ALUMINIUM (ACHF)

METAL GUAGE	JOINT TYPE	TUNGSTEN SIZE	FILLER ROD SIZE	CUP SIZE	SHIELD GAS FLOW			WELDING AMPERES	TRAVEL SPEED
					TYPE	CFH (L/MN)	PSI		
1/16 (1.6 mm)	BUTT	1/16 (1.6 mm)	1/16 (1.6 mm)	4, 5, 6	ARGON	15 (7)	20	60-80	12 (307.2 mm)
	FILLET							70-90	10 (256 mm)
1/8 (3.2 mm)	BUTT	3/32 (2.4 mm)	3/32 (2.4 mm)-1/8 (3.2 mm)	6, 7	ARGON	17 (8)	20	125-145	12 (307.2 mm)
	FILLET		3/32 (2.4 mm)-1/16 (1.6 mm)					140-160	10 (256 mm)
3/16 (4.8 mm)	BUTT	1/8 (3.2 mm)	1/8 (3.2 mm)	7, 8	ARGON/ HELIUM	21 (10)	20	190-220	11 (258.6 mm)
	FILLET							210-240	9 (230.4 mm)
1/4 (6.4 mm)	BUTT	3/16 (4.8 mm)	1/8 (3.2 mm)	8, 10	ARGON/ HELIUM	25 (12)	20	260-300	10 (256 mm)
	FILLET							280-320	8 (204.8 mm)

WELDING ALUMINUM

The use of TIG welding for aluminum has many advantages for both manual and automatic processes. Filler metal can be either wire or rod and should be compatible with the base alloy. Filler metal must be dry, free of oxides, grease, or other foreign matter. If filler metal becomes damp, heat for 2 hours at 250°F before using. Although ACHF is recommended, DCRP has been successful up to 3/32", DCSP with helium shield gas is successful in mechanized applications.

MAGNESIUM (ACHF)

METAL GUAGE	JOINT TYPE	TUNGSTEN SIZE	FILLER ROD SIZE	CUP SIZE	SHIELD GAS FLOW			WELDING AMPERES	TRAVEL SPEED
					TYPE	CFH (L/MN)	PSI		
1/16 (1.6 mm)	BUTT	1/16 (1.6 mm)	3/32 (2.4 mm)-1/8 (3.2 mm)	5, 6	ARGON	13 (5)	15	60	20 (512 mm)
	FILLET							60	
1/8 (3.2 mm)	BUTT	3/32 (2.4 mm)	1/8 (3.2 mm)-5/32 (4.0 mm)	7, 8	ARGON	19 (9)	15	115	17 (435.2 mm)
	FILLET							115	
1/4 (6.4 mm)	BUTT	3/16 (4.8 mm)	5/32 (4.0 mm)	8	ARGON	25 (12)	15	100-130	22 (563.2 mm)
	BUTT (2)							110-135	20 (512 mm)
1/2 (12.8 mm)	BUTT (2)	1/4 (6.4 mm)	3/16 (4.8 mm)	10	ARGON	35 (17)	15	260	10 (256 mm)

WELDING MAGNESIUM

Magnesium alloys are in three groups, they are: (1) aluminum-zinc-magnesium, (2) aluminum-magnesium, and (3) maganese-magnesium. Since magnesium absorbs a number of harmful ingredients and oxiodize rapidly when subjected to welding heat, TIG welding in an inert gas atmosphere is distinctly advantageous, the welding of magnesium is similar, in many respects, to the welding of aluminum. Magnesium was one of the first metals to be welded commercially by TIG. Magnesium requires a positive pressure of argon as a backup on the root side of the weld.

DEOXIDIZED COPPER (DCSP)

METAL GUAGE	JOINT TYPE	TUNGSTEN SIZE	FILLER ROD SIZE	CUP SIZE	SHIELD GAS FLOW			WELDING AMPERES	TRAVEL SPEED
					TYPE	CFH (L/MN)	PSI		
1/16 (1.6 mm)	BUTT	1/16 (1.6 mm)	1/16 (1.6 mm)	4, 5, 6	ARGON	18 (9)	15	110-140	12 (307.2 mm)
	FILLET							130-150	10 (256 mm)
1/8 (3.2 mm)	BUTT	3/32 (2.4 mm)	3/32 (2.4 mm)	4, 5, 6	ARGON	18 (9)	15	175-225	11 (258.6 mm)
	FILLET							200-250	9 (230.4 mm)
3/16 (4.8 mm)	BUTT	1/8 (3.2 mm)	1/8 (3.2 mm)	8, 10	HELIUM	36 (17.5)	15	190-225	10 (256 mm)
	FILLET							205-250	8 (204.8 mm)
1/4 (6.4 mm)	BUTT (2)	3/16 (4.8 mm)	1/8 (3.2 mm)	8, 10	HELIUM	36 (17.5)	15	225-260	9 (230.4 mm)
	FILLET							250-280	7 (179.2 mm)

WELDING DEOXIDIZED COPPER

Where extensive welding is to be done, the use of deoxidized (oxygen-free) copper is preferable over electrolytic tough pitch copper, although TIG welding has been used occasionally to weld zinc-bearing copper alloys, such as brass and commercial bronzes, it is not recommended because the shielding gas does not suppress the vaporization of zinc. For the same reason zinc bearing filler rods should not be used. There is some preference of helium for the inert atmosphere in welding thickness above 1/8" because of the improved weld metal fluidity. Preheating recommendations should be followed.

TITANIUM (DCSP)

METAL GUAGE	JOINT TYPE	TUNGSTEN SIZE	FILLER ROD SIZE	CUP SIZE	SHIELD GAS FLOW			WELDING AMPERES	TRAVEL SPEED
					TYPE	CFH (L/MN)	PSI		
1/16 (1.6 mm)	BUTT	1/16 (1.6 mm)	NONE	4, 5, 6	ARGON	15 (7)	20	90-110	10 (256 mm)
	FILLET							110-150	8 (204.8 mm)
1/8 (3.2 mm)	BUTT	3/32 (2.4 mm)	1/16 (1.6 mm)	5, 6, 7	ARGON	15 (7)	20	190-220	9 (230.4 mm)
	FILLET							210-250	7 (179.2 mm)
3/16 (4.8 mm)	BUTT	3/32 (2.4 mm)	1/8 (3.2 mm)	6, 7, 8	ARGON	20 (10)	20	220-250	8 (204.8 mm)
	FILLET							240-280	7 (179.2 mm)
1/4 (6.4 mm)	BUTT (2)	1/8 (3.2 mm)	1/8 (3.2 mm)	8, 10	ARGON	30 (15)	20	275-310	8 (204.8 mm)
	FILLET (2)							290-340	7 (179.2 mm)

WELDING TITANIUM

Small amounts of impurities, particularity oxygen and nitrogen, cause embrittlement of molten or hot titanium. The molten weld metal in the heat-affected zones must be shielded by a protective blanket of inert gases. Titanium requires a strong, positive pressure of argon or helium as a backup on the root side of the weld, as well as long, trailing, protective tail of argon gas to protect the metal while cooling. Purge chambers and trailing shields are available from CK Worldwide to assist in providing quality results.

STAINLESS STEEL (DCSP)

METAL GUAGE	JOINT TYPE	TUNGSTEN SIZE	FILLER ROD SIZE	CUP SIZE	SHIELD GAS FLOW			WELDING AMPERES	TRAVEL SPEED
					TYPE	CFH (L/MN)	PSI		
1/16 (1.6 mm)	BUTT	1/16 (1.6 mm)	1/16 (1.6 mm)	4, 5, 6	ARGON	11 (5.5)	20	80-100	12 (307.2 mm)
	FILLET							90-100	10 (256 mm)
1/8 (3.2 mm)	BUTT	1/16 (1.6 mm)	3/32 (2.4 mm)	4, 5, 6	ARGON	11 (5.5)	20	120-140	12 (307.2 mm)
	FILLET							130-150	10 (256 mm)
3/16 (4.8 mm)	BUTT	3/32 (2.4 mm)	1/8 (3.2 mm)	5, 6, 7	ARGON	13 (6)	20	200-250	12 (307.2 mm)
	FILLET	3/32 (2.4 mm)-1/8 (3.2 mm)						225-275	10 (256 mm)
1/4 (6.4 mm)	BUTT	1/8 (3.2 mm)	3/16 (4.8 mm)	8, 10	ARGON	13 (6)	20	275-350	10 (256 mm)
	FILLET							300-375	8 (204.8 mm)

WELDING STAINLESS STEEL

In TIG welding of stainless steel, welding rods having the AWS-ASTM prefixes of E or ER can be used as filler rods. However, only bare uncoated rods should be used. Stainless steel can be welded using ACHF, however, recommendations for DCSP must be increased 25%. Light gauge metals less then 1/16" thick should always be welded with DCSP using argon gas. Follow the normal precautions for welding stainless such as: Clean surfaces; dry electrodes; use only stainless steel tools and brushes, carefully remove soap from welds after pressure testing; keep stainless from coming in contact with other metals.

LOW ALLOY STEEL (DCSP)

METAL GUAGE	JOINT TYPE	TUNGSTEN SIZE	FILLER ROD SIZE	CUP SIZE	SHIELD GAS FLOW			WELDING AMPERES	TRAVEL SPEED
					TYPE	CFH (L/MN)	PSI		
1/16 (1.6 mm)	BUTT	1/16 (1.6 mm)	1/16 (1.6 mm)	4, 5, 6	ARGON	15 (7)	20	95-135	15 (384 mm)
	FILLET							95-135	15 (384 mm)
1/8 (3.2 mm)	BUTT	1/16 (1.6 mm)-3/32 (2.4 mm)	3/32 (2.4 mm)	4, 5, 6	ARGON	15 (7)	20	145-205	11 (281.6 mm)
	FILLET							145-205	11 (281.6 mm)
3/16 (4.8 mm)	BUTT	3/32 (2.4 mm)	1/8 (3.2 mm)	7, 8	ARGON	16 (6.5)	20	210-260	10 (256 mm)
	FILLET							210-260	10 (256 mm)
1/4 (6.4 mm)	BUTT	1/8 (3.2 mm)	5/32 (4.0 mm)	8, 10	ARGON	18 (8.5)	20	240-300	10 (256 mm)
	FILLET (2)							240-300	10 (256 mm)

WELDING LOW ALLOY STEEL

Mild and low carbon steels with less then 0.30% carbon and less than 1" thick, generally do not require preheat. An exception to this allowance is welding on highly restrained joints. These joints should be preheated 50 to 100°F to minimize shrinkage cracks in the base metal. Low alloy steels such as the chromium-molybdenum steels will have hard heat affected zones after welding, if the preheat temperature is too low. This is caused by rapid cooling of the base material and the formation of martensitic grain structures. A 200 to 400°F preheat temperature will slow the cooling rate and prevent the martensitic structure.