

# **Supercored 81MAG**

FLUX CORED ARC WELDING CONSUMABLE  
FOR WELDING OF LOW-TEMPERATURE  
SERVICE STEEL

2022.02

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**HYUNDAI WELDING CO., LTD.**



## Supercored 81MAG

### ❖ Specification

*AWS A5.29*

E81T1-Ni1M H4

*(AWS A5.29M*

E551T1-Ni1M H4)

*EN ISO 17632-A*

T 50 6 1Ni P M21 2 H5

### ❖ Applications

Supercored 81MAG meet NACE requirements. It can be used for oil and gas construction, pipe, and offshore stations.

### ❖ Characteristics on Usage

Supercored 81MAG is a titania-type flux cored wire to be used with Ar+CO<sub>2</sub> gas mixture shielding. It provide excellent notch toughness at low temperature ,not only as-welded but also stress relieved state.

### ❖ Note on Usage

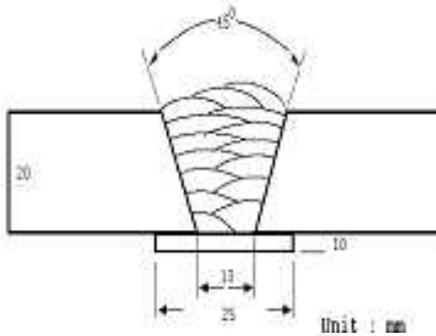
1. For preheating guidelines, please refer to your local standards and codes relative to your best practices.
2. Use Ar+20~25% CO<sub>2</sub> gas.



## Mechanical Properties & Chemical Composition of All Weld Metal

### ❖ Welding Conditions

Method by AWS Spec.



[ Joint Preparation & Layer Details ]

<b>Diameter(mm)</b>	: 1.2mm(0.045in)
<b>Shielding Gas</b>	: Ar+20%CO <sub>2</sub>
<b>Welding Position</b>	: 1G
<b>Amp./ Volt.</b>	: 270~280 /29~30
<b>Stick-Out(mm)</b>	: 20~25 (0.79~0.98in)
<b>Pre-Heat(°C)</b>	: R.T .
<b>Interpass Temp.(°C)</b>	: 150±15 (302±59 °F)

### ❖ Mechanical Properties of all weld metal

Consumable	Tensile Test			CVN Impact Test J(ft-lbs)		Remark
	YS Mpa(lbs/in <sup>2</sup> )	TS Mpa((lbs/in <sup>2</sup> )	EL(%)	-30°C (-20°F)	-60°C (-76°F)	
<b>Supercored 81MAG</b>	550 (80,000)	590 (86,000)	26.0	100(74)	60(44)	As welded
	510 (74,000)	570 (83,000)	28.0	90(66) at -46°C (-50°F)		PWHT (620°C ×2hr)
<b>AWS A5.29 E81T1-Ni1M H4</b>	≥ 470 (68,000)	550~690 (80,000~100,000)	≥ 19	≥ 27(20) at -30°C (-20°F)		As welded

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

Consumable	C	Si	Mn	P	S	Ni
<b>Supercored 81MAG</b>	0.05	0.28	1.20	0.008	0.012	0.93
<b>AWS A5.29 E81T1-Ni1M H4</b>	≤ 0.12	≤ 0.80	≤ 1.50	≤ 0.03	≤ 0.03	0.8~1.1

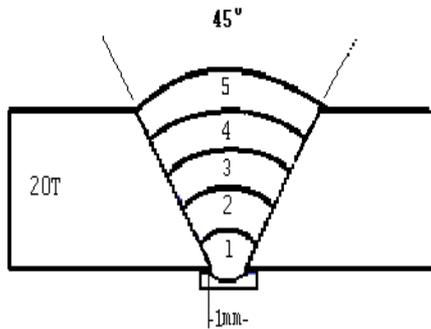
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## Mechanical Properties & Chemical Composition of All Weld Metal

### ❖ Welding Conditions

Method by AWS Spec.



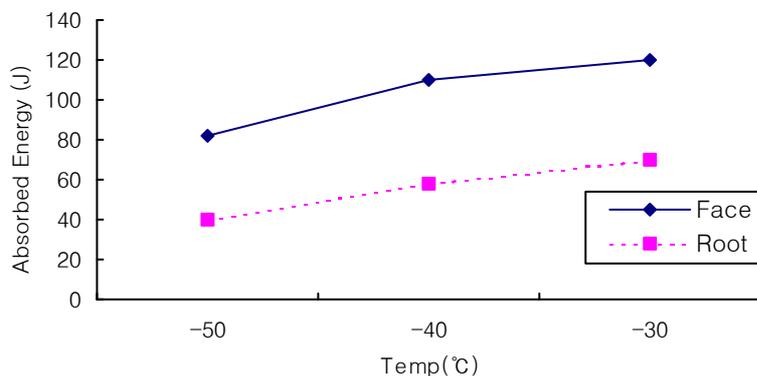
[ Joint Preparation & Layer Details ]

<b>Diameter(mm)</b>	: 1.2mm(0.045in)
<b>Shielding Gas</b>	: Ar+20% CO <sub>2</sub>
<b>Welding Position</b>	: 3G (v-up)
<b>Amp./ Volt.</b>	: 1 pass : 180 /25 2pass~: 210~220/25~26
<b>Stick-Out(mm)</b>	: 20~25
<b>Pre-Heat(°C)</b>	: R.T .
<b>Interpass Temp.(°C)</b>	: 150±15 (302±59 °F)
<b>Polarity</b>	: DC(+)

### ❖ Mechanical Properties of all weld metal

		CVN Impact Test J(ft·lbs)	
		-50 °C (-58 °F)	-40 °C (-40 °F)
Location of specimen	Face	80(59)	100(74)
	Root	40(30)	60(44)

### Charpy v-notch test



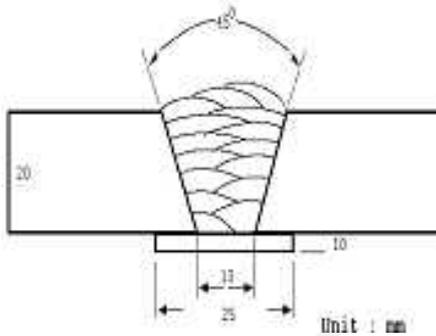
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## Mechanical Properties & Chemical Composition of All Weld Metal

### ❖ Welding Conditions

Method by AWS Spec.



[ Joint Preparation & Layer Details ]

<b>Diameter(mm)</b>	: 1.4mm(0.052in)
<b>Shielding Gas</b>	: Ar+20%CO <sub>2</sub>
<b>Welding Position</b>	: 1G
<b>Amp./ Volt.</b>	: 300~315 /29~30
<b>Stick-Out(mm)</b>	: 20~25 (0.79~0.98in)
<b>Pre-Heat(°C)</b>	: R.T .
<b>Interpass Temp.(°C)</b>	: 150±15 (302±59 °F)

### ❖ Mechanical Properties of all weld metal

Consumable	Tensile Test			CVN Impact Test J(ft·lbs)		Remark
	YS Mpa(lbs/in <sup>2</sup> )	TS Mpa((lbs/in <sup>2</sup> )	EL(%)	-30°C (-20°F)	-60°C (-76°F)	
<b>Supercored 81MAG</b>	540 (78,000)	585 (85,000)	27.6	90(66)	60(44)	As welded
	500 (73,000)	565 (82,000)	28.4	84(62) at -46°C (-50°F)		PWHT (620°C ×2hr)
<b>AWS A5.29 E81T1-Ni1M H4</b>	≥470 <b>(68,000)</b>	<b>550~690</b> <b>(80,000~100,000)</b>	≥ 19	≥27(20) at -30°C (-20°F)		<b>As welded</b>

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

Consumable	C	Si	Mn	P	S	Ni
<b>Supercored 81MAG</b>	0.05	0.29	1.19	0.007	0.009	0.89
<b>AWS A5.29 E81T1-Ni1M H4</b>	≤0.12	≤0.80	≤1.50	≤0.03	≤0.03	<b>0.8~1.1</b>

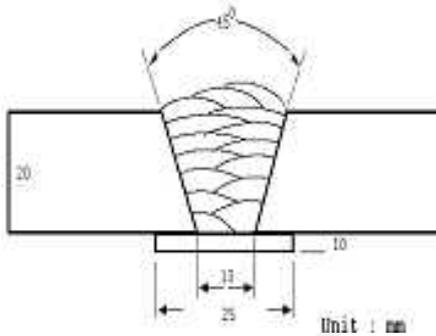
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## Mechanical Properties & Chemical Composition of All Weld Metal

### ❖ Welding Conditions

Method by AWS Spec.



[ Joint Preparation & Layer Details ]

<b>Diameter(mm)</b>	: 1.6mm(1/16 in)
<b>Shielding Gas</b>	: Ar+20%CO <sub>2</sub>
<b>Welding Position</b>	: 1G
<b>Amp./ Volt.</b>	: 320~330 /29~30
<b>Stick-Out(mm)</b>	: 20~25 (0.79~0.98in)
<b>Pre-Heat(°C)</b>	: R.T .
<b>Interpass Temp.(°C)</b>	: 150±15 (302±59 °F)

### ❖ Mechanical Properties of all weld metal

Consumable	Tensile Test			CVN Impact Test J(ft·lbs)		Remark
	YS Mpa(lbs/in <sup>2</sup> )	TS Mpa((lbs/in <sup>2</sup> )	EL(%)	-30℃ (-20°F)	-60℃ (-76°F)	
<b>Supercored 81MAG</b>	540 (78,000)	580 (84,000)	27.8	80(59)	50(37)	As welded
	490 (71,000)	560 (81,000)	28.0	70(52) at -46℃ (-50°F)		PWHT (620℃ ×2hr)
<b>AWS A5.29 E81T1-Ni1M H4</b>	≥470 <b>(68,000)</b>	<b>550~690</b> <b>(80,000~100,000)</b>	≥ 19	≥27(20) at -30℃ (-20°F)		<b>As welded</b>

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

Consumable	C	Si	Mn	P	S	Ni
<b>Supercored 81MAG</b>	0.05	0.33	1.22	0.009	0.007	0.91
<b>AWS A5.29 E81T1-Ni1M H4</b>	≤0.12	≤0.80	≤1.50	≤0.03	≤0.03	<b>0.8~1.1</b>

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## Welding Efficiency

### ❖ Deposition Rate & Efficiency

Consumable (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)	84~86	3.2(7.0)
	250	28	13.3(525)	85~87	4.4(9.7)
	300	32	15.3(600)	86~88	5.5(12.1)
1.4mm (0.052in)	250	28	7.6 (300)	85~87	3.6(7.9)
	300	32	10.2 (400)	86~88	4.7(10.4)
	330	36	12.8 (500)	87~89	6.3(13.9)
1.6mm (1/16 in)	280	31	6.4 (250)	86~88	4.0(8.8)
	330	33	7.6 (300)	86~89	4.6(10.1)
	350	34	8.1 (320)	87~89	5.6(12.3)
	400	38	9.2 (360)	88~90	6.5(14.3)
Remark				Deposition efficiency =(Deposited metal weight/ Wire weight used)×100	Deposition rate =(Deposited metal weight/ Welding time, min.)×60

\* Shielding Gas : Ar+20%CO<sub>2</sub>



## Diffusible Hydrogen Content

### ❖ Welding Conditions

<b>Diameter(mm)</b>	: 1.2mm(0.045in)	<b>Amps(A) / Volts(V)</b>	: 270 / 29
<b>Shielding Gas</b>	: Ar+20%CO <sub>2</sub>	<b>Stick-Out(mm)</b>	: 20mm(0.79in)
<b>Flow Rate(ℓ /min.)</b>	: 20	<b>Welding Speed</b>	: 35 cm/min (13.8 in/min)
<b>Welding Position</b>	: 1G	<b>Current Type &amp; Polarity</b>	: DC(+)

### ❖ Hydrogen Analysis Using Gas Chromatography Method

<b>Hydrogen Evolution Time</b>	: 72 hrs
<b>Evolution Temp.</b>	: 45 °C(113°F)
<b>Barometric Pressure</b>	: 780 mm-Hg

### ❖ Result(ml/100g Weld Metal)

X1	X2	X3	X4
3.4	3.5	3.3	3.4

**Average Hydrogen Content 3.4 ml / 100g Weld Metal**



# Supercored 81MAG

## ❖ Proper Current Range

Consumable	Shielding Gas	Welding Position	Current
1.2mm (0.045in)	Ar+20%CO <sub>2</sub>	Flat	150~300 Amp
		V-up Over head	150~240 Amp
		V-down	150~300 Amp
1.4mm (0.052in)	Ar+20%CO <sub>2</sub>	Flat	150~320 Amp
		V-up Over head	150~270 Amp
		V-down	150~320 Amp
1.6mm (1/16 in)	Ar+20%CO <sub>2</sub>	Flat	150~360 Amp
		V-up Over head	150~320 Amp
		V-down	150~360 Amp

## ❖ AUTHORIZED APPROVAL DETAILS

Consumable	Welding position	Register of shipping & Size(mm)			
		ABS	LR	BV	DNV
Supercored 81MAG	All V-down	5Y400SA H5 1.2 (0.045in)	5Y40S H5 1.2 (0.045in)	SA5Y40M HHH 1.2 (0.045in)	VY40MS( H5) 1.2 (0.045in)

## ❖ F No. & A No.

F No	A No
6	10

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