

Flux-Cored Wire for Gas Shield Arc Welding
"DW-50"



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DW-50 is a rutile (TiO₂) based flux-cored wire for out-of-position welding work with easier arc control, which has outstanding features mainly as described below.

- 1) **Fast freezing slag** formula of DW-50 guarantees excellent bead appearance and bead profile in vertical upward welding with keeping welding performance in flat position also.
- 2) Can be used in vertical upward and overhead **welding at high current** up to 260Amps (0.045in.).
- 3) Its slag can be **easily removed** almost in a natural way and also ensures **lustrous bead** appearance in any welding position.
- 4) DW-50 is **versatile** and formulated for both straight CO₂ gas and Ar-CO₂ mixed gas with **low fume** emission and **low spatter** generation.
- 5) **Non-baked** and shiny wire surface covered with special lubricant creates smooth wire feedability and extended liner life.



1. Wire specification

Table1 Specifications of wire

Typical applications	-Mild steels and High tensile strength steels -Multi-pass and single-pass applications	
Polarity of power supply	DC-EP	
Applicable classification	AWS A5.20 / ASME SFA 5.20	E71T-1C, E71T-1 M E71T-9C, E71T-9M
	CWB CSA W48-01	E491T-9 H8, E491T-9M H8
Applicable size	0.045in.(1.1mm), 0.052in.(1.3mm), 1/16in.(1.6 mm)	
Applicable unit quantity	28lbs(12.5kg) Spool, 44lbs (20kg) Spool, 550lbs (250kg) Drum	
Approval by the shipping registers	AB, LR, NV, GL, NK ^{*1}	

*1 CO2 only

2. Properties of undiluted deposited metal

Tensile properties, toughness property and its chemistry of undiluted deposited metal with 100%CO₂ and 75%Ar-25%CO₂ are shown in Table2 and Table3 respectively, which were obtained by testing in accordance with AWS specification A5.20.

Table2 Typical mechanical properties of undiluted deposited metal *1

Diameter inch (mm)	Shielding gas	0.2%P.S. ksi (N/mm ²)	T.S ksi (N/mm ²)	EI %	Impact value ft-lbs (J)	
					-20°F	0 °F
0.045 (1.1)	CO ₂	78.3 (540)	88.0 (607)	30	50<53,48,49> (68<72,65,67>)	56<55,56,56> (76<75,76,76>)
	Ar-CO ₂	82.2 (567)	90.8 (626)	29	66<63,65,68> (89<86,88,92>)	89<90,90,88> (121<122,122,119>)
0.052 (1.3)	CO ₂	76.7 (529)	87.9 (606)	32	46<46,47,44> (62<62,64,59>)	49<51,42,56> (67<69,57,76>)
	Ar-CO ₂	84.0 (579)	94.7 (653)	30	61<66,60,57> (83<90,82,77>)	74<85,69,73> (100<116,94,90>)
1/16 (1.6)	CO ₂	75.5 (522)	86.9 (599)	28	39<41,42,35> (53<55,57,48>)	43<41,43,45> (58<55,58,61>)
	Ar-CO ₂	83.2 (574)	93.4 (644)	27	59<61,72,43> (80<84,98,58>)	75<86,74,65> (102<117,101,88>)

*1 The values in parenthesis conform to SI unit.

Table3 Typical Chemical composition of deposited metal (mass%)

Diameter inch (mm)	Shielding gas	C	Mn	Si	P	S
0.045 (1-1)	CO ₂	0.05	1.34	0.70	0.008	0.009
	Ar-CO ₂	0.05	1.53	0.83	0.008	0.009
0.052 (1.3)	CO ₂	0.05	1.31	0.68	0.009	0.010
	Ar-CO ₂	0.05	1.52	0.84	0.009	0.009
1/16 (1.6)	CO ₂	0.05	1.29	0.66	0.009	0.009
	Ar-CO ₂	0.05	1.51	0.84	0.008	0.009

3. Properties of butt joint (0.045in.)

The butt joint test was performed with both gases according to the welding conditions shown in Table4 and 5. The test results are shown in Table6 and Table7.

Table4 Welding condition and pass sequence

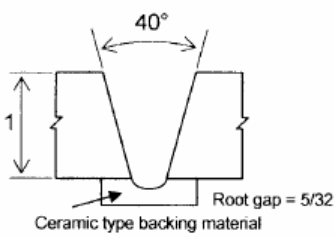
Welding position	Flat (1G), Horizontal (2G), Vertical upward (3G)	(Joint design)  Unit [in.]
Welding wire	DW-50 0.045in.	
Welding current	200-280A	
Shielding gas	100%CO ₂ , 75%Ar-25%CO ₂ 53CFH(25L/min)	
Current and polarity	DC-EP	
Preheat temp. Interpass temp.	Room temp. 300 ± 20°F (150 ± 10°C)	
Test plate	JIS G3106 SM490A (Equivalent to A36)	

Table5 Welding condition and pass sequence

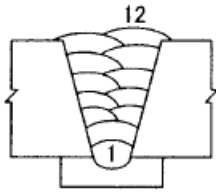
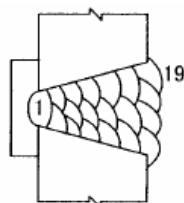
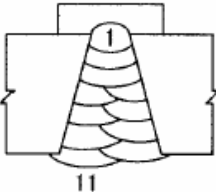
Welding position	Welding condition	Pass sequence
12passes - 7layers Flat	1 st pass : 200A 2 nd pass : 280A	
19passes - 7layers Horizontal	1 st pass : 200A 2 nd pass : 280A	
11passes - 7layers Vertical upward	1 st pass : 200A 2 nd pass : 220A	

Table6 Charpy absorbed energy

Welding position	Shielding gas	-20°F ft-lbs (J)			0°F ft-lbs (J)		
		Face ^{*1}	Center ^{*2}	Root ^{*3}	Face ^{*1}	Center ^{*2}	Root ^{*3}
Flat	CO ₂	50 (68)	49 (67)	46 (63)	77 (104)	66 (90)	60 (81)
	Ar-CO ₂	55 (75)	44 (60)	52 (70)	63 (85)	52 (70)	65 (88)
Horizontal	CO ₂	51 (69)	57 (77)	55 (75)	56 (76)	58 (78)	73 (99)
	Ar-CO ₂	59 (80)	54 (73)	68 (92)	66 (90)	72 (97)	62 (84)
Vertical upward	CO ₂	57 (77)	60 (82)	35 (48)	65 (88)	63 (85)	44 (60)
	Ar-CO ₂	55 (75)	49 (67)	40 (54)	64 (87)	58 (78)	48 (65)

*1 5/64in.(2mm) from face side, *2 Center of thickness, *3 5/64in.(2mm) from root side

Table7 Tensile properties of weld metal

Welding position	Shielding gas	0.2%P.S ksi (N/mm ²)	T.S ksi (N/mm ²)	El %
Flat	CO ₂	78.7 (543)	88.6 (611)	28
	Ar-CO ₂	84.2 (581)	91.2 (629)	28
Horizontal	CO ₂	83.5 (576)	92.7 (639)	27
	Ar-CO ₂	86.0 (593)	96.0 (662)	26
Vertical upward	CO ₂	74.0 (510)	82.8 (571)	29
	Ar-CO ₂	80.0 (552)	86.9 (599)	28

4. Diffusible hydrogen content (0.045in. , 1/16in.)

The diffusible hydrogen content tested with both gases in accordance with AWS 5.20 is shown in Table8.

Typical diffusible hydrogen content in weld metal ^{*1}

Diameter inch (mm)	Shielding gas	Diffusible hydrogen content ml/100g depo				
		N=1	N=2	N=3	N=4	Ave.
0.045 (1.1)	100%CO ₂	4.5	4.2	4.1	4.5	4.3
	75%Ar-25%CO ₂	4.8	5.0	4.8	4.9	4.9
1/16 (1.6)	100%CO ₂	6.5	5.9	5.1	5.5	5.8
	75%Ar-25%CO ₂	6.8	6.5	6.3	6.6	6.6

*1 Welding position: Flat. Welding condition: 250A (0.045in), 380A (1/16in). Wire-stick out: 3/4in. (20mm)

5. Fume generation rate (0.045in. 1/16in.)

The fume generation rate with both gases was investigated according to the condition shown in Table9.

Table9 Typical fume generation rate (mg/min) ^{*1}

Diameter inch (mm)	Shielding gas	Welding current (A)				
		180	220	260	300	340
0.045 (1.1)	100%CO ₂	377	499	617	706	-
	75%Ar-25%CO ₂	266	399	446	439	-
1/16 (1.6)	100%CO ₂	-	419	570	688	793
	75%Ar-25%CO ₂	-	391	462	519	595

*1 Welding position: Flat. Wire-stick out: 1in.(25mm).

6. Usage

Table10 Welding position and proper range of welding current (A)

Diameter in. (mm)	0.045 (1.1)	0.052 (1.3)	1/16 (1.6)
Welding position			
Flat	120 - 300	150 - 400	180 - 450
Vertical upward	120 - 260	150 - 270	180 - 280
Vertical downward	200 - 300	220 - 300	250 - 300
Horizontal	120 - 300	150 - 350	200 - 400
Overhead	120 - 260	150 - 270	180 - 280
Horizontal fillet	120 - 300	150 - 350	200-400

7. Recommended welding conditions

Table Welding position and proper range of welding current

Diameter in. (mm)	Wire Feeding Speed in/min	Current A (DC-EP)	Voltage V	Deposition Rate lbs/hr	Wire Stick Out in.
0.045 (1.1)	190	140	22-24	4.5	5/8-3/4
	240	180	24-27	6.0	
	340	220	27-30	8.5	
	450	260	28-32	11.0	
	580	300	30-34	14.0	
0.052 (1.3)	165	160	24-26	5.0	3/4-1
	250	220	25-28	7.5	
	390	280	27-31	10.5	
	545	340	29-33	13.5	
	730	400	32-36	18.0	
1/16 (1.6)	145	200	25-27	6.0	3/4-1
	200	260	27-30	8.0	
	295	320	30-34	11.5	
	380	380	32-36	14.0	
	500	440	33-37	18.5	

*1 Voltage shown is for 100%CO₂ shielding gas. For 80-75%Ar-Bal.CO₂use approximately 2 volts less than shown here.