

FAMILIARC™

LB-52U Arc Welding Electrode

AWS A5.1 E7016, EN ISO 2560-A-E 42 2 B, JIS Z3211 E4316
(For Root Pass Welding)

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LB-52U is a low hydrogen type welding electrode which produces the innerside reinforcement of weld. In this welding, excellent weld metal and beautiful root ripple bead free from defects can be achieved by welding from one side of the joint. By this method, a welder can speed up the operation and yet get the good weld joint. LB-52U is often used for welding pipes and welding structures such as tanks, which can be welded only from one side.

General Characteristics

Workability

- LB-52U is much superior in its ability of the root pass welding to the other low hydrogen type electrodes.
- Removability of the slag is good.
- This electrode makes beautiful root ripple bead if the manipulation of the electrode is suitable.

Production Sizes and Recommended Welding Current

Table 1: Production sizes and recommended welding current (AC or DC ±)

Electrode Diameter (mm)		2.6	3.2	4.0
Electrode Length (mm)		350	400	400
Current Range (Amp)	F, HF, H	60 ~ 90	90 ~ 130	130 ~ 180
	VU, OH	50 ~ 80	80 ~ 120	110 ~ 170
	Root Pass	30 ~ 80	60 ~ 110	90 ~ 140

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Joint Geometry

Table 2: Recommended joint geometry of LB-52U

Kind of Joint	Single V Groove	Double V Groove	Single-Edged T Joint
Joint Geometry			
t (mm)	0 ~ 1	0 ~ 1	0 ~ 1
θ°	60 ~ 70	60 ~ 70	60 ~ 70
g (mm)	1.5 ~ 3.5	2.0 ~ 4.0	2.5 ~ 3.5
Electrode Diameter (mm)	F	2.6, 3.2, 4.0	2.6, 3.2
	V	2.6, 3.2, 4.0	2.6, 3.2
	O	2.6, 3.2	2.6, 3.2
	H.F.	-	2.6, 3.2

Remarks: F : Flat Position, V : Vertical Position, O : Overhead Position, H.F. : Horizontal Fillet Position

Manipulation of electrode

If the following points are observed in using **LB-52U**, favorable weld without defects can be achieved.

- (a) The first arc strike should be done on the groove surface or tap plate.
- (b) Put the electrode so deep that the protruding electrode coating might touch the face of the joint.
- (c) Keep the arc length as short as possible.
- (d) During welding, a key hole should be formed in front of the molten pool.
- (e) Maintain key hole shape constant applying either semi weaving (Fig. 1) or straight weaving (Fig. 2) technique.
- (f) For the first arc stopping without previous bead, some kind of crater treatment should be done to prevent crater cracking (Fig. 3).
- (g) Arc re-start should be done on previous bead before moving to joining part.
- (h) Subsequent arc stopping should be done on previous bead.

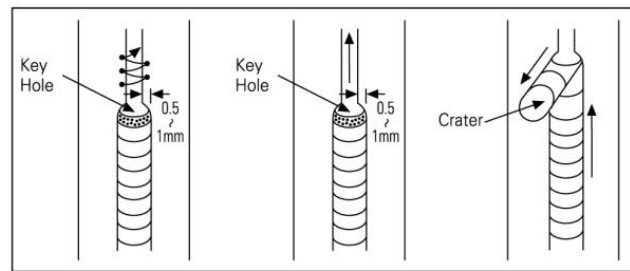


Fig. 1: Semi Weaving Fig. 2: Straight Fig. 3: Arc Stopping

Weldability

Mechanical Properties of All Weld Metal

Table 3: Typical Mechanical Properties of All Weld Metal

	Yield Point		Tensile Strength		Elongation (%)	IV at -40°C (J)
	MPa	(ksi)	MPa	(ksi)		
Example	441	(64)	545	(79)	31	90
Guaranty	≥400	(≥58)	≥480	(≥70)	≥22	≥27

Chemical Composition of All Weld Metal

Table 4: Typical Chemical Composition of All Weld Metal (mass%)

C	Mn	Si	P	S
0.08	0.86	0.64	0.012	0.008

Approval List

Table 6: Approvals List

ABS	LR	DNV-GL
3H10, 3Y	3m, 3Ym, H15	3YH10

Notes of Usages

- Before using LB-52U, dry it at 300°C~350°C for 30~60 minutes.
- In the welding method which has LB-52U produced the inner reinforcement of weld, the result is greatly influenced by the geometry, current used and conveyance of the electrode.
- Pay full attention to observe the recommended welding conditions.
- Keep the arc length as short as possible.
- 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.
- Use the wind screen against strong wind.

Technical Report

LB-52U is the world's No. 1 covered electrode for "uranami" welding, or the root pass melt-through welding with penetration beads. With LB-52U you welding will be easier and faster, and you will have confidence in the quality of your welds in any kind of pipe welding of mild steel and 490N/mm² high tensile steel.

Inception of LB-52U

LB-52U was developed around 1954. The letter "L" stands for low hydrogen, while "B" symbolizes a slag shielding covered electrode. The digits "52" refer to the level of approximate tensile strength of the deposited metal when it was developed. The letter "U" was coined from "uranami" welding.

What makes LB-52U the best for "Uranami" welding ?

• **Unsurpassed usability in all-position welding**

LB-52U features a very stable arc and low spatter over a wide range of welding currents. In particular, LB-52U really shines in the "uranami" welding of horizontally fixed pipes.

LB-52U features very smooth, glossy "uranami" beads, or the penetration beads protruded on the reverse side of the groove – Fig. 4. LB-52U can accommodate wider tolerance of the root opening, which is an advantage in site welding. Once you have used LB-52U, you will choose it again and again for unsurpassed performance.

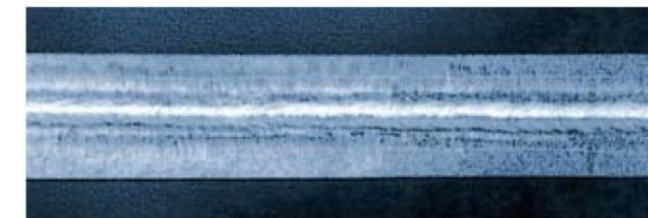


Fig. 4: An "uranami" bead, or the penetration bead protruded on the reverse side of the groove.

• **Superior crack resistance and mechanical properties**

LB-52U provides superior crack resistibility due to a lower level of diffusible hydrogen in the weld metal. In addition, its impact strength is high over arrange of testing temperatures – Fig. 5. Therefore, it can be used for low-temperature applications.

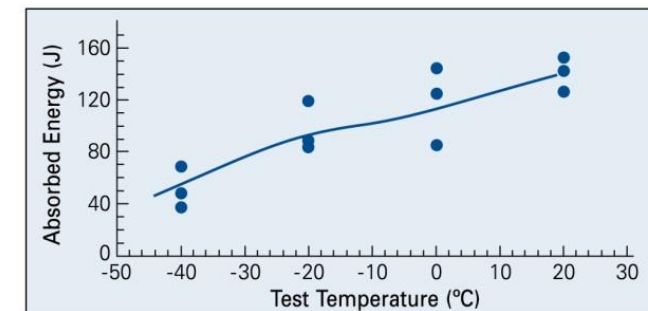


Fig. 5: Charpy impact test results of the LB-52U weld metal by using DC-EP welding current in the vertical-up position.

• **A field-proven electrode in the worldwide markets**

The unsurpassed usability of LB-52U in the "uranami" welding of pipe joints has satisfied users around the world. LB-52U has been popular for a variety of piping jobs across Russia, Asia and the Pacific region. Particularly in Russia, LB-52U has made a real contribution to the construction of very long, oil and gas pipelines under freezing weather with a long history of reliability. Since 1982 more than 20,000 metric tons of LB-52U has been consumed in the construction of the Russian pipelines.

Key points in the "Uranami" welding of pipes with LB-52U

- Use the keyhole technique. Right after you get the arc by striking the groove face, control the molten pool to form the keyhole crater; then manipulate the electrode along the edge of the keyhole by using the semi-weaving technique – Fig. 6.

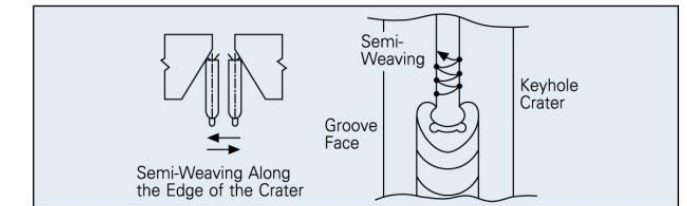


Fig. 6: The keyhole technique.

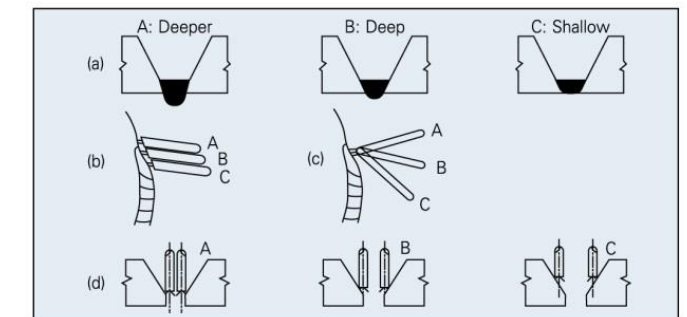


Fig. 7: The relationship between the weld penetration (a), the arc exposure spot (b), the electrode holding angle (c) and the electrode oscillation width (d) in the "uranami" welding of horizontally fixed pipes

- Control the weld penetration in the root of the groove by controlling the arc exposure spot, the electrode holding angle and the electrode oscillation width – Fig. 7(a,b,c,d). Fig. 7(a) relates to the other figures of (b), (c) and (d) respectively.

- Terminate the crater on the groove face in order to prevent the crater cracking – Fig. 8.

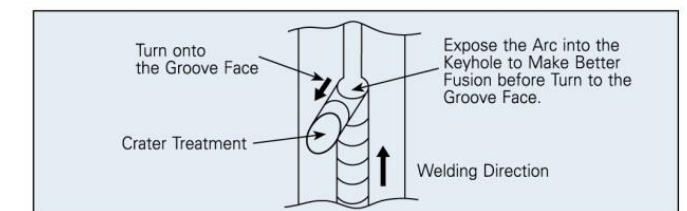


Fig. 8: How to terminate the weld crater in order to prevent the crater from cracking.

- Grind both the starting and ending terminals of the preceding weld heads to assure a smooth joint of weld beads with the succeeding welds.

- When joining the weld beads, start the arc on the preceding bead, and expose the arc into the keyhole to assure better fusion; then follow the same procedure as in Fig. 6.