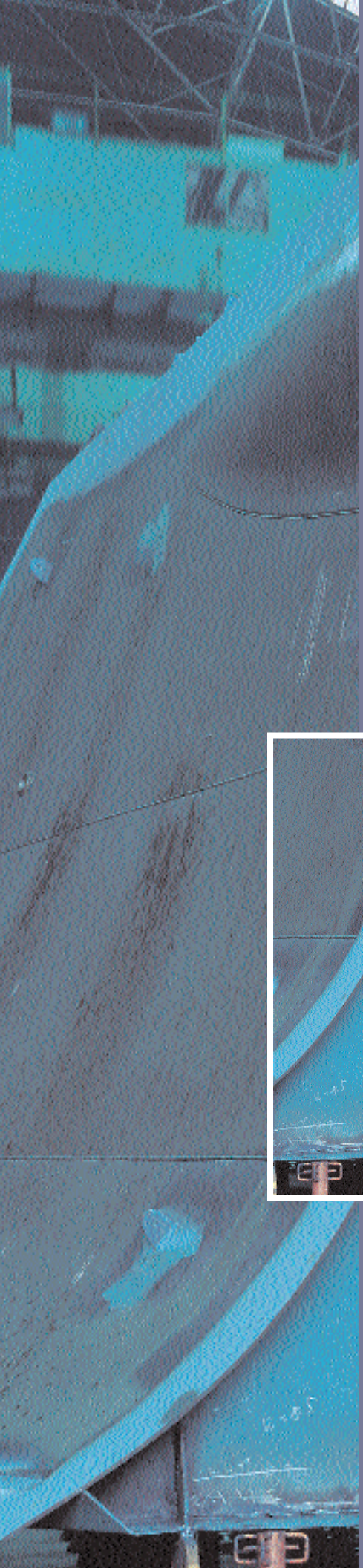
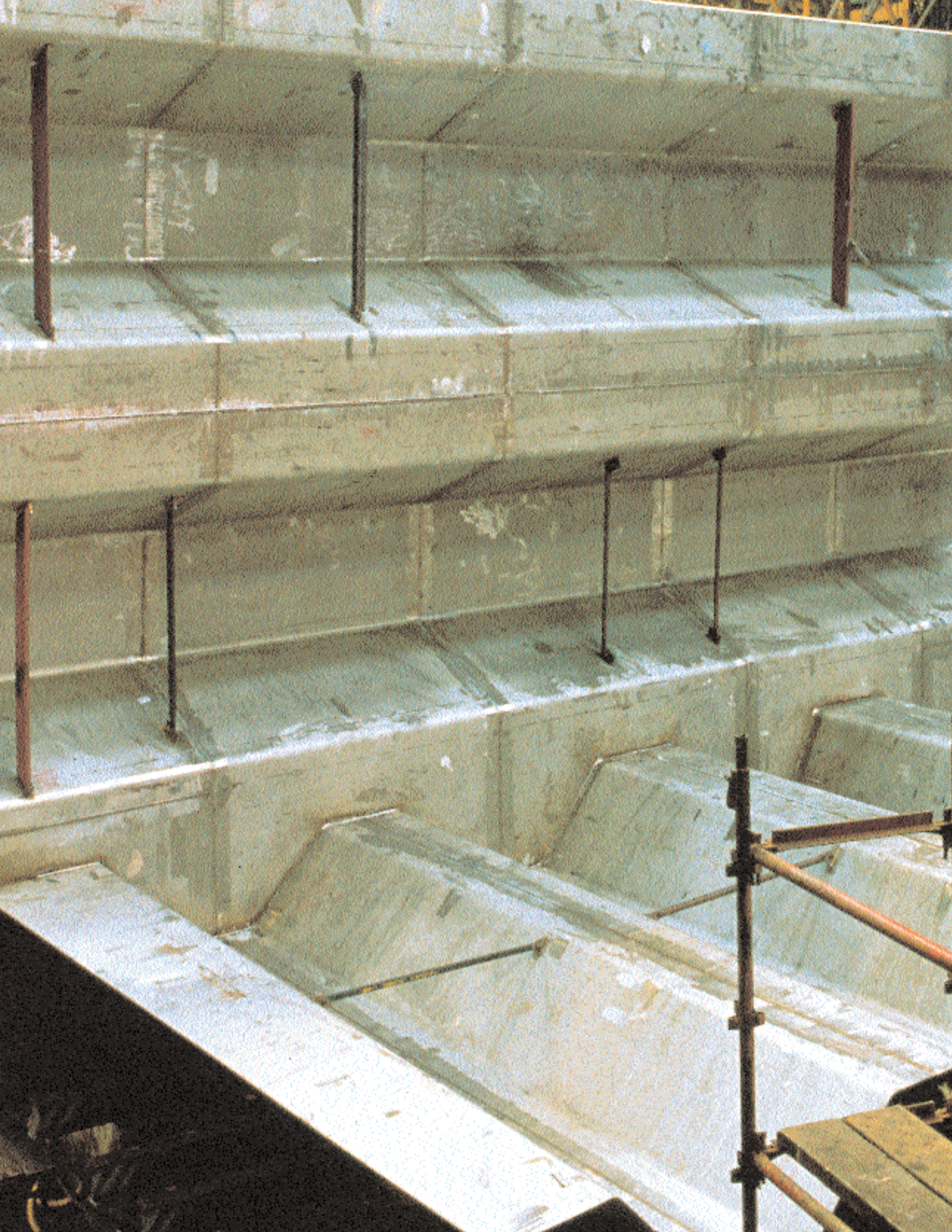


Kobelco Flux Cored Wires

for easy and high efficiency welding in every field

KOBELCO WELDING OF AMERICA INC.

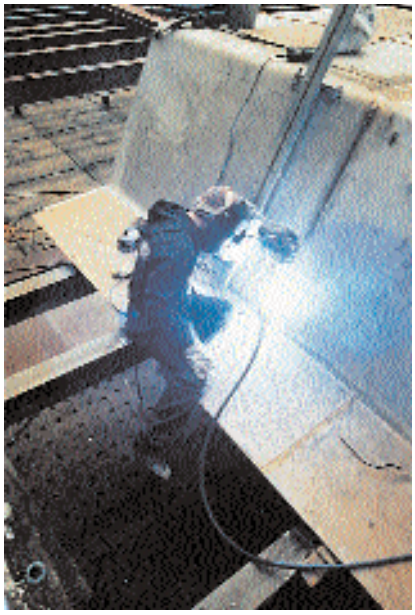


Kobelco Welding of America

Kobelco Welding of America, Inc., (KWAI) was established in Houston, Texas in 1990, as a wholesale company owned by Kobe Steel USA Holdings for marketing Kobelco welding consumables in North America and Latin America.

Since KWAI launched its business, it has worked closely with all its customers through quality services both in sales activities and technical support. Because of its outstanding business attitude, KWAI has earned rapid growth led by its excellent reputation and the distributor's sales network expansion nationwide. Today, more than 300 distributors are stocking Kobelco welding wires, mostly flux-cored wires, supplied from KWAI. In particular, KWAI's stainless steel flux-cored wires have earned the largest market share, 40%, in the North American market.

KWAI will pursue customer satisfaction, through the activities based on the business slogan QTQ (Quality products, Technical support and Quick delivery), targeting a higher market share. KWAI expanded its sales network by opening the Cincinnati Distribution Center (1993), the Salt Lake City Distribution Center (1996) and the Chicago Sales Office (1999).



High efficiency and low costs

Welding efficiency consists of both deposition rate and deposition efficiency. The deposition rate is the amount of weld metal which is deposited on the base metal in a certain time. Higher deposition rates enable faster welding and thus realizes a reduction of the unit labor cost. A flux cored wire (FCW) has a far higher deposition rate than a covered electrode (CE) or a solid wire (SW) as can be seen in Figures 1 and 2.

Deposition efficiency is the ratio of deposited metal

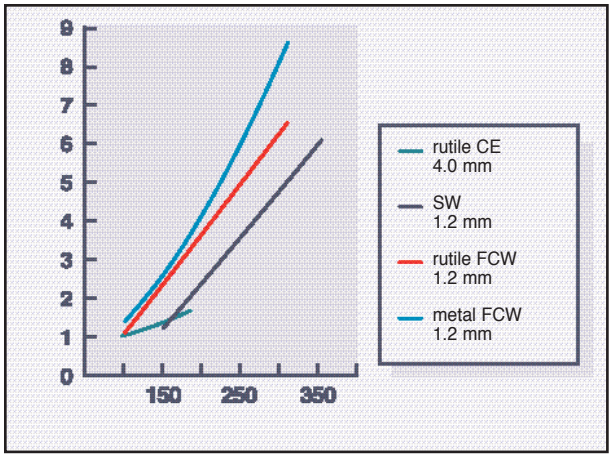


Fig. 1 Deposition rates (kg/h) for different mildsteel consumables at different currents (A)

to the net weight of filler metal consumed. This results in advantages of the welding process, also the reduction of the amount of wire necessary for welding and the reduction of cleaning work is very beneficial. This proves the economical advantages of Kobelco FCW. In Figure 3 a comparison of welding costs between a flux cored wire (FCW), solid wire (SW) and a covered electrode (CE) are indicated.

When compared to using covered electrodes or standard MIG/MAG solid wires, Kobelco rutile flux cored wires are remarkably much faster, this point being most noticeable in the application for vertical up and overhead welding. This is mainly due to the fact

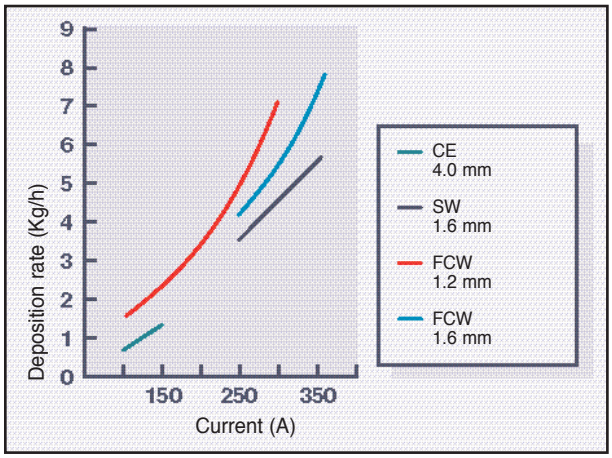


Fig. 2 Deposition rates (kg/h) for different stainless steel consumables at different currents (A)

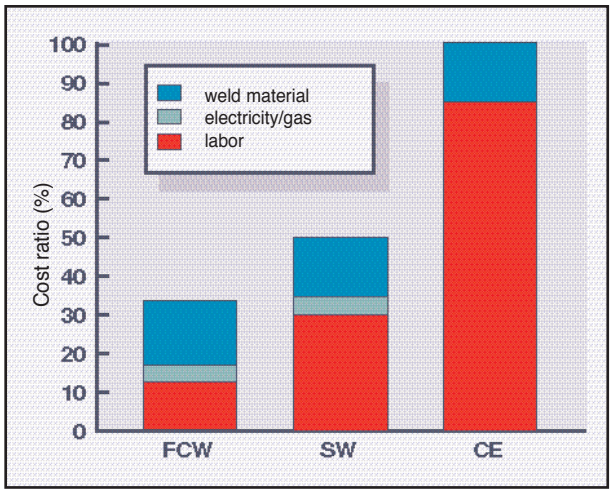


Fig. 3 Welding cost ratios of different types of consumables welding in vertical up position

that spray arc occurs at around 150 Amperes for 1.2mm diameter rutile flux cored wires and higher amperage can be applied in all positions.

As with all Kobelco flux cored wires higher current density (A/mm^2) can be utilized, which gives higher deposition rates, something which cannot be achieved by using solid wires.

Welding with Kobelco Flux Cored Wires

To obtain high quality welded structures conforming to specifications and the purpose of design, welding work must be carried out in accordance with safe procedures for manufacturing. Before the actual welding starts, the applied shielding gas, parameters and welding method must be determined. Also the welding environment sometimes requires preventative measures.

Shielding gases

The shielding gas is necessary for protecting the molten pool from the adverse effects of nitrogen and oxygen from the surrounding air. The proper gas composition is important for the bead appearance, weldability and the mechanical properties of the weld metal.

Welding parameters

The adjustment of the appropriate welding current and voltage is very important. Welding current and voltage influence the arc stability, bead appearance, undercut, penetration, spatter, etc. A proper welding current depends on type and size of wire and welding position.

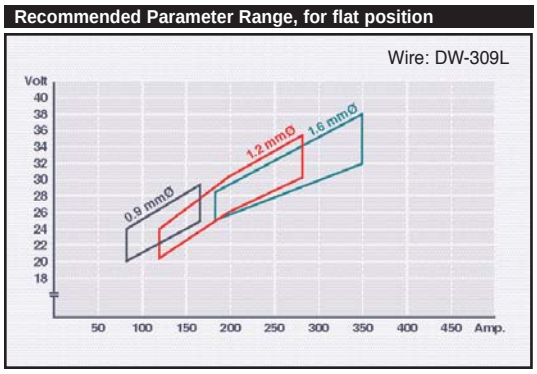


Fig. 4 Applicable range for welding parameters for different diameters

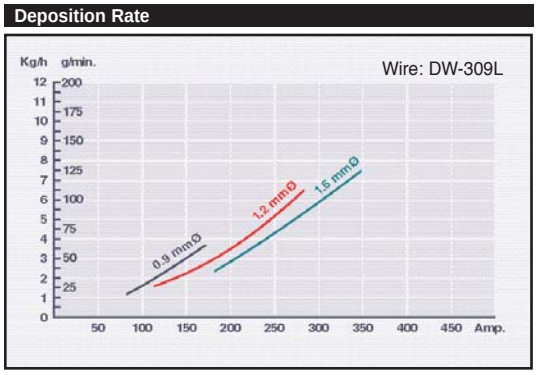


Fig. 5 Deposition rates for different diameters and current

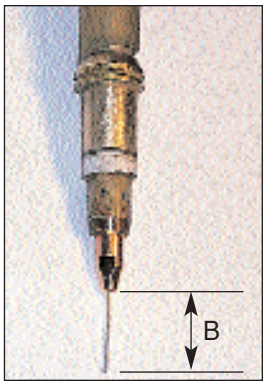


Fig. 6 Wire stick-out B

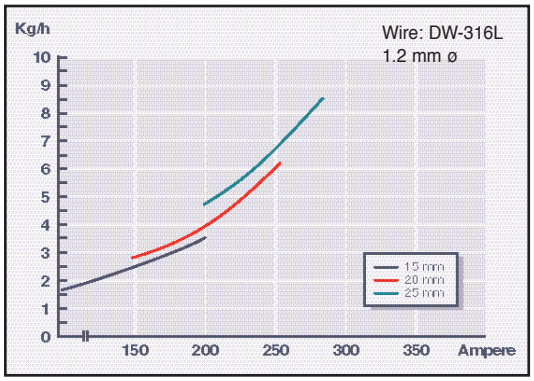


Fig. 7 The effect of wire stick-out on deposition rate

Figure 4 shows applicable range for welding parameters. As can be seen in Figure 5, deposition rate is influenced by parameters. During welding the arc voltage must be kept constant. Increased arc voltage can affect the weld soundness. Suitable voltage depends on the type of wire being used.

Wire stick-out and deposition rate

As can be seen in Figure 6, the stick-out (B) is the distance between the contact tip and the base material.

The changing of wire stick-out due to lifting the torch, influences arc stability, penetration, bead appearance and deposition rate.

Deposition rate can be increased by welding with a longer wire stick-out. This is achieved by utilizing the effect of current density (A/mm^2) and resistance heating in the wire. The wall thickness of Kobelco FCW is quite thin, thus its cross sectional area is small, resulting in a high current density in the wire. It is this higher current density which results in a faster melting rate for the wire, resulting in a higher deposition rate. Figure 7 clearly shows this effect of stick-out and deposition rate.

Preheat and interpass temperature

In order to prevent problems, preheating and interpass temperature may have to be controlled. The degree of control will depend on the type of FCW, the type and thickness of base material and the ambient temperature.

Heat input

In order to reach desired impact value levels, the heat input may have to be controlled depending on the type of FCW and the type and thickness of the base material.

Welding speed

Welding speed governs weld penetration, weld bead appearance, sensitivity to porosity and the leg length and throat thickness of the bead.

Welding technique and torch angle

Gas shielded arc welding allows for both forehand and backhand welding. For welding mild steel FCW, forehand welding is mostly preferred during horizontal fillet welding and cap pass welding. Although it offers shallower penetration it achieves flatter weld bead surfaces. Backhand welding is better for welding inside a groove. Beads are more convex but this technique has the benefit of deeper penetration.

For welding stainless FCW, backhand welding brings the best results, with good penetration and a flat bead. As the torch angle becomes too big, forehand welding with stainless FCW is not preferred as it tends to generate spatter.

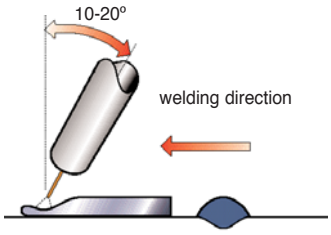


Fig. 8 Forehand welding mild steel FCW

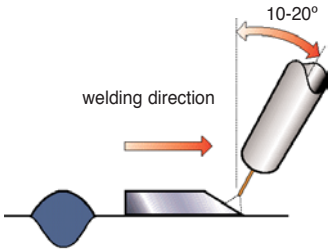
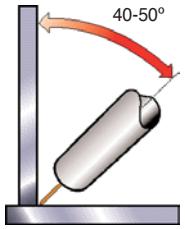
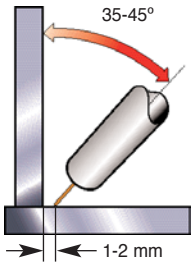


Fig. 9 Backhand welding mild steel FCW

Figures 10-12 show correct torch angles for horizontal fillets with the torch perpendicular to the welding direction. The torch angle is dependent on the kind of pass sequence to be applied. More passes will result in larger throat thickness and leg lengths. The leg length may be controlled by the welding speed or the amperes, voltage and stick-out being applied.

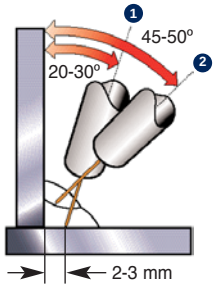


Leg length < 5 mm



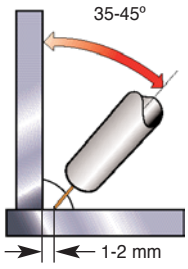
Leg length > 5 mm

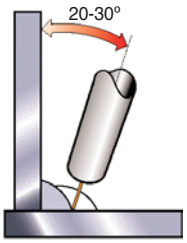
Fig. 10 A single pass fillet weld



2-pass welding with a leg length 8-12 mm

Fig. 11 A two pass fillet weld





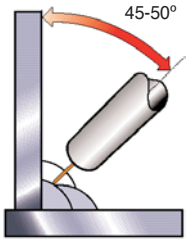
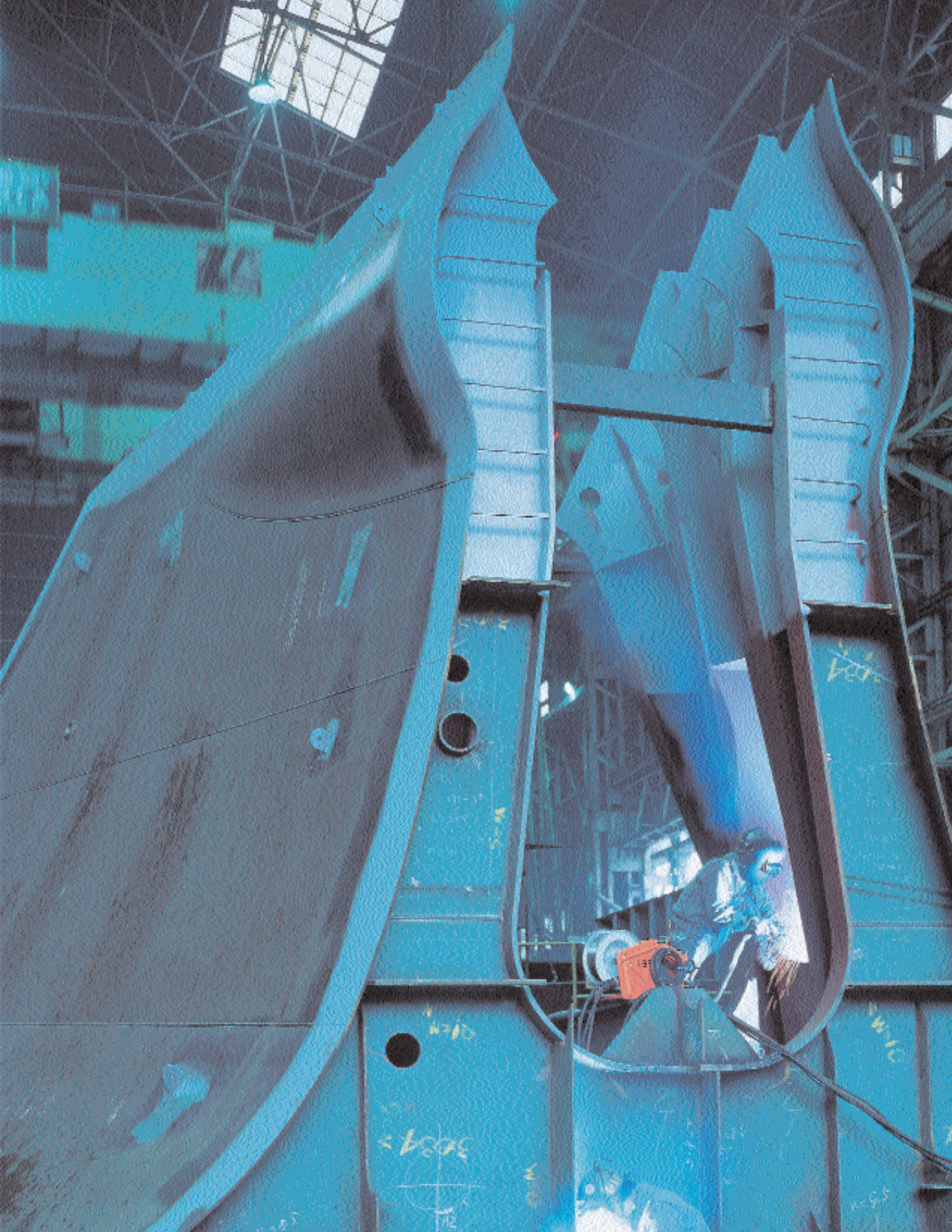


Fig. 12 Multi pass welding of a leg length of 12 mm or more

Protection in welding

When welding, welders should wear suitable protective clothing and eye protection. Ventilation and/or fume extraction must be sufficient so as to keep fume concentrations within safe limits.



Kobelco Flux Cored Wire

DW Stainless Series

Welding materials compared with	Merits of DW Stainless Series wire
Covered electrode (SMAW)	• High efficiency • Less spattering • Good bead appearance • Good slag removability
TIG Rod (GTAW)	• High efficiency
MIG wire (GMAW)	• Less voltage sensitive • Good bead appearance • Less spattering • Easy to make multi-pass • Higher deposition rate welding (no oxidized surface) • CO_2 gas (lower gas cost)

Wire Size (in)	Approx. Wire Feed Speed (in/min)	Current DC-EP* (Amp)	Arc Voltage** (Volt)	Deposition Rate (Lbs/Hr)
0.035	180	80	23-25	2.2
	205	90	23-25	2.5
	250	100	24-26	3.0
	280	110	25-27	3.3
	330	120	25-28	3.9
	375	130	27-29	4.5
	460	140	28-30	5.5
	550	150	29-31	6.6
0.045	210	140	24-26	5.0
	275	160	25-27	6.0
	330	180	26-28	6.7
	380	200	27-29	8.0
	440	220	28-30	9.3
	545	240	28-31	10.6
	615	260	30-33	12.0
	680	280	31-22	13.5
	780	300	31-33	15.0
1/16	155	200	28-30	6.5
	195	220	29-31	8.0
	230	240	29-31	8.5
	260	260	31-33	9.3
	290	280	31-33	11.0
	330	300	31-34	12.0
	360	320	32-35	13.5
	420	350	33-35	16.0

Tables shown are approximate values that will vary with welding conditions. Blue shaded areas represent optimum welding conditions.
*DC: Electrode Positive **Arc voltage is measured at the wire feeder.

Voltages shown are for 100% CO_2 shielding gas.
For 75% Ar + 25% CO_2 use two (2) volts less than shown.
The use of gas blends with more than 75-80% Argon is not recommended.

Wire Size (In)	Wire Extension from contact tip to work (In)	Cup Size (In)	Shielding Gas flow rate* (Cubic Ft/Hr)
0.035	1/2	1/2-5/8	35-45
0.045	5/8-3/4	5/8	40-50
1/16	3/4-1	5/8-3/4	40-50

*Gas flow is measured at gas cup (orifice) with wire in position.

DW-308L

AWS A5.22-95 E308LT0-1/4
Diameters: 0.035″*, 0.045″, 1/16″
Spool Size: 28 Lb, 0.035″ also on 11 Lb
Shielding Gas: 100% CO_2 or 75%Ar / 25%CO_2
Welding Positions: Flat and Horizontal
Chemical Analysis:

C	Mn	Si	Cr	Ni
0.028	1.45	0.54	19.39	9.91

Tensile Strength: 78,898 psi
Yield Strength: 61,132 psi
Elongation: 42%

* Can be used out of position

DW-308LP

AWS A5.22-95 E308LT1-1/4
Diameters: 0.045″
Spool Size: 28 Lb
Shielding Gas: 100% CO_2 or 75%Ar / 25%CO_2
Welding Positions: All Position
Chemical Analysis:

C	Mn	Si	Cr	Ni
0.021	1.40	0.53	19.12	10.07

Tensile Strength: 77,883 psi
Yield Strength: 59,062 psi
Elongation: 42%

DW-308

AWS A5.22-95 E308T0-1/4
Diameters: 0.045″
Spool Size: 28 Lb
Shielding Gas: 100% CO_2 or 75%Ar / 25%CO_2
Welding Positions: Flat and Horizontal
Chemical Analysis:

C	Mn	Si	Cr	Ni
0.042	1.44	0.52	19.79	9.56

Tensile Strength: 86,729 psi
Yield Strength: 56,806 psi
Elongation: 40%

DW-308P

AWS A5.22-95 E308T1-1/4
Diameters: 0.045″
Spool Size: 28 Lb
Shielding Gas: 100% CO_2 or 75%Ar / 25%CO_2
Welding Positions: All Position
Chemical Analysis:

C	Mn	Si	Cr	Ni
0.055	1.25	0.57	19.38	9.53

Tensile Strength: 83,400 psi
Yield Strength: 54,600 psi
Elongation: 42%

DW-308H

AWS A5.22-95 E308HT1-1/4
Diameters: 0.045″
Spool Size: 28 Lb
Shielding Gas: 100% CO_2 or 75%Ar / 25%CO_2
Welding Positions: All Position
Chemical Analysis:

C	Mn	Si	Cr	Ni
0.063	1.27	0.26	18.55	9.59

Tensile Strength: 82,008 psi
Yield Strength: 56,626 psi
Elongation: 45%
*For use in high temperature service

DW-309L

AWS A5.22-95 E309LT0-1/4
Diameters: 0.035″*, 0.045″, 1/16″
Spool Size: 28 Lb, 0.035″ on 11 Lb, 1/16″ also on 44 Lb
Shielding Gas: 100% CO_2 or 75%Ar / 25%CO_2
Welding Positions: Flat and Horizontal
Chemical Analysis:

C	Mn	Si	Cr	Ni
0.027	1.23	0.51	23.95	12.66

Tensile Strength: 81,218 psi
Yield Strength: 60,907 psi
Elongation: 34%

* Can be used out of position

DW-309LP

AWS A5.22-95 E309LT1-1/4
Diameters: 0.045″
Spool Size: 28 Lb
Shielding Gas: 100% CO_2 or 75%Ar / 25%CO_2
Welding Positions: All Position
Chemical Analysis:

C	Mn	Si	Cr	Ni
0.021	1.20	0.42	23.24	12.59

Tensile Strength: 79,188 psi
Yield Strength: 59,056 psi
Elongation: 42%

DW-309LMo

AWS A5.22-95 E309LMoT0-1/4
Diameters: 0.045″, 1/16″
Spool Size: 28 Lb
Shielding Gas: 100% CO_2 or 75%Ar / 25%CO_2
Welding Positions: Flat and Horizontal
Chemical Analysis:

C	Mn	Si	Cr	Ni	Mo
0.026	1.16	0.61	23.21	12.67	2.26

Tensile Strength: 105,800 psi
Yield Strength: 71,280 psi
Elongation: 33%

DW-310

Does not conform to AWS

Diameters: 0.045″
Spool Size: 28 Lb
Shielding Gas: 100% CO_2 or 75%Ar / 25%CO_2
Welding Positions: Flat and Horizontal
Chemical Analysis:

C	Mn	Si	Cr	Ni
0.190	4.76	0.64	27.37	20.55

Tensile Strength: 92,386 psi
Yield Strength: 62,970 psi
Elongation: 34%

DW-312

AWS A5.22-95 E312T0-1/4
Diameters: 0.045″
Spool Size: 28 Lb
Shielding Gas: 100% CO_2 or 75%Ar / 25%CO_2
Welding Positions: Flat and Horizontal
Chemical Analysis:

C	Mn	Si	Cr	Ni
0.110	1.15	0.56	28.25	10.10

Tensile Strength: 113,300 psi
Yield Strength: 79,143 psi
Elongation: 24%

DW-316L

AWS A5.22-95 E316LT0-1/4
Diameters: 0.035″*, 0.045″, 1/16″
Spool Size: 28 Lb
Shielding Gas: 100% CO_2 or 75%Ar / 25%CO_2
Welding Positions: Flat and Horizontal
Chemical Analysis:

C	Mn	Si	Cr	Ni	Mo
0.027	1.35	0.49	18.94	12.02	2.21

Tensile Strength: 81,800 psi
Yield Strength: 57,521 psi
Elongation: 37%
* Can be used out of position

DW-316LP

AWS A5.22-95 E316LT1-1/4
Diameters: 0.045″
Spool Size: 28 Lb
Shielding Gas: 100% CO_2 or 75%Ar / 25%CO_2
Welding Positions: All Position
Chemical Analysis:

C	Mn	Si	Cr	Ni
0.021	1.20	0.42	18.75	12.59

Tensile Strength: 81,508 psi
Yield Strength: 60,172 psi
Elongation: 36%

DW-317L

AWS A5.22-95 E317LT0-1/4
Diameters: 0.045″*, 1/16″
Spool Size: 28 Lb
Shielding Gas: 100% CO_2 or 75%Ar / 25%CO_2
Welding Positions: Flat and Horizontal
Chemical Analysis:

C	Mn	Si	Cr	Ni	Mo
0.024	1.03	0.43	18.95	12.74	3.24

Tensile Strength: 88,615 psi
Yield Strength: 59,706 psi
Elongation: 36%
* Can be used out of position

DW-347

AWS A5.22-95 E347T0-1/4
Diameters: 0.045″, 1/16″
Spool Size: 28 Lb
Shielding Gas: 100% CO_2 or 75%Ar / 25%CO_2
Welding Positions: Flat and Horizontal
Chemical Analysis:

C	Mn	Si	Cr	Ni
0.050	1.64	0.39	19.16	9.68

Tensile Strength: 81,400 psi
Yield Strength: 62,269 psi
Elongation: 37%

DW-329AP

AWS A5.22-95 E2209T1-1/4
Diameters: 0.045″
Spool Size: 28 Lb
Shielding Gas: 100% CO_2 or 75%Ar / 25%CO_2
Welding Positions: All Position
Chemical Analysis:

C	Mn	Si	Cr	Ni	Mo	N
0.023	0.76	0.68	23.32	9.43	3.35	0.14

Tensile Strength: 118,201 psi
Yield Strength: 90,500 psi
Elongation: 29%º

DW-2209

AWS A5.22-95 E2209T1-1/4
Diameters: 0.045″, 1/16″
Spool Size: 28 Lb
Shielding Gas: 100% CO_2 or 75%Ar / 25%CO_2
Welding Positions: All Position
Chemical Analysis:

C	Mn	Si	Cr	Ni	Mo	N
0.026	0.78	0.60	23.48	8.89	3.35	0.16

Tensile Strength: 112,000 psi
Yield Strength: 93,100 psi
Elongation: 28%

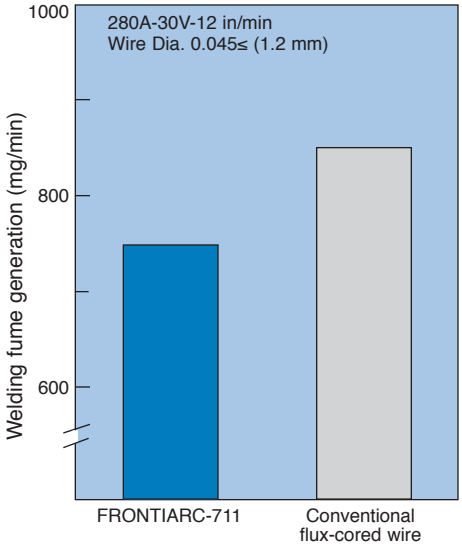
Carbon Steel Flux Cored Wire

Recommended Procedure Ranges

Wire Size (in)	Wire Extension from contact tip (in)	Cup Size (in)	Shielding Gas Flow Rate* (cubic ft/hr)
0.045	5/8–3/4	5/8	40–50
0.052	3/4–1	5/8**	40–50
1/16	3/4–1	5/8–3/4**	40–50

* Gas flow is measured at gas cup (Orifice) with wire in position.
** When utilizing amperage above 300 use 3/4 in. diam. or larger cup size.

Welding Fume Generation Rate



Recommended Welding Conditions and Deposition Rates

Wire Size (in diam)	Wire Feed Speed (in/min)	Current DC-EP* (amp)	Arc Voltage** (volt)	Deposition Rate (lbs/hr)
0.045	180	140	24–27	5.0
	200	160	25–28	6.0
	245	180	26–29	7.0
	290	200	27–30	8.0
	330	220	27–30	9.0
	380	240	28–30	10.0
	440	260	29–31	11.5
	520	280	29–31	13.0
	560	300	29–32	15.0
0.052	130	150	24–27	4.0
	175	180	24–27	5.5
	215	210	25–28	7.0
	265	240	26–28	8.0
	315	270	27–29	10.0
	395	300	29–31	11.0
	460	330	30–32	13.0
	525	360	30–33	15.0
	690	400	31–34	17.5
1/16	120	200	25–28	5.5
	165	240	25–28	7.0
	190	260	26–29	8.0
	215	280	28–30	9.0
	250	300	29–31	10.0
	300	340	30–32	11.5
	380	380	30–33	14.0
	450	420	31–35	16.5
	520	450	32–35	18.5

Tables shown are approximate values that will vary with changes in welding conditions.
*DC–Electrode positive **Arc voltage is measured at the wire feeder. Voltages shown are for 100% CO_2 shielding gas. For 75% Argon + 25% CO_2 use two (2) volts less than shown.

Frontiarc-711

AWS A5.20-95 E71T-1/1M, E71T-12/12M
Diameters: 0.045″, 0.052″, 1/16″
Spool Size: 28 Lb, 44 Lb, 55 Lb and 550 Lb Drum
Shielding Gas: 100% CO_2 or 75%Ar / 25%CO_2
Welding Positions: All Position
Chemical Analysis:

C	Mn	Si	P	S
0.040	1.32	0.56	0.015	0.005

Tensile Strength: 85,600 psi
Yield Strength: 75,800 psi
Elongation: 31%

Frontiarc-701

AWS A5.20-95 E70T-1/12
Diameters: 5/64″
Spool Size: 44 Lb, and 550 Lb Drum
Shielding Gas: 100% CO_2
Welding Positions: Flat and Horizontal
Chemical Analysis:

C	Mn	Si	P	S
0.050	1.32	0.46	0.011	0.006

Tensile Strength: 79,800 psi
Yield Strength: 71,900 psi
Elongation: 30%

DW-50

AWS A5.20-95 E71T-1/1M
Diameters: 0.045″, 0.052″, 1/16″
Spool Size: 44 Lb, 550 Lb Drum
Shielding Gas: 100% CO_2 or 75% Ar / 25% CO_2
Welding Positions: All Position
Chemical Analysis:

C	Mn	Si	P	S
0.050	1.52	0.50	0.013	0.007

Tensile Strength: 89,050 psi
Yield Strength: 81,218 psi
Elongation: 28%

DWA-50

AWS A5.20-95 E71T-1M
Diameters: 0.045″
Spool Size: 44 Lb
Shielding Gas: 75%Ar / 25%CO_2
Welding Positions: All Position
Chemical Analysis:

C	Mn	Si	P	S
0.040	1.15	0.46	0.013	0.009

Tensile Strength: 81,798 psi
Yield Strength: 73,096 psi
Elongation: 29%

DWA-55ESR

AWS A5.20-95 E71T-12MJ
Diameters: 0.045″
Spool Size: 44 Lb
Shielding Gas: 75%Ar / 25%CO_2
Welding Positions: All Position
Chemical Analysis:

C	Mn	Si	P	S
0.050	1.36	0.47	0.013	0.007

Strength: 85,425 psi
Yield Strength: 75,850 psi
Elongation: 29%
Excellent impact strengths even after PWHT.

MX-200

AWS A5.20-95 E70T-1
Diameters: 0.045″
Spool Size: 44 Lb
Shielding Gas: 100%CO_2
Welding Positions: Flat and Horizontal
Chemical Analysis:

C	Mn	Si	P	S
0.060	1.35	0.50	0.013	0.009

Tensile Strength: 83,800 psi
Yield Strength: 76,600 psi
Elongation: 29%
Designed to weld through primer coat.

Low Alloy Steel Flux Cored Wire

DW-81B2

AWS A5.29 E81T1-B2/B2M
Diameters: 0.045″, 1/16″
Spool Size: 28 Lb
Shielding Gas: 100% CO_2 or 75%Ar / 25%CO_2
Welding Positions: All Position
Chemical Analysis:

C	Mn	Si	P	S	Cr	Mo
0.060	0.57	0.62	0.008	0.010	1.27	0.50

Tensile Strength: 96,000 psi
Yield Strength: 84,000 psi
Elongation: 26%

DW-91B3

AWS A5.29 E91T1-B3/B3M
Diameters: 0.045″, 1/16″
Spool Size: 28 Lb
Shielding Gas: 100% CO_2 or 75%Ar / 25%CO_2
Welding Positions: All Position
Chemical Analysis:

C	Mn	Si	P	S	Cr	Mo
0.060	0.60	0.60	0.009	0.012	2.21	0.97

Tensile Strength: 102,000 psi
Yield Strength: 88,000 psi
Elongation: 22%

Carbon Steel Metal Cored Wire

MXA-70C6

AWS A5.18 E70C-6M
Diameters: 0.045″, 0.052″, 1/16″
Spool Size: 44 Lb, 550 Lb Drum
Shielding Gas: 75%Ar / 25%CO_2 or higher Argon gas mixtures
Welding Positions: Flat and Horizontal
Chemical Analysis:

C	Mn	Si	P	S
0.060	1.63	0.79	0.011	0.009

Tensile Strength: 86,900 psi
Yield Strength: 67,000 psi
Elongation: 28%

Carbon Steel Solid Wire

MG-51T

AWS A5.18 ER70S-6
Diameters: 0.035″, 0.045″
Spool Size: 44 Lb, 550 Lb Drum
Shielding Gas: 100% CO_2 or 75%Ar / 25%CO_2
Welding Positions: Flat and Horizontal
Chemical Analysis:

C	Mn	Si	P	S
0.100	1.15	0.53	0.012	0.008

Tensile Strength: 86,000 psi
Yield Strength: 73,000 psi
Elongation: 31%

TGX Series Flux Cored Tig Rod

TGX-308L

AWS A5.22-95 R308LT1-5
Diameters: 0.087″ or 2.2mm
Packaging: 11 Lb
Shielding Gas: 100% Ar
No back purge necessary
Chemical Analysis:

C	Mn	Si	Cr	Ni
0.018	1.66	0.80	19.62	10.31

Tensile Strength: 92,800 psi
Yield Strength: 65,250 psi
Elongation: 47%

TGX-309L

AWS A5.22-95 R309LT1-5
Diameters: 0.087″ or 2.2mm
Packaging: 11 Lb
Shielding Gas: 100% Ar
No back purge necessary
Chemical Analysis:

C	Mn	Si	Cr	Ni
0.017	1.52	0.81	24.26	12.62

Tensile Strength: 98,600 psi
Yield Strength: 76,850 psi
Elongation: 32%

TGX-316L

AWS A5.22-95 R316LT1-5
Diameters: 0.087″ or 2.2mm
Packaging: 11 Lb
Shielding Gas: 100% Ar
No back purge necessary
Chemical Analysis:

C	Mn	Si	Cr	Ni
0.016	1.55	0.87	18.89	12.47

Tensile Strength: 87,000 psi
Yield Strength: 63,800 psi
Elongation: 38%

TGX-347

AWS A5.22-95 R347T1-5
Diameters: 0.087″ or 2.2mm
Packaging: 11 Lb
Shielding Gas: 100% Ar
No back purge necessary
Chemical Analysis:

C	Mn	Si	Cr	Ni
0.020	1.60	0.80	19.09	10.21

Tensile Strength: 91,350 psi
Yield Strength: 66,770 psi
Elongation: 48%

Technical Data

Product Name	C	Si	Mn	P	S	Ni	Cr	Mo	N
DW-308L	0.028	0.54	1.45	0.017	0.010	9.91	19.39	–	–
DW-308LP	0.021	0.53	1.40	0.018	0.011	10.07	19.12	0.02	–
DW-308	0.042	0.52	1.44	0.018	0.011	9.56	19.79	–	–
DW-308P	0.055	0.57	1.25	0.021	0.008	9.53	19.38	–	0.015
DW-308H	0.063	0.26	1.27	0.022	0.011	9.59	18.55	0.03	–
DW-309L	0.027	0.51	1.23	0.016	0.011	12.66	23.95	0.01	–
DW-309LP	0.021	0.42	1.20	0.017	0.005	12.59	23.24	0.03	–
DW-309LMo	0.026	0.61	1.16	0.021	0.012	12.67	23.21	2.26	–
DW-310	0.190	0.64	4.76	0.028	0.002	20.55	27.37	0.09	–
DW-312	0.110	0.56	1.15	0.021	0.014	10.10	28.25	0.03	–
DW-316L	0.027	0.49	1.35	0.023	0.013	12.02	18.94	2.21	–
DW-316LP	0.021	0.59	1.38	0.021	0.005	12.32	18.55	2.64	–
DW-317L	0.024	0.43	1.03	0.016	0.012	12.74	18.95	3.24	–
DW-347	0.050	0.39	1.64	0.021	0.010	9.68	19.16	0.02	–
DW-2209	0.026	0.60	0.78	0.019	0.007	8.89	23.48	3.35	0.16
DW-329AP	0.023	0.68	0.76	0.018	0.004	9.43	23.32	3.35	0.14
Frontiarc-711	0.040	0.56	1.32	0.015	0.005	–	–	–	–
DWA-50	0.040	0.46	1.15	0.013	0.009	–	–	–	–
DW-50	0.050	0.50	1.52	0.013	0.007	–	–	–	–
DWA-55ESR	0.050	0.47	1.36	0.013	0.007	–	–	–	–
Frontiarc-701	0.050	0.46	1.32	0.011	0.006	–	–	–	–
DW-81B2	0.060	0.62	0.57	0.008	0.010	–	1.27	0.50	–
DW-91B3	0.060	0.60	0.60	0.009	0.012	–	2.21	0.97	–
MXA-70C6	0.060	0.79	1.63	0.011	0.009	–	–	–	–
MX-200	0.060	0.50	1.35	0.013	0.009	–	–	–	–
MG-51T	0.100	0.53	1.15	0.012	0.008	–	–	–	–
TGX-308L	0.018	0.80	1.66	0.023	0.005	10.31	19.62	–	–
TGX-309L	0.017	0.81	1.52	0.022	0.006	12.62	24.26	–	–
TGX-316L	0.016	0.87	1.55	0.023	0.004	12.47	18.89	2.32	–
TGX-347	0.020	0.80	1.60	0.021	0.004	10.21	19.09	–	–

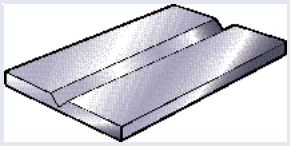
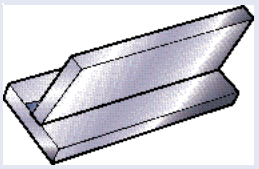
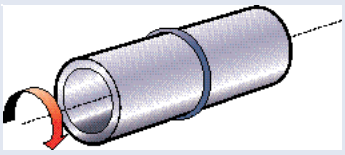
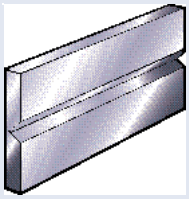
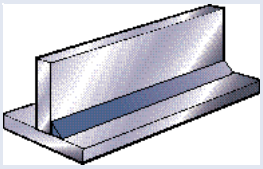
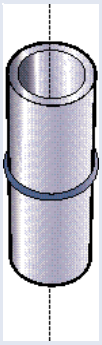
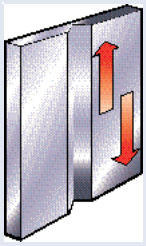
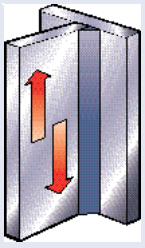
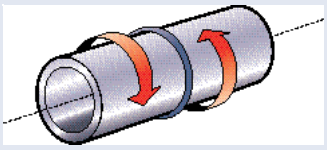
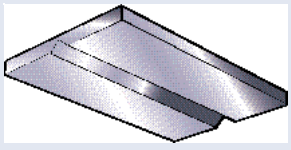
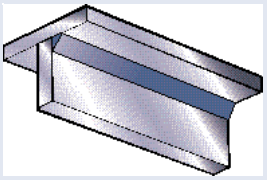
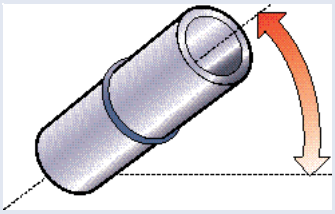
Product Name	Tensile Strength (PSI)	Yield Strength (PSI)	EL %	I.V. (Ft/Lb)	Temp (°F)	Shaeffler Diagram (%)	WRC Diagram (FN)	Shield Gas
DW-308L	78,898	61,132	42	38	32	7.8	9.2	CO_2 or Ar/CO_2
DW-308LP	77,883	59,062	42	40	32	7.6	9.2	CO_2 or Ar/CO_2
DW-308	86,729	56,806	40	36	32	7.9	9.5	CO_2 or Ar/CO_2
DW-308P	83,400	54,600	42	–	–	7.3	7.8	CO_2 or Ar/CO_2
DW-308H	82,008	56,626	45	50	32	2.2	3.1	CO_2 or Ar/CO_2
DW-309L	81,218	60,907	34	26	32	12.6	19.2	CO_2 or Ar/CO_2
DW-309LP	79,188	59,056	42	34	32	11.7	14.7	CO_2 or Ar/CO_2
DW-309LMo	105,800	71,280	33	21	32	12.9	21.5	CO_2 or Ar/CO_2
DW-310	92,386	62,970	34	50	32	–	–	CO_2 or Ar/CO_2
DW-312	113,300	79,143	24	–	–	29.5	51.1	CO_2 or Ar/CO_2
DW-316L	81,800	57,521	37	32	32	5.6	7.1	CO_2 or Ar/CO_2
DW-316LP	81,508	60,172	36	42	32	7.2	7.1	CO_2 or Ar/CO_2
DW-317L	88,615	59,706	36	26	32	8.1	7.4	CO_2 or Ar/CO_2
DW-347	81,400	62,269	37	58	32	6.5	8.5	CO_2 or Ar/CO_2
DW-2209	112,000	93,100	28	27	-20	61	45.6	CO_2 or Ar/CO_2
DW-329AP	118,201	90,500	29	41	-4	57	49.1	CO_2 or Ar/CO_2
Frontiarc-711	85,600	75,800	31	43	-20	–	–	CO_2 or Ar/CO_2
DWA-50	81,798	73,096	29	64	-4	–	–	Ar/CO_2
DW-50	89,050	81,218	28	51	-4	–	–	CO_2 or Ar/CO_2
DWA-55ESR	85,425	75,850	29	104	-40	–	–	Ar/CO_2
Frontiarc-701	79,800	71,900	30	73	-20	–	–	CO_2
DW-81B2	96,000	84,000	26	–	–	–	–	CO_2 or Ar/CO_2
DW-91B3	102,000	88,000	22	–	–	–	–	CO_2 or Ar/CO_2
MXA-70C6	86,900	67,000	28	47	-20	–	–	Ar/CO_2
MX-200	83,800	76,600	29	45	-4	–	–	CO_2
MG-51T	86,000	73,000	31	63	-20	–	–	CO_2 or Ar/CO_2
TGX-308L	92,800	65,250	47	94	32	–	–	Ar
TGX-309L	98,600	76,850	32	80	32	–	–	Ar
TGX-316L	87,000	63,800	38	–	–	–	–	Ar
TGX-347	91,350	66,700	48	94	32	–	–	Ar

Available Approvals

Product Name	Shielding Gas	AWS	CWB	ABS	LR	DNV	TUV
DW-308L	Ar+CO_2	X	X	–	–	X	X
DW-308L	CO_2	X	X	X	X	X	X
DW-308LP	Ar+CO_2	X	X	–	–	–	–
DW-308LP	CO_2	X	X	–	X	–	–
DW-308	Ar+CO_2	X	X	–	–	–	–
DW-308	CO_2	X	X	–	–	–	–
DW-308P	Ar+CO_2	X	–	–	–	–	–
DW-308P	CO_2	X	–	–	–	–	–
DW-308H	Ar+CO_2	X	X	–	–	–	–
DW-308H	CO_2	X	X	–	–	–	–
DW-309L	Ar+CO_2	X	X	–	X	–	–
DW-309L	CO_2	X	X	X	X	X	–
DW-309LP	Ar+CO_2	X	X	–	X	X	–
DW-309LP	CO_2	X	X	–	X	X	–
DW-309LMo	Ar+CO_2	X	X	–	–	–	–
DW-309LMo	CO_2	X	X	–	–	–	–
DW-310	Ar+CO_2	–	–	–	–	–	–
DW-310	CO_2	–	–	–	–	–	–
DW-312	Ar+CO_2	X	–	–	–	–	–
DW-312	CO_2	X	X	–	–	–	–
DW-316L	Ar+CO_2	X	X	–	X	X	X
DW-316L	CO_2	X	X	X	X	X	X
DW-316LP	Ar+CO_2	X	X	–	X	X	–
DW-316LP	CO_2	X	X	–	–	X	–
DW-317L	Ar+CO_2	X	X	–	–	–	–
DW-317L	CO_2	X	X	–	X	X	–
DW-347	Ar+CO_2	X	X	–	–	–	–
DW-347	CO_2	X	X	–	–	–	–
DW-2209	Ar+CO_2	X	X	–	–	–	–
DW-2209	CO_2	X	X	–	–	–	–
DW-329AP	Ar+CO_2	X	X	–	–	–	–
Frontiarc-711	Ar+CO_2	X	X	X	X	–	–
Frontiarc-711	CO_2	X	X	X	X	–	–
DWA-50	Ar+CO_2	X	–	X	X	X	X
DW-50	Ar+CO_2	X	–	–	X	X	–
DW-50	CO_2	X	–	X	X	X	–
DWA-55ESR	Ar+CO_2	X	–	X	–	–	–
Frontiarc-701	Ar+CO_2	X	–	–	–	–	–
Frontiarc-701	CO_2	X	–	–	–	–	–
DW-81B2	Ar+CO_2	X	X	–	–	–	–
DW-81B2	CO_2	X	X	–	–	–	–
DW-91B3	Ar+CO_2	X	X	–	–	–	–
DW-91B3	CO_2	X	X	–	–	–	–
MXA-70C6	Ar+CO_2	X	–	–	–	–	–
MX-200	CO_2	X	–	X	X	X	–
MG-51T	Ar+CO_2	X	–	–	–	–	–
MG-51T	CO_2	X	–	X	X	X	–
TGX-308L	Ar	X	–	–	–	–	–
TGX-309L	Ar	X	–	–	–	–	–
TGX-316L	Ar	X	–	–	–	–	–
TGX-347	Ar	X	–	–	–	–	–

AWS: American Welding Society
CWB: Canadian Welding Bureau
ABS: American Bureau of Shipping
DNV: Det Norske Veritas
TUV: Technischer Uberwachungs-Verein
LR: Lloyd's Register of Shipping

Welding positions

Butt welds	Fillet welds	Pipe welds
		
AWS: 1G	AWS: 1F	AWS: 1G
		
AWS: 2G	AWS: 2F	AWS: 2G
		
AWS: 3G	AWS: 3F	AWS: 5G
		
AWS: 4G	AWS: 4F	AWS: 6G

KOBELCO WELDING OF AMERICA INC.

7478 Harwin Drive, Houston, Texas 77036 U.S.A.
713/974-5774 Fax: 713/974-6543
www.kobelcowelding.com
E-Mail: kobelco@kobelcowelding.com

Chicago Sales Office: 847-439-8450 Fax: 847-439-8455
Distribution Centers: Houston • Cincinnati • Salt Lake City

KOBELCO WELDING OF AMERICA INC.

7478 Harwin Dr., Houston, Texas 77036
713-974-5774 Fax: 713-974-6543 kobelcowelding.com

Chicago Sales Office: 847-439-8450 Fax: 847-439-8455
Distribution Centers: Houston • Cincinnati • Salt Lake City