HYUNDAI WELDING

Rev. 02

SC-91LP

FLUX CORED ARC WELDING CONSUMABLE
FOR HIGH TENSILE STEEL

HYUNDAI WELDING CO., LTD.

SC-91LP

❖ Specification

AWS A5.29	E91T1-GM
(AWS A5.29M	E621T1-GM)
EN ISO 17632-A	T50 4 1Ni P M21 1

❖ Applications

SC-91LP is a flux cored wire for welding of high tensile steel, and It can be used for shipbuilding, machinery, bridge, structural fabrication and building, piping.

❖ Characteristics on Usage

SC-91LP is a titania-type flux cored wire to be used with Ar+20~25%CO_2 gas mixture shielding.

Provide an exceptionally smooth and stable arc with a fast freezing slag system, this wire is ideal for pipe welding.

Bead shape and appearance are excellent in all position welding.

It provide excellent notch toughness at low temperature

❖ Note on Usage

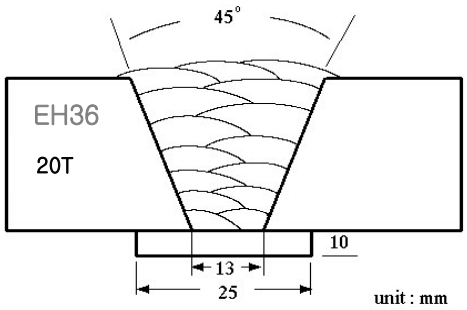
1. Proper preheating(50~150℃(150~302℉)) and interpass temperature must be used in order to release hydrogen which may cause cracking in weld metal when electrodes are used for medium and heavy plates

2. Use Ar+20~25%CO_2 gas.

Typical Mechanical Properties & Chemical Composition of All Weld Metal

❖ Welding Conditions

Method by AWS spec.



[Joint Preparation & Layer Details]

Welding Position	:	1G(PA)
Diameter(mm)	:	1.2mm(0.045in)
Shielding Gas	:	Ar+20%CO_2
Flow Rate(ℓ /min.)	:	20
Amp./ Volt.	:	280 / 30
Stick-Out(mm)	:	20~25(0.79~0.98in)
Interpass Temp.(℃)	:	150±15 (302±59 ℉)
Polarity	:	DC(+)

❖ Typical Mechanical Properties of all weld metal

Consumable	Tensile Test			CVN Impact Test J(ft·lbs)
	YS MPa(ksi)	TS MPa(ksi)	EL(%)	-40℃(-40℉)
SC-91LP	650(94)	690(100)	24.5	65(48)
AWS A5.29 E91T1-GM	≥ 540(78)	620~760 (90~110)	≥ 17	No Specified

❖ Typical Chemical Analysis of all weld metal(wt%)

Consumable	C	Si	Mn	P	S	Ni	Cr	Mo
SC-91LP	0.05	0.40	1.40	0.011	0.005	0.90	0.03	0.001
AWS A5.29 E91T1-GM	N/S (Not Specified) [h]							

* h : The electrode must have a minimum of one or more of the following: ≥0.5%Ni, ≥0.3%Cr, ≥0.2%Mo

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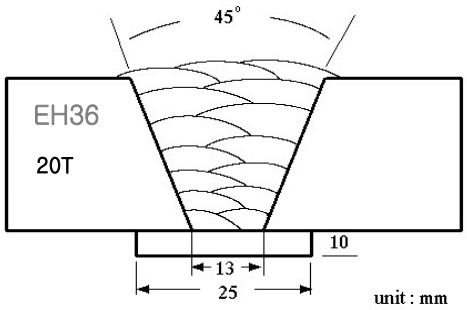
Typical Mechanical Properties & Chemical Composition of All Weld Metal

❖ Welding Conditions

Method by AWS spec.



[Joint Preparation & Layer Details]

Welding Position	:	1G(PA)
Diameter(mm)	:	1.4mm(0.052in)
Shielding Gas	:	Ar+20%CO_2
Flow Rate(ℓ /min.)	:	20
Amp./ Volt.	:	280 / 30
Stick-Out(mm)	:	20~25(0.79~0.98in)
Interpass Temp.(℃)	:	150±15 (302±59 ℉)
Polarity	:	DC(+)

❖ Typical Mechanical Properties of all weld metal

Consumable	Tensile Test			CVN Impact Test J(ft·lbs)
SC-91LP	YS MPa(ksi)	TS MPa(ksi)	EL(%)	-40℃(-40℉)
	660(95700)	695(100775)	24.0	60(44)
AWS A5.29 E91T1-GM	≥ 540(78)	620~760 (90~110)	≥ 17	No Specified

❖ Typical Chemical Analysis of all weld metal(wt%)

Consumable	C	Si	Mn	P	S	Ni	Cr	Mo
SC-91LP	0.05	0.42	1.42	0.013	0.006	0.88	0.04	0.001
AWS A5.29 E91T1-GM	N/S (Not Specified) [h]							

* h : The electrode must have a minimum of one or more of the following: ≥0.5%Ni, ≥0.3%Cr, ≥0.2%Mo

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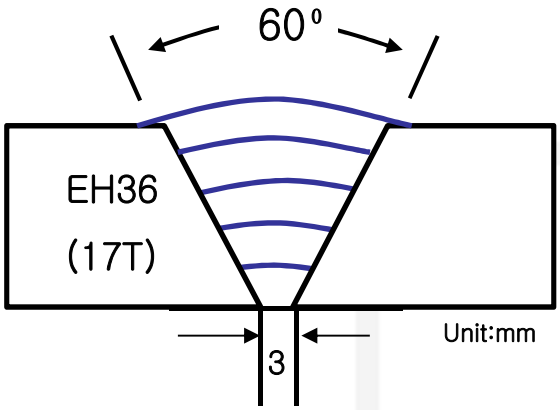
Typical Mechanical Properties & Chemical Composition of Weld Metal

❖ Welding Conditions



[Joint Preparation & Layer Details]

•Layer/ Pass : 5Layer/5Pass

- 1~2pass : TIG Welding (ER70S-3) 2.4mm
- 3~5Pass : SC-91LP , 1.2mm

* Shielding Gas

- TIG Welding : 100% Ar
- FCW Welding : Ar+20% CO2

* Welding Position

- 3G (Vertical-up)

❖ Welding Detail Data

Welding Method	Pass	Welding parameter		
		Amp / Volt	Welding Speed (cpm)	Heat Input (kj/cm)
TIG (ER70S-3, 2.4mm)	1	150A	8.4	-
	2	200A	5.8	-
FCW (SC-91LP, 1.2mm)	3	200A /24V	10.9	26.4
	4	200A/ 24V	10.6	27.2
	5	200A /24V	12.0	24.0

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Typical Mechanical Properties & Chemical Composition of Weld Metal

❖ Typical Mechanical Properties of Weld Metal

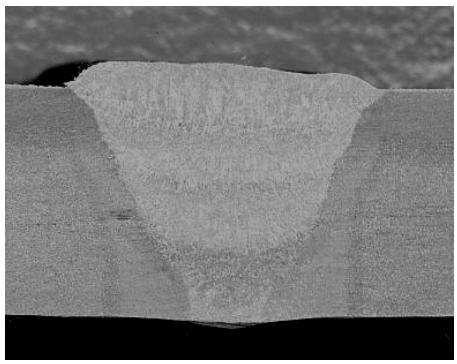
Charpy V-notch Impact Values (Joules) [-40℃(-40℉)]				
Notch Location	**X1**	**X2**	**X3**	**Avg.**
Face 2mm(0.08in)	**85(63)**	**90(66)**	**85(63)**	**87(64)**
Root 2mm(0.08in)	**75(55)**	**82(61)**	**87(64)**	**81(60)**

* Notch location of impact test specimens 1) Face 2mm(0.08in) : Weld center from surface 2mm(0.08in)
2) Root 2mm(0.08in) : Weld center from root 2mm(0.08in)

❖ Typical Chemical Analysis of Weld Metal(wt%)

C	Si	Mn	P	S	Ni
0.05	0.43	1.40	0.013	0.007	0.89

❖ Macro Section



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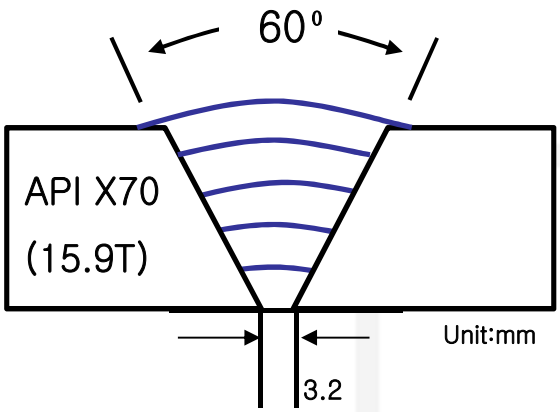
Typical Mechanical Properties & Chemical Composition of Weld Metal (Orbital Welding)

❖ Welding Conditions



[Joint Preparation & Layer Details]

* Layer/ Pass : 5Layer/5Pass
  - 1~2pass : TIG Welding (ER70S-3) 2.4mm
  - 3~5Pass : SC-91LP , 1.2mm
* Shielding Gas
  - TIG Welding : 100% Ar
  - FCW Welding : Ar+20% CO2
* Welding Position
  - 5G (Orbital Welding)

❖ Welding Detail Data

Welding Method	Pass	Welding parameter		
		Amp / Volt	Welding Speed (cpm)	Heat Input (kj/cm)
TIG (ER70S-3, 2.4mm)	1	150A	8.4	-
	2	200A	5.8	-
FCW (SC-91LP, 1.2mm)	3	195A /23.5V	10.1	27.2
	4	200A/ 24.0V	12.0	24.0
	5	200A /24.0V	11.9	24.2

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Typical Mechanical Properties & Chemical Composition of Weld Metal (Orbital Welding)

❖ Typical Mechanical Properties of Weld Metal

Charpy V-notch Impact Values (Joules) [-40℃(-40℉)]				
Notch Location	**X1**	**X2**	**X3**	**Avg.**
Face 2mm(0.08in)	**75(55)**	**80(59)**	**85(63)**	**80(59)**
Root 2mm(0.08in)	**75(55)**	**70(52)**	**65(48)**	**70(52)**

* Notch location of impact test specimens 1) Face 2mm(0.08in) : Weld center from surface 2mm(0.08in)
2) Root 2mm(0.08in) : Weld center from root 2mm(0.08in)

❖ Typical Chemical Analysis of Weld Metal(wt%)

C	Si	Mn	P	S	Ni
0.05	0.40	1.35	0.012	0.006	0.90

❖ Macro Section

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Welding Efficiency

❖ Deposition Rate & Efficiency

Wire Size	Welding Conditions		Wire Feed Speed m/min (in/min)	Deposition Efficiency(%)	Deposition Rate kg/hr(lb/hr)
	Amp.(A)	Volt.(V)			
1.2mm (0.045in)	200	26	10.2(400)	85~87	3.8(8.4)
	250	28	13.3(525)	85~87	4.5(9.9)
	300	32	15.3(600)	86~88	5.7(12.5)
Remark				Deposition efficiency =(Deposited metal weight/ Wire weight used)×100	Deposition rate =(Deposited metal weight/ Welding time,min.)×60

* Shielding Gas : Ar+20%CO_2

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Diffusible Hydrogen Content

❖ Welding Conditions

Diameter(mm)	:	1.2mm(0.045in)	**Amps(A) / Volts(V)**	:	280A / 30V
Shielding Gas	:	80%Ar+20%CO_2	**Stick-Out(mm)**	:	20mm(0.79in)
Flow Rate(ℓ /min.)	:	20	**Welding Speed**	:	35 cm/min (13.8 in/min)
Welding Position	:	1G	**Current Type & Polarity**	:	DC(+)

❖ Hydrogen Analysis Using Gas Chromatography Method

Hydrogen Evolution Time	:	72 hrs
Evolution Temp.	:	45 ℃(113℉)
Barometric Pressure	:	780 mm-Hg

❖ Result(㎖/100g Weld Metal)

X1	X2	X3	X4
3.3	**3.0**	**3.4**	**3.6**

Average Hydrogen Content 3.3 *㎖ / 100g Weld Metal*

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Proper Welding Condition

❖ Proper Current Range

Consumable	Shielding Gas	Welding Position	Wire Dia.
			1.2mm (0.045in)
SC-91LP	Ar +20%CO_2	F & HF	150~300Amp
		V-Up	180~260Amp
		V-Down	180~260Amp
		Overhead	120~250Amp

❖ F No & A No

F No	A No
6	10

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