

S-7016.H

COVERED ARC WELDING ELECTRODE
FOR 490MPa CLASS HIGH TENSILE STEEL



❖ Specification

AWS A5.1	E7016
JIS Z 3211	E4916
EN ISO 2560-A	E42 2 B 1 2

❖ Applications

Structures using 490MPa class high tensile steel, bridges, buildings, ship, high pressure vessels, rolling stock and off-shore structures.

❖ Characteristics on Usage

S-7016.H is the most widely used low hydrogen type electrode for all positions welding of 490MPa class high tensile steel. X-ray performance and mechanical properties of weld metal are excellent. The usability such as arc smoothness, slag detachability and bead appearance are good and easy to weld in all position.

❖ Note on Usage

1. Dry the electrodes at 300~350℃ (572~662°F) for 30~60 minutes before use.
2. Keep the arc as short as possible, and avoid large width weaving.
3. Adopt back step method or strike the arc on a small steel plate prepared for this particular purpose to prevent blowholes at the arc starting.
4. Use the wind screen against strong wind.

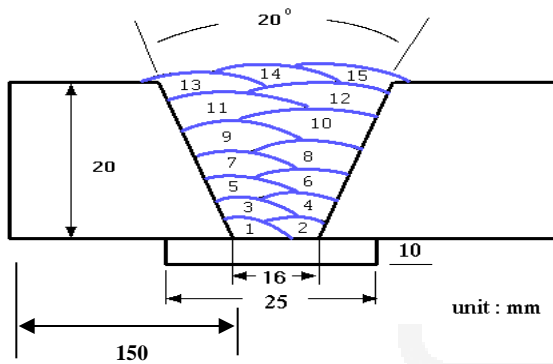


Mechanical Properties & Chemical Compositions of All Weld Metal

❖ Welding Conditions

Measurement method	: AWS A5.1
Diameter	: 4.0 X 400mm(5/32 X 16in)
Welding position	: Flat (1G-PA)
Welding Polarity	: AC
Pass & Layers	: 15Passes - 7Layer
Interpass Temp.	: 105~175°C(221~347°F)
Test plate	: ASTM A36 (groove shape as below)

❖ Groove configuration



[Joint Preparation & Layer Details]

Notes:

- Groove angle : $20^{\circ}+5^{\circ}$
- plate thickness : 20mmt
- Root opening : 16mm
- Test plate width : 150mm (min. 125)
- Test plate Length : 300mm (min. 250)

[Welding parameters]

size (mm)	Welding position	Polarity	Pass	condition		Speed (cm/min)	Heat-Input (kJ/cm)	Interpass temperature (°C)
				Current (A)	Voltage (V)			
4.0* 400	1G (PA)	AC	1	160	24	15.5	14.2	27
			2	160	24	15.2	15.2	47
			3	170	25	16.4	15.5	110
			4	170	25	16.8	15.2	112
			5	170	25	16.0	15.9	110
			6	170	25	16.3	15.6	107
			7	170	25	16.9	15.0	105
			8	170	25	16.3	15.6	110
			9	170	25	16.0	15.9	118
			10	170	25	16.8	15.2	114
			11	170	25	16.2	15.7	111
			12	170	25	15.9	16.0	105
			13	170	25	16.3	15.6	107
			14	170	25	15.5	16.5	110
			15	170	25	15.8	16.1	108



Mechanical Properties & Chemical Compositions of All Weld Metal

❖ Mechanical Property of All Weld Metal

Consumable	Tensile test			CVN Impact Test J (ft·lbs)
	YS MPa (lbs/in ²)	TS MPa (lbs/in ²)	EL (%)	-30 °C (-22 °F)
S-7016.H	560(81,000)	620(91,000)	25.4	80(59)
AWS Spec.	≥ 400(58,000)	≥ 490(71,000)	≥ 22	≥ 27(20)

❖ Chemical Composition of All Weld Metal(wt%)

Consumable	Chemical Composition (%)				
	C	Si	Mn	P	S
S-7016.H	0.08	0.62	1.22	0.017	0.011
AWS Spec.	≤0.15	≤0.75	≤1.60	≤0.035	≤0.035



Weldability & Welding Efficiency Test

❖ Weldability

Item	Division	Flat position	Vertical position
Arc stability		Good	Good
Melting rate		Excellent	Excellent
Deposition rate		Excellent	Excellent
Resistance of spatter occurrence		Excellent	Excellent
Bead appearance		Good	Good
The others		Good	Good

❖ Test Conditions of Deposition Efficiency

Consumable	Base Metal		Welding conditions		
	Specification	Dimension, mm(in)	Amp. (A)	Welding speed (mm/min)	Position
S-7016.H (4.0 x 400 mm) (5/32 x 16 in)	ASTM A36	300 X 100 X12 (12 X 3.9 X 0.5)	170	200	Flat

❖ Results of Deposition Efficiency Test

Consumable	Deposition efficiency(%)	
	For electrode	For core wire
S-7016.H 4.0mm(5/32in)	63 ~ 66	96 ~ 100



Diffusible Hydrogen Content

❖ Welding Conditions

consumable	: S-7016.H	Welding Position	: 1G
Diameter mm(in)	: 4.0 x 400(5/32 x 16)	Amp.(A) / Volts(V)	: 170~180Amp.
Re-drying conditions	: 350°C X 1hr (662°F X 1hr)	Current Type & Polarity	: AC/DC+

❖ Hydrogen Analysis Using Gas Chromatography Method

Hydrogen Evolution Time	: 72 hrs	Analysis Temp.	: 25 °C (77°F)
Evolution Temp.	: 25 °C (77°F)	Exposure Condition	: 80%RH-30°C (86°F)
Barometric Pressure	: 780 mm-Hg		

❖ Result (ml/100g Weld Metal)

X1	X2	X3	X4
6.9	7.5	7.0	7.4

Average Hydrogen Content **7.2 ml/100g Weld Metal**



Size Available and recommended Current & Approval

❖ Sizes Available and Recommended Current

Diameter, mm(in)		2.6 (3/32)	3.2 (1/8)	4.0 (5/32)	5.0 (3/16)	6.0 (15/64)
Length, mm(in)		350(14)	350(14)	400(16)	400(16)	450(18)
Recommended current range (AC or DC+ Amp.)	Flat position	55 ~85	90 ~130	130 ~180	180 ~240	250 ~310
	Vertical & Overhead position	50 ~80	80 ~120	110 ~170	150 ~200	-

❖ Authorized Approval Details

Classification	Dia. mm(in)	Welding position	Grade					
			KR	ABS	LR	BV	DNV GL	NK
AWS								
E7016	2.6(3/32) ~ 5.0(3/16)	All	3H10, 3YH10	3H10, 3Y	3, 3YH15	3YHH	3YH10	KMW 53HH
	6.0 (15/64)	Flat						

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.