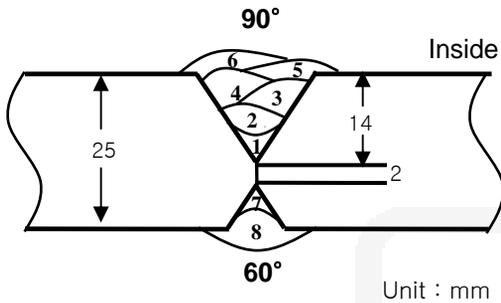
Consumables	C	Si	Mn	P	S
S-800WT X M-12K	0.091	0.38	1.55	0.019	0.006

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Multi-run Welding Test (25t)

❖ Welding Conditions



[Joint Preparation & Layer Details]

- Base metal** : S355NL
- Particle size** : 12 X 60 (ASME)
- Flux type** : Agglomerated
- Stick-Out(mm)** : 30
- Pre-Heat(°C)** : R.T .
- Interpass Temp.(°C)** : ≤150
- Polarity** : DC+

❖ Welding Condition

Position	Pass No.	W/D Process	Filler Metal		Current Type/ Polarity	Welding Parameter			Interpass Temp. (°C)
			AWS Class	Size (mm)		Ampere (A)	Voltage (V)	Speed (CPM)	
Face	1	FCW	E81T1-K2C	1.2	DC+	260	32	-	≤ 150
	2	SAW	EM12K	4.0	DC+	550	28	40	
	3-6	SAW	EM12K	4.0	DC+	600	32	40	
Root	7	SAW	EM12K	4.0	DC+	600	32	40	
	8	SAW	EM12K	4.0	DC+	700	32	40	



Multi-run Welding Test (25t)

❖ Mechanical Properties of All weld metal

Consumables	Butt Tensile Test		Side Bend Test	CVN Impact Test (Joule)					
	TS (MPa)	Fraction Location		Temp. (°C)	Location	X1	X2	X3	Avg.
S-800WT X M-12K	547	Base metal	Good	-30°C	Inside	140	108	93	114
					Outside	84	99	71	85

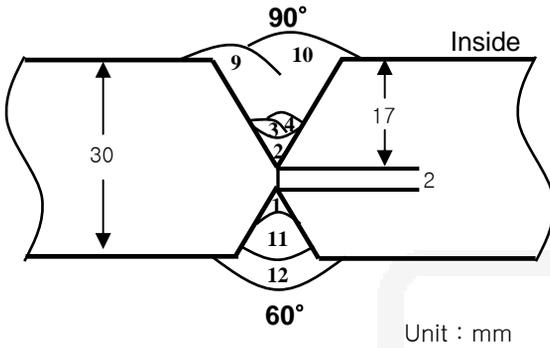
❖ Chemical Analysis of All weld metal(wt%)

Consumables	C	Si	Mn	P	S
S-800WT X M-12K	0.090	0.41	1.62	0.022	0.006



Multi-run Welding Test (30t)

❖ Welding Conditions



Unit : mm

[Joint Preparation & Layer Details]

- Base metal** : S355NL
- Particle size** : 12 X 60 (ASME)
- Flux type** : Agglomerated
- Stick-Out(mm)** : 30
- Pre-Heat(°C)** : R.T .
- Interpass Temp.(°C)** : ≤150
- Polarity** : DC+

❖ Welding Condition

Position	Pass No.	W/D Process	Filler Metal		Current Type/ Polarity	Welding Parameter			Interpass Temp. (°C)
			AWS Class	Size (mm)		Ampere (A)	Voltage (V)	Speed (CPM)	
Root	1	FCW	E81T1-K2C	1.2	DC+	260	32	-	≤ 150
Face	2	SAW	EM12K	4.0	DC+	550	28	40	
	3-4	SAW	EM12K	4.0	DC+	600	32	45	
	5-10	SAW	EM12K	4.0	DC+	600	32	40	
Root	11	SAW	EM12K	4.0	DC+	600	30	40	
	12	SAW	EM12K	4.0	DC+	600	32	40	

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Multi-run Welding Test (30t)

❖ Mechanical Properties of All weld metal

Consumables	Butt Tensile Test		Side Bend Test	CVN Impact Test (Joule)					
	TS (MPa)	Fraction Location		Temp. (°C)	Location	X1	X2	X3	Avg.
S-800WT X M-12K	574	Base metal	Good	-30°C	Inside	70	63	57	63
					Outside	68	67	56	64

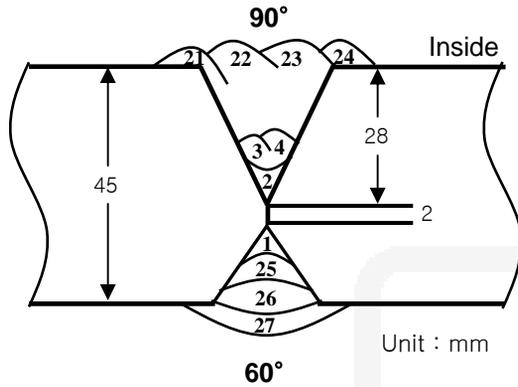
❖ Chemical Analysis of All weld metal(wt%)

Consumables	C	Si	Mn	P	S
S-800WT X M-12K	0.104	0.35	1.40	0.020	0.007



Multi-run Welding Test (45t)

❖ Welding Conditions



Base metal	: S355NL
Particle size	: 12 X 60 (ASME)
Flux type	: Agglomerated
Stick-Out(mm)	: 30
Pre-Heat(°C)	: R.T .
Interpass Temp.(°C)	: ≤150
Polarity	: DC+

[Joint Preparation & Layer Details]

❖ Welding Condition

Position	Pass No.	W/D Process	Filler Metal		Current Type/ Polarity	Welding Parameter			Interpass Temp. (°C)
			AWS Class	Size (mm)		Ampere (A)	Voltage (V)	Speed (CPM)	
Root	1	FCW	E81T1-K2C	1.2	DC+	280	32	-	≤ 150
Face	2	SAW	EM12K	4.0	DC+	550	28	40	
	3-4	SAW	EM12K	4.0	DC+	600	32	45	
	5-24	SAW	EM12K	4.0	DC+	600	32	40	
Root	25	SAW	EM12K	4.0	DC+	650	30	40	
	26	SAW	EM12K	4.0	DC+	600	30	40	
	27	SAW	EM12K	4.0	DC+	600	32	40	



Multi-run Welding Test (45t)

❖ Mechanical Properties of All weld metal

Consumables	Butt Tensile Test		Side Bend Test	CVN Impact Test (Joule)					
	TS (MPa)	Fraction Location		Temp. (°C)	Location	X1	X2	X3	Avg.
S-800WT X M-12K	545	Base metal	Good	-50°C	Inside	66	80	64	70
					Outside	60	56	59	58

❖ Chemical Analysis of All weld metal(wt%)

Consumables	C	Si	Mn	P	S
S-800WT X M-12K	0.095	0.44	1.630	0.021	0.006



Diffusible Hydrogen Content

❖ Welding Conditions

wire	: M-12K	Amps(A) / Volts(V)	: 625/30
Diameter(mm)	: 4.0	Stick-Out(mm)	: 30
Flow Rate(ℓ /min.)	: -	Welding Speed	: 60 cpm
Welding Position	: 1G	Current Type & Polarity	: DC(+)

❖ Result(ml/100g Weld Metal)

X1	X2	X3	X4
5.8	5.3	5.2	5.4

Average Hydrogen Content *5.7 ml / 100g Weld Metal*