Doc. No. 012010-F031

Mar. 2010

Flux-Cored Wire for CO_2 Gas Shielded Arc Welding "DW-100KS"

KOBE STEEL, LTD.

WELDING COMPANY

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"DW-100KS"

1. Description

"DW-100KS" is rutile type flux cored wire for all positional welding of mild steel and 490MPa high tensile strength steel with CO_2 shielding gas. This wire is applicable to low temperature service.

Features of "DW-100KS" are shown as follows:

a) Suitable for butt and fillet welding in all positions.
b) Good impact value at low temperatures down to -40°C.
c) Excellent usability in vertical upward welding.
d) Excellent usability with soft and stable arc, less fume and spattering, good bead appearance and smooth slag removal.

2. Wire specification, approvals and recommended welding parameters

Table1 Specifications of wire

Applications	Mild Steels and 490MPa high tensile strength steels Multi-pass and single-pass applications
Applicable classification	AWS A5.20 E71T-9C-J ASME SFA-5.20 E71T-9C-J
Shielding gas	100% CO_2
Polarity of power supply	DC-EP
Applicable wire diameter	1.2mm, 1.4mm

Table2 Approvals by shipping registers

ABS	LR	DNV	BV	KR	GL
3YSA, 3Y400SA H10	3Y40S (H10)	IVY40MS (H10)	SA3Y40M HH	3Y40SG(C) H10	4Y40H10S

Table3 Recommended welding parameters

Wire diameter	1.2mm	1.4mm
Flat	120 - 300A	150 - 400A
Horizontal fillet	120 - 300A	150 - 350A
Horizontal	120 - 280A	150 - 320A
Vertical upward / Overhead	120 - 260A	150 - 270A

3. Typical properties of all-weld-metal

Tensile properties, impact property and its chemistry of all-weld-metal are shown in **Table4** and **Table5** respectively, which were obtained by testing in accordance with AWS classification A5.20.

Table4 Mechanical properties of all-weld-metal*1

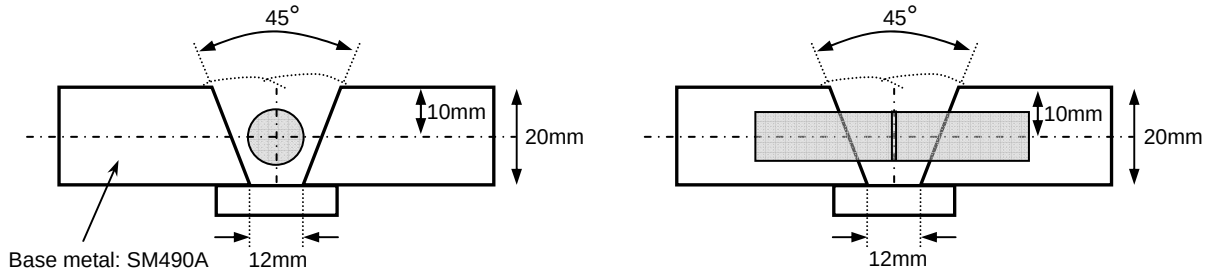
Wire diameter	Tensile properties			Impact properties
	0.2% O.S. (MPa)	T.S. (MPa)	El (%)	$vE_{-40°C}$ (J)
1.2mm	525	601	28	104 (96, 116, 100)
1.4mm	518	591	28	93 (84, 87, 107)
Guaranty	≧400	490 - 670	≧22	≧27

*1 [Welding current] 280A (1.2mm), 300A (1.4mm), [Shielding gas] 100%CO_2(25L/min.),
[Pass sequence] 12passes-6layers, [Preheat temp.] Room temp., [Inter-pass temp.] 140-160°C
[Location of test specimen] Refer to Fig.1

Table5 Chemical compositions of all-weld-metal (wt.%)*2

Wire diameter	C	Si	Mn	P	S	Ni
1.2mm	0.05	0.54	1.47	0.010	0.009	0.33
1.4mm	0.05	0.55	1.48	0.011	0.009	0.38
Guaranty	≦0.18	≦0.90	≦1.75	≦0.03	≦0.03	≦0.50

*2 [Analyzed area] Center of deposited metal (Refer to Fig.1-(a))



(a) Tensile test and chemical analysis (b) Impact test

Fig.1 Location of test specimen

4. Diffusible hydrogen contents of deposited metal

Diffusible hydrogen contents of each wire are shown in **Table6**.

Table6 Diffusible hydrogen content of deposited metal*3

Wire diameter	Diffusible hydrogen content (ml/100g, deposited metal)				
	1	2	3	4	Avg.
1.2mm	4.5	4.3	4.8	4.0	4.4
1.4mm	4.9	5.0	4.5	4.2	4.7

*3 [Test method] Gas chromatography measurement (According to JIS Z3118)
[Welding current] 220A (1.2mm), 250A (1.4mm), [Wire stick-out] 25mm,
[Welding speed] 300mm/min. [Shielding gas] 100%CO_2 (25L/min.)

5. Fume emission rate

Fume emission rate is shown in **Fig.2**.

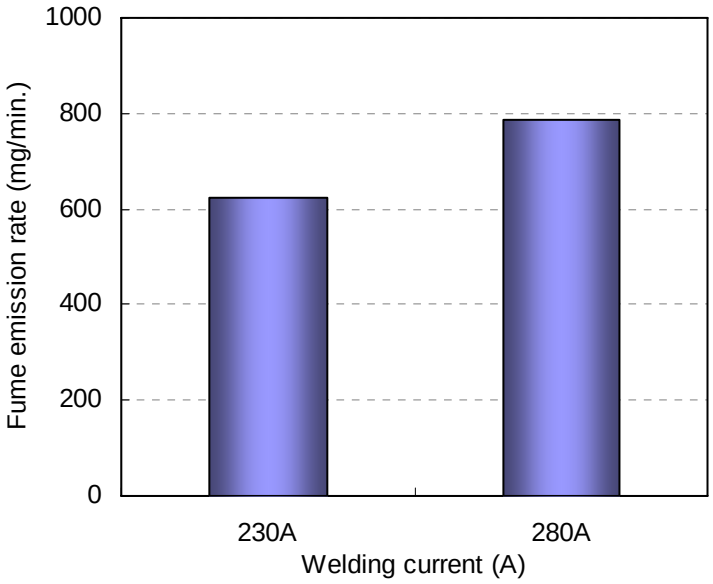


Fig.2 Fume emission rate

6. Properties of butt joint (1.2mm)

The butt joint test was performed in accordance with the welding conditions shown in **Table7** and **Table8**. The test results are shown in **Table9** and **Table10**.

Table7 Test conditions

Welding wire	DW-100KS 1.2mm
Backing material	FB-B3 (Ceramic type)
Test plate	JIS G3106 SM490A 25mm^t
Groove preparation	Groove angle: 40°V, Root gap: 5mm
Welding position	Flat, Vertical upward, Horizontal
Preheat temp.	Room temp.
Interpass temp.	150±10°C
Shielding gas	100%CO_2 (25L/min.)
Polarity	DC-EP

Table8 Welding conditions

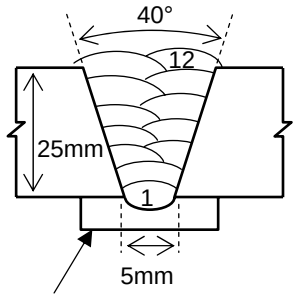
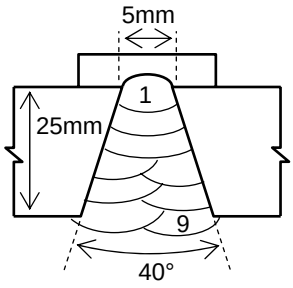
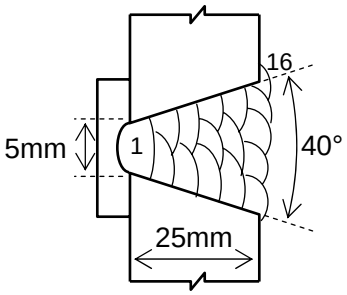
Welding position	**Flat**	**Vertical upward**	**Horizontal**
Pass sequence	12passes – 7layers  Ceramic type backing material	9passes – 6layers 	16passes – 6layers 
Welding current	Root pass: 200A 2nd to final pass: 280A	Root pass: 200A 2nd to final pass: 220A	Root pass: 200A 2nd to 11th pass: 280A Final layer: 250A
Average Heat input	1.4kJ/mm	1.7kJ/mm	1.1kJ/mm

Table9 Mechanical properties of weld metal*4

Welding position	Tensile test			Impact test	
	0.2% O.S. (MPa)	T.S. (MPa)	El. (%)	Location	$vE_{-40°C}$ (J)
Flat	542	598	28	Face	111 (90, 129, 114)
				Root	83 (78, 82, 89)
Vertical upward	534	594	28	Face	98 (115, 93, 86)
				Root	69 (63, 70, 73)
Horizontal	578	632	27	Face	81 (83, 77, 82)
				Root	85 (85, 82, 87)

*4 [Location of test specimen] Refer to Fig.3

Table10 Chemical composition of weld metal*5

Welding position	C	Si	Mn	P	S	Ni
Flat	0.05	0.49	1.48	0.013	0.007	0.35
Vertical upward	0.05	0.51	1.49	0.011	0.007	0.31
Horizontal	0.06	0.51	1.47	0.010	0.006	0.34

*5 [Analyzed area] Center of weld metal (Refer to Fig.3)

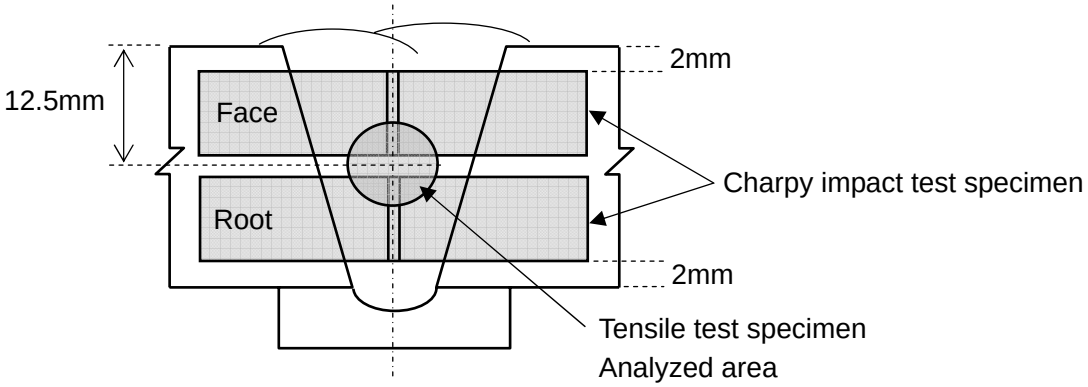


Fig.3 Location of test specimen