

FAMILIARC™

B-14 Arc Welding Electrode

AWS A5.1 E6019, EN ISO 2560-A-E 35 2 RA, JIS Z3211 E4319
(For Mild Steel)

KOBELCO
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B-14 is a welding electrode with an ilmenite type coating. This electrode has greatly improved workability, mechanical properties, crack resistibility and economy of the traditional ilmenite type electrodes in the performance of flat, vertical and overhead position welding. Therefore it is widely used in the construction of ships, vehicles, buildings and important structures.

General Characteristics

Recommended range of plate thickness

- It is suitable for butt joint and fillet welding of thin and middle thick plate up to 20mm.

Workability

- As the covering property of its slag is good, it produces beautiful beads in the flat position welding. Besides it enables the operation even when the part to be welded has a considerable incline.
- Among electrodes of this kind, this electrode is the most excellent in its easiness of vertical and overhead position welding.

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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	5.0
Electrode Length (mm)		350	400	450	450
Current Range (Amp)	Flat Position	55 ~ 90	85 ~ 140	130 ~ 190	180 ~ 260
	Vertical & Overhead	45 ~ 75	60 ~ 120	100 ~ 160	135 ~ 210

Weldability

Mechanical Properties of All Weld Metal

Table 2: Typical Mechanical Properties of All Weld Metal

	Yield Point		Tensile Strength		Elongation (%)	IV at -18°C (J)
	MPa	(ksi)	MPa	(ksi)		
Example	410	(60)	460	(67)	32	82
Guaranty	≥330	(≥48)	≥410	(≥60)	≥22	≥27

Chemical Composition of All Weld Metal

Table 3: Chemical Composition of All Weld Metal (mass%)

C	Mn	Si	P	S
0.10	0.43	0.10	0.015	0.007

Hot Crack Resistance

It is designed to achieve high Mn/S ratio so as to obtain the high hot crack resistance.

Table 4: Difference of Mn/S ratio of weld

Type	Mn/S
B-14	60
E6013	30

Approval List

B-14 has received approvals listed in the following Table.

Table 5: Shipping approvals

NK	LR	ABS	DNV	BV
KMW3	3m	3	3	3

Notes of Usages

- Though **B-14** is contained in a damp-proof package, it absorbs moisture if it is stored or left for a long time. It is always recommended to dry it again at 70°C ~ 100°C for 30 ~ 60 minutes before use.
- 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

B-14 is a versatile ilmenite type covered electrode for mild steel, offering unsurpassed usability and weldability in all-position butt and fillet welding and in welding sheet metals and mid-thick (up to 20mm) plates.

History of ilmenite type electrodes

Kobe Steel developed, in 1942, an epoch-making ilmenite type covered electrode: "B-17", which used ilmenite (a composition of iron oxide and titanium oxide) as the raw material for the major part of the coating flux. After a period of years, Kobe Steel developed other ilmenite type covered electrodes, B-10 and B-14, so as to satisfy the requirements of a variety of users.

The consumption of ilmenite type covered electrodes increased sharply, particularly in the shipbuilding industry as the construction of ships increased through 1960s and 1970s. The annual production of ilmenite type covered electrodes in Japan increased year by year up to 132,000 MT in 1973, comprising a major portion of the market of mild steel covered electrodes.

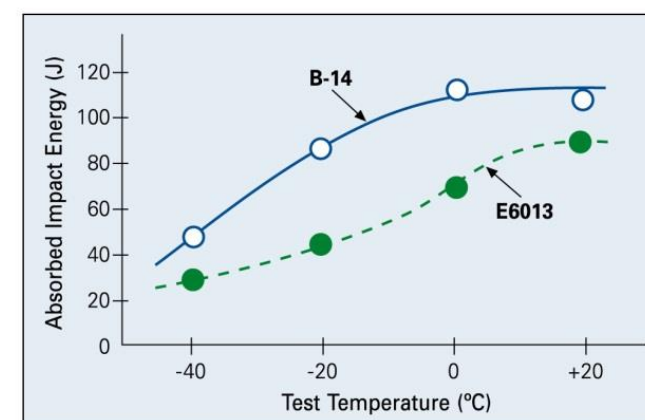


Fig. 2: Charpy impact test results of B-14 and E6013 deposited metals

However, starting 1975, right after the first global oil crisis, ship construction began to slow down, after which the consumption of covered electrodes, including the ilmenite type, rapidly decreased. Since then this trend has accelerated, with covered electrodes being superseded by gas metal arc welding wires in order to save welding costs.

But the consumption ratio of ilmenite type covered electrodes is still high. In 1995, the annual production of ilmenite type covered electrodes was approximately 17,000 MT, which is approximately 30% of all 56,000 MT of mild steel cover electrode produced in Japan.

Ilmenite type covered electrodes classified as E4319 in the JIS standard have been also classified as E6019 (iron oxide, titania potassium type) in the AWS standard since 1991. This standardization per AWS is due to Kobe Steel's active work in the Japan Welding Engineering Society and the American welding society. Nowadays, ilmenite types covered electrodes are used to welding general steel structures, pipes, and ships in Japan and overseas. Among these ilmenite type covered electrodes, B-14 is one of the leading brands, which is produced by Kobe Steel and overseas subsidiary companies: TKW, KWAP and INTIWI.

Characteristics of B-14

Compared with E6013 electrodes, B-14 features the following characteristics.

- Suitable for welding heavy-duty structures due to superior X-ray soundness, higher ductility, high notch toughness (Fig. 2) and deeper penetration (Fig. 3).
- Suitable for welding thicker steel plates due to superior hot crack resistance.
- Higher welding efficiency due to longer unit electrode length and higher proper currents (Table 6).

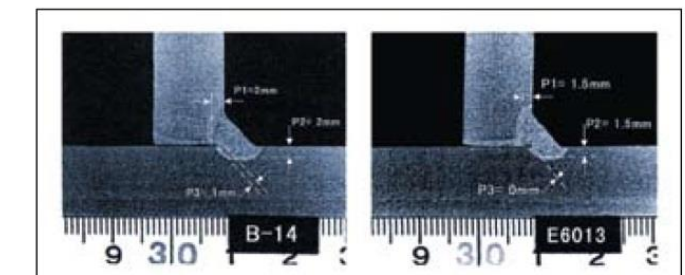


Fig. 3: A comparison between B-14 and E6013 covered electrodes (4.0mm Ø, 175A) in fillet weld penetration; P1, P2 and P3 show sizes of penetration

Table 6: A comparison between B-14 and E6013 covered electrodes on unit length and proper welding current ranges

Brand	Size (mm Ø)	3.2	4.0	5.0
B-14	Electrode unit length (mm)	400	450	450
	Proper current in flat welding (A)	85-140	130-190	180-260
E6013	Electrode unit length (mm)	350	400	400
	Proper current in flat welding (A)	60-125	105-170	180-220

Note on Usage

The electrode's performance depends greatly on how it is used. In order to get the best welding results, the following key points should be noted.

- Use B-14 with welding current within the proper ranges, because excessive welding current may degrade X-ray soundness, increase spatters and cause undercut and irregular bead appearance.
- Re-dry B-14 at 70~100°C for 30~60 minutes, if the electrode picked up excessive moisture. This is because excessive moisture in the coating may degrade electrode's usability and cause the occurrence of pits in the weld metal.
- Avoid excessively high temperatures and long time in re-drying B-14, because the excessive redrying may damage the coating, causing less penetration, poor X-ray soundness and electrode burn.