



HYUNDAI
W E L D I N G

Rev. 00

S-6013.LF

COVERED ARC WELDING ELECTRODE
FOR WELDING LIGHT STRUCTURAL STEELS

HYUNDAI WELDING CO., LTD.



❖ **Specification**

AWS A5.1

E6013

JIS Z3211

E4313

EN ISO 2560-A

E38 0 R 1 2

❖ **Applications**

S-6013.LF can be used for welding of machinery, vehicles and light structural steels surface dressing of heavy steel structures.

❖ **Characteristics on Usage**

S-6013.LF is a high titania type electrode whose usability is excellent in all position welding. It is suitable for welding of light structural steels because of its stable arc, shallow penetration and smooth weld bead.

S-6013.LF is a low fume type electrode of which fume generation is about 20% less than conventional high titania type electrode.

❖ **Note on Usage**

1. When excessive moisture absorption occurs for any reason dry the electrodes at 70~100℃ for 30~60minutes before use.

Excessive moisture absorption causes increase of fumes, spatters and may result in some porosity, lower usability.

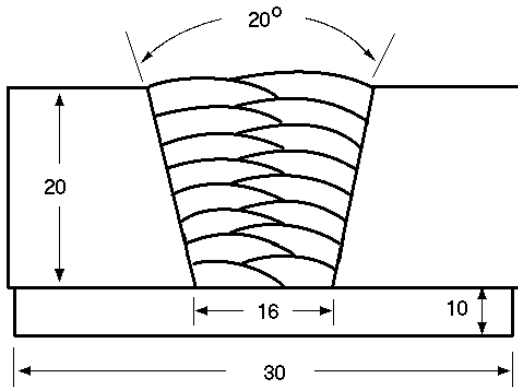
2. Pay attention not to exceed the range of proper currents welding with excessive current not only lowers X-ray performance but also causes increase of spatter, undercut and insufficient slag covering.



Mechanical Properties & Chemical Compositions of All Weld Metal

❖ Welding Conditions

Method by AWS Spec.



[Joint Preparation & Layer Details]

| | |
|---------------------|----------------|
| Diameter(mm) | : 4.0mm x 400 |
| Amp./ Volt. | : 170 / 23~ 24 |
| Interpass Temp.(°C) | : 80~ 130 |
| Polarity | : AC |

❖ Mechanical Property of All Weld Metal

| consumable | Tensile test | | | CVN Impact Test (Joule) |
|------------|--------------|----------|--------|-------------------------|
| | YS (MPa) | TS (MPa) | EL (%) | 0°C |
| S-6013.LF | 439 | 488 | 26.8 | 67 |
| AWS Spec. | ≥ 330 | ≥ 430 | ≥ 17 | - |

❖ Chemical Composition of All Weld Metal(wt%)

| Consumable | Chemical Composition | | | | |
|------------|----------------------|-------|-------|-------|-------|
| | C | Si | Mn | P | S |
| S-6013.LF | 0.05 | 0.23 | 0.35 | 0.022 | 0.017 |
| AWS Spec. | ≤0.20 | ≤1.00 | ≤1.20 | N.S | N.S |

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**Weldability
& Generated Fumes****❖ Weldability**

| Item \ Division | Flat position | Vertical position |
|----------------------------------|---------------|-------------------|
| Arc stability | Excellent | Excellent |
| Melting rate | Good | Good |
| Deposition rate | Excellent | Good |
| Resistance of spatter occurrence | Good | Good |
| Bead appearance | Excellent | Excellent |
| Slag fluidity & Removability | Excellent | Excellent |
| The others | Good | Good |

❖ The Amounts of Generated Fumes

| Consumable | Division | Times | X ₁ | X ₂ | X ₃ | X ₄ | X ₅ | X ₆ | Avg. |
|------------------|----------|-------|----------------|----------------|----------------|----------------|----------------|----------------|------|
| | | | S-6013.LF | Ft | 266 | 243 | 276 | 254 | 270 |
| Fw | 8.1 | 7.8 | | 8.4 | 7.9 | 8.2 | 8.2 | 8.1 | |
| Conventional E/R | Ft | 329 | 332 | 347 | 311 | 325 | 340 | 331 | |
| | Fw | 10.2 | 10.3 | 10.6 | 9.5 | 10.0 | 10.4 | 10.2 | |

❖ Typical Chemical Composition of Fumes

| Consumables | Fe ₂ O ₃ | SiO ₂ | MnO | TiO ₂ | Al ₂ O ₃ | CaO | MgO | Na ₂ O | K ₂ O |
|------------------|--------------------------------|------------------|-----|------------------|--------------------------------|-----|-----|-------------------|------------------|
| S-6013.LF | 38 | 18 | 7 | 18 | 1.5 | 2 | 0.5 | 6 | 5 |
| Conventional E/R | 40 | 18 | 8 | 17 | 2 | 1 | 1 | 6 | 6 |

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Welding Efficiency Test

❖ Test Conditions of Deposition Efficiency

| Consumable | Base Metal | | Welding conditions | | |
|-------------------------|---------------|----------------|--------------------|------------------------|----------|
| | Specification | Dimension (mm) | Amp. (A) | Welding speed (mm/min) | Position |
| S-6013.LF (4.0mm x 400) | ASTM A36 | 300 X 75 X12 | 170 | 250 | Flat |

❖ Results of Deposition Efficiency Test

| Consumable | Deposition efficiency(%) | |
|-------------------------|--------------------------|---------------|
| | For electrode | For core wire |
| S-6013.LF (4.0mm x 400) | 65 | 92 |

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Size Available and recommended Current & Approval

❖ Sizes Available and Recommended Current

| Diameter (mm) | | 2.6 | 3.2 | 4.0 | 5.0 | 6.0 |
|--|------------------------------|------------|-------------|--------------|--------------|--------------|
| Length (mm) | | 350 | 350 | 400 450 | 400 450 | 450 |
| Recommended current range (AC or DC+ Amp.) | Flat position | 55 ~ 95 | 80 ~ 130 | 120 ~ 180 | 160 ~ 230 | 220 ~ 300 |
| | Vertical & Overhead position | 45 ~ 90 | 60 ~ 120 | 100 ~ 160 | 120 ~ 200 | - |

❖ Authorized Approval Details

| Classification | | Dia. (mm) | Welding position | Grade | | | | | | |
|----------------|-------|--------------|---------------------|-------|-----|----|----|-----|----|------|
| JIS | AWS | | | KR | ABS | LR | BV | DNV | GL | NK |
| E6013 | E6013 | 2.6 ~ 5.0 | All | RMW2 | 2 | 2 | 2 | 2 | 2 | KMW2 |
| | | 6.0 | F, H- Fil. | | | | | | | |

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