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THE STANDARD IN TIG WELDING

TECHNICAL GUIDE

SPECIFICATIONS FOR TIG WELDING

CK MASTER TIG

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THE STANDARD IN TIG WELDING

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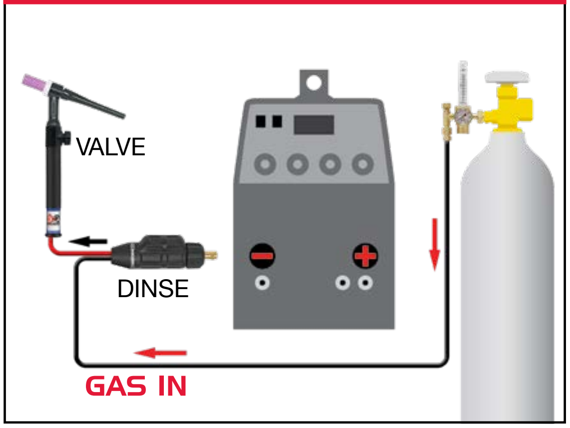
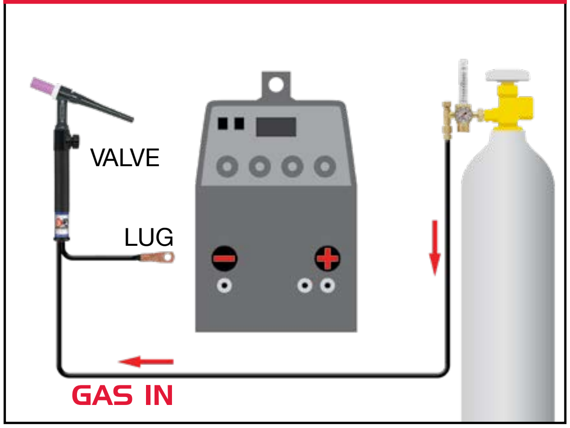
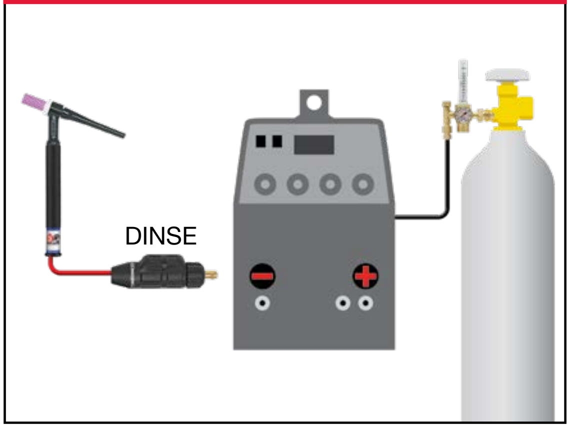


2 PIECE GAS-COOLED

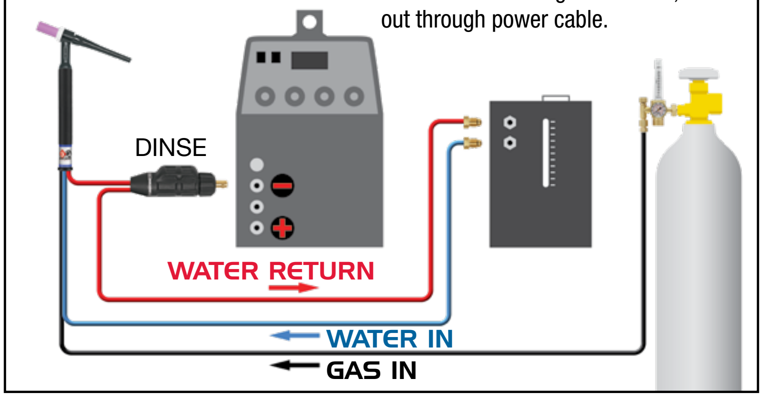


1 PIECE GAS-THRU

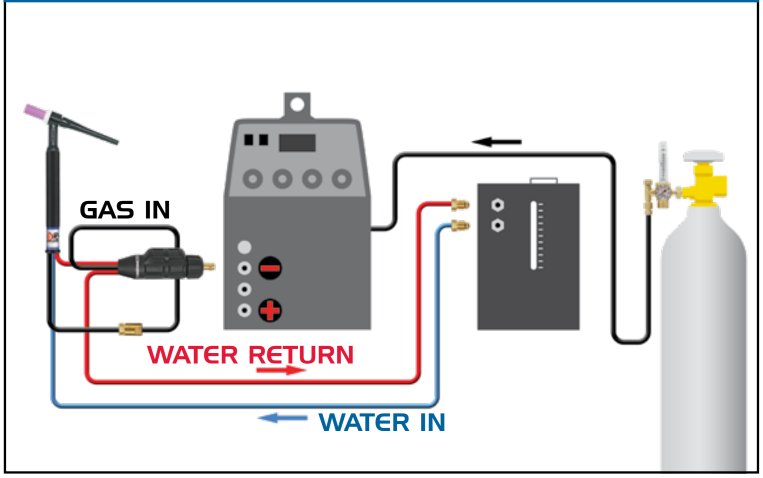


WATER-COOLED

NOTE: 1 quart (1 liter) per minute flow rate. Water in through water line, water out through power cable.

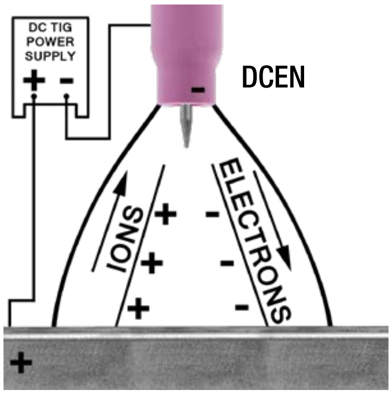


WATER-COOLED GAS-THRU



CHARACTERISTICS OF CURRENT TYPES FOR GAS TUNGSTEN ARC WELDING

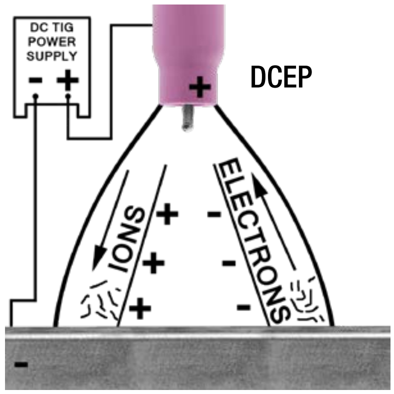
When TIG welding, there are three choices of welding current. They are: Direct Current Straight Polarity (DCSP), Direct Current Reverse Polarity (DCRP), and Alternating Current with or without High Frequency stabilization (ACHF). Each of these has its applications, advantages, and disadvantages. A look at each type and its uses will help the operator select the best current type for the job. The type of current used will have a great effect on the penetration pattern as well as the bead configuration. The diagrams below show arc characteristics of each current polarity type.



TIG WELDING DCSP

Direct Current Straight Polarity produces deep penetration by concentrating heat in the joint area. No cleaning action occurs with this polarity.

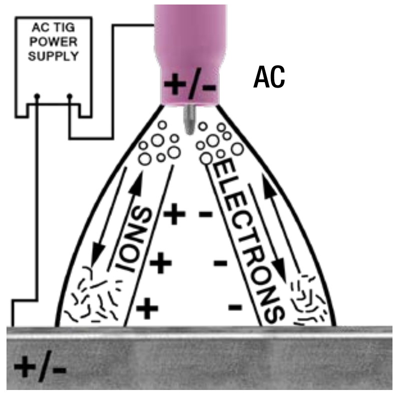
CURRENT TYPE	DCSP
ELECTRODE POLARITY	Electrode negative
OXIDE CLEANING ACTION	No
HEAT BALANCE IN THE ARC	70% of work end 30% at electrode end
PENETRATION PROFILE	Deep narrow
ELECTRODE CAPACITY	Excellent



TIG WELDING DCRP

Direct Current Reverse Polarity produces the best cleaning action as the argon ions flowing towards the work strike with sufficient force to break up oxides on the surface.

CURRENT TYPE	DCRP
ELECTRODE POLARITY	Electrode positive
OXIDE CLEANING ACTION	Yes
HEAT BALANCE IN THE ARC	30% of work end 70% at electrode end
PENETRATION PROFILE	Shallow wide
ELECTRODE CAPACITY	Poor



TIG WELDING WITH ACHF

Alternating Current High Frequency combines the weld penetration on the negative half cycle with the cleaning action of the positive half cycle. High frequency re-establishes the arc which breaks each half cycle on transformer based machines.

CURRENT TYPE	ACHF
ELECTRODE POLARITY	Alternating
OXIDE CLEANING ACTION	Yes (once every half cycle)
HEAT BALANCE IN THE ARC	50% of work end 50% at electrode end
PENETRATION PROFILE	Medium
ELECTRODE CAPACITY	Good

DCSP mainly used on: Stainless Steel, Mild Steel, Nickel, Copper, Titanium

ACHF mainly used on: Aluminum, Magnesium

DCRP mainly used on: Thin Material

SELECTING THE CORRECT TORCH NOZZLE

CUP CHART

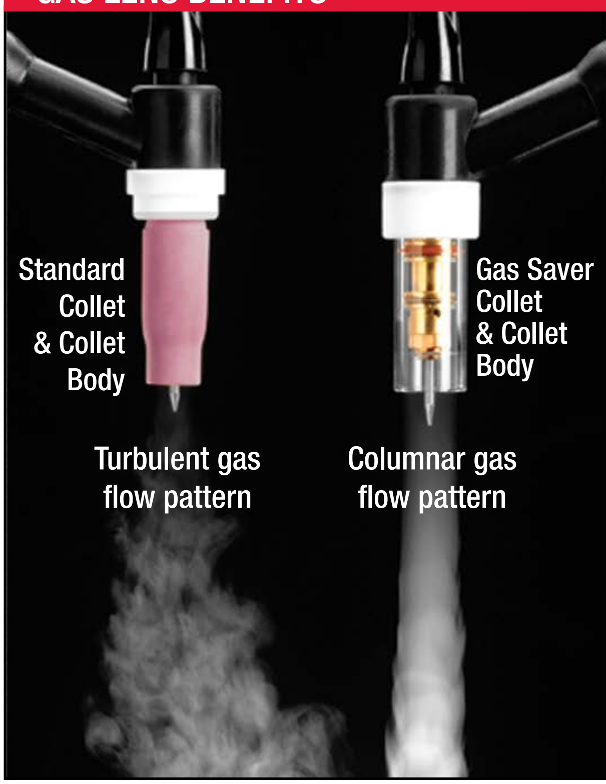
ALUMINA
High impact resistance
Low thermal shock
(Aluminum Oxide)

CERAMIC
High thermal shock
Low impact resistance
(Lava)

SUPER CUP
High thermal shock
High impact resistance
(Silicon Nitride)

PYREX
High visibility
Low thermal shock
Low impact resistance
(Pyrex)

GAS LENS BENEFITS



- 40% Argon savings
- Columnar flow gas pattern
- Longer electrode stick-out
- Lower gas flow rates
- Better visibility
- Longer parts life
- Cleaner welds

GUIDE FOR SHIELD GAS FLOWS, CURRENT SETTINGS & CUP SELECTION

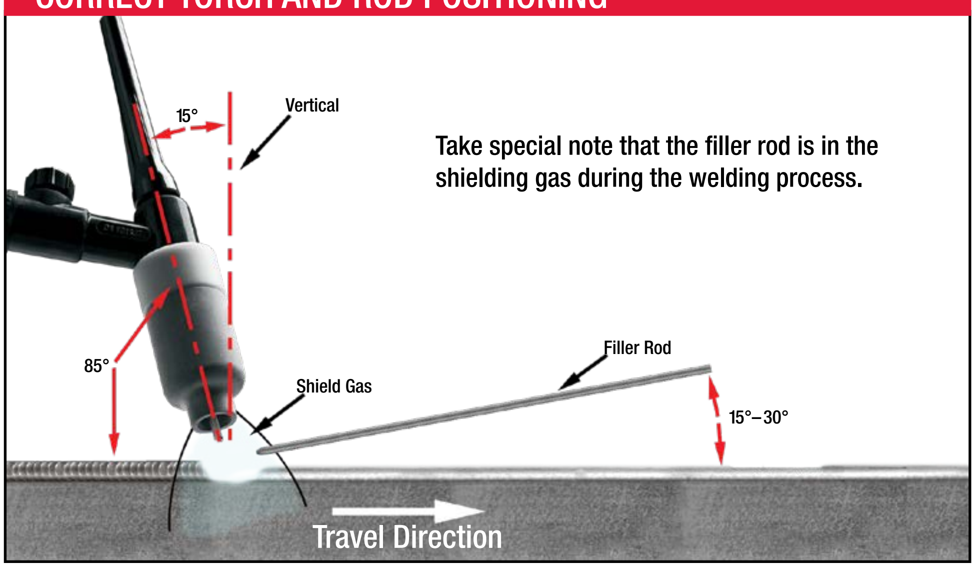
		WELDING CURRENT (AMPS) TUNGSTEN TYPE				ARGON FLOW FERROUS METALS		ARGON FLOW ALUMINUM	
Electrode Diameter	Cup Size	AC Pure	AC Thoriated	DCSP Pure	DCSP Thoriated	Standard Body CFH (L/MN)	Gas Lens Body CFH (L/MN)	Standard Body CFH (L/MN)	Gas Lens Body CFH (L/MN)
.020" (0.5mm)	3, 4, or 5	5–15	5–20	5–15	5–20	5–8 (3–4)	5–8 (3–4)	5–8 (3–4)	5–8 (3–4)
.040" (1.0mm)	4 or 5	10–60	15–80	15–70	20–80	5–10 (3–5)	5–8 (3–4)	5–12 (3–6)	5–10 (3–5)
1/16" (1.6mm)	4, 5, or 6	50–100	70–150	70–130	80–150	7–12 (4–6)	5–10 (3–5)	8–15 (4–7)	7–12 (4–6)
3/32" (2.4mm)	6, 7, or 8	100–160	140–235	150–220	150–250	10–15 (5–7)	8–10 (4–5)	10–20 (5–10)	10–15 (5–7)
1/8" (3.2mm)	7, 8, or 10	150–210	220–325	220–330	240–350	10–18 (5–9)	8–12 (4–6)	12–25 (6–12)	10–20 (5–10)
5/32" (4.0mm)	8 or 10	200–275	300–425	375–475	400–500	15–25 (7–12)	10–15 (5–7)	15–30 (7–14)	12–25 (6–12)
3/16" (4.8mm)	8 or 10	250–350	400 –525	475–800	475–800	20–35 (10–17)	12–25 (6–12)	25–40 (12–19)	15–30 (7–14)
1/4" (6.4mm)	10	325–700	500–700	750–1000	700–1000	25–50 (12–24)	20–35 (10–17)	30–55 (14–26)	25–45 (12–21)

For pure helium shielding gas, double flow rates shown. For argon-helium mixes with below 30% helium content, use figures shown. Always adjust gas flows to accommodate best shielding results.

TUNGSTEN ELECTRODE TIP SHAPES AND CURRENT RANGES

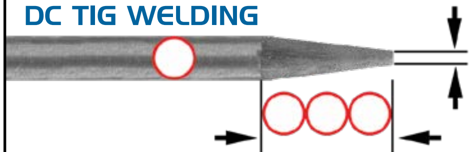
ELECTRODE DIAMETER		DIAMETER AT TIP				
Millimeters	Inches	Millimeters	Inches	INCLUDED ANGLE	CURRENT RANGE	PULSED CURRENT RANGE
1.0mm	**.040"**	.125mm	.005"	12°	2–15 amps	2–25 amps
1.0mm	**.040"**	.250mm	.010"	20°	5–30 amps	5–60 amps
1.6mm	**1/16"**	.500mm	.020"	25°	8–50 amps	8–100 amps
1.6mm	**1/16"**	.800mm	.030"	30°	10–70 amps	10–140 amps
2.4mm	**3/32"**	.800mm	.030"	35°	12–90 amps	12–180 amps
2.4mm	**3/32"**	1.100mm	.045"	45°	15–150 amps	15–250 amps
3.2mm	**1/8"**	1.100mm	.045"	60°	20–200 amps	20–300 amps
3.2mm	**1/8"**	1.500mm	.060"	90°	25–250 amps	25–350 amps

CORRECT TORCH AND ROD POSITIONING

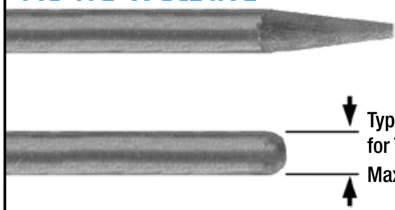


TUNGSTEN TIP PREPARATION

DC TIG WELDING



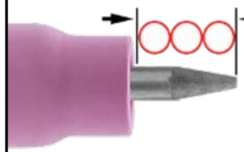
AC TIG WELDING



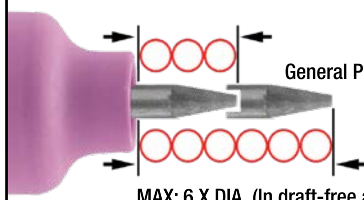
Ball tip by arcing on non-ferrous metal at low current DCRP (EP) then slowly increase current to form the desired ball diameter. Return setting to AC.

TUNGSTEN EXTENSION

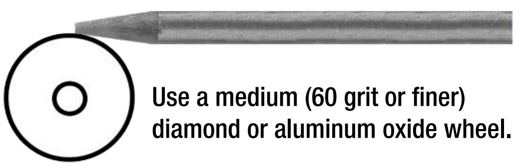
STANDARD PARTS



GAS LENS PARTS

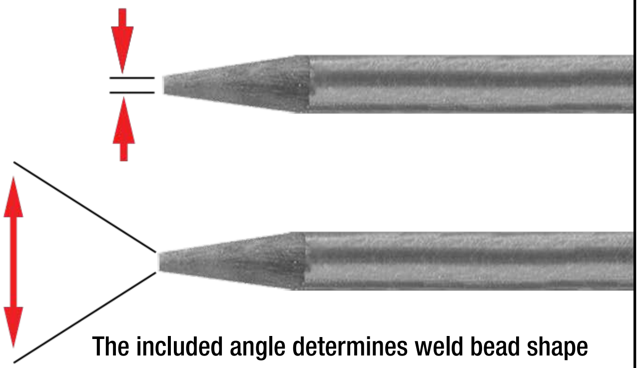


TUNGSTEN GRINDING



Use a medium (60 grit or finer) diamond or aluminum oxide wheel.

- Grind longitudinally (never radially)
- Truncate (blunt) end
- Diameter of flat spot determines amperage capacity

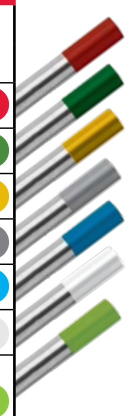


The included angle determines weld bead shape and size. Generally, as the included angle increases, penetration increases and bead width decreases.

*Refer to page 5

COLOR CODE FOR TUNGSTEN ELECTRODES

Designation		Chemical Composition Impurities ≤ 0.1%		TIP COLOR	
ISO 6848	AWS A5.12	OXIDE ADDITIVE	TUNGSTEN		
WT20	EWTh-2	ThO_2: 1.70–2.20%	2% THORIATED	Red	
WP	EWP	~~~~~~	PURE	Green	
WL15	EWLa-1.5	LaO_2: 1.30–1.70%	1.5% LANTHANATED	Gold	
WC20	EWCe-2	CeO_2: 1.80–2.20%	2% CERIATED	Gray	
WL20	EWLa-2	La_2O_3: 1.80–2.20%	2% LANTHANATED	Blue	
WZ8	EWZr-8	ZrO_2: 0.70–0.90%	0.8% ZIRCONIATED	White	
LaYZr™	EWG	La_2O_3: 1.3–1.7%; Y_2O_3: 0.06–0.10%; ZrO_2: 0.6–1.0%	1.5% LANTHANATED 0.8% YTTRIATED 0.8% ZIRCONIATED	Chartreuse	



TUNGSTEN ELECTRODE CHARACTERISTICS

Tungsten	Color Code	Characteristics
Pure	Green	Provides good arc stability for AC welding. Reasonably good resistance to contamination. Lowest current carrying capacity. Least expensive. Maintains a balled end. Used on transformer based machines only.
2% Ceriated	Gray	Similar performance to thoriated tungsten. Easy arc starting, good arc stability, long life. Possible replacement for thoriated.
2% Thoriated	Red	Easier arc starting. Higher current capacity. Greater arc stability. High resistance to weld pool contamination. Difficult to maintain balled end on AC.
1.5% Lanthanated	Gold	Similar performance to thoriated tungsten. Easy arc starting, good arc stability, long life, high current capacity. 1.5% possible replacement for thoriated. 2% possible replacement for Pure.
2% Lanthanated	Blue	Similar performance to thoriated tungsten. Easy arc starting, good arc stability, long life, high current capacity. 1.5% possible replacement for thoriated. 2% possible replacement for Pure.
.8% Zirconiated	White	Excellent for AC welding due to favorable retention of balled end, high resistance to contamination, and good arc starting. Preferred when tungsten contamination of weld is intolerable. Possible replacement for Pure.
LaYZr™	Chartreuse*	Best for use on automated or robotic applications. Runs cooler than 2% Thoriated with longer life. Low to medium amperage range.

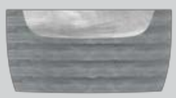
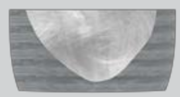
**Substitute for Purple (Same oxide blend).*

TUNGSTEN ELECTRODE CURRENT RANGES

Tungsten Diameter in inches (mm)	Gas Cup (Inside Diameter)	TYPICAL CURRENT RANGE				
		Direct Current, DC	Alternating Current, AC			
		DCEN	70% Penetration		(50/50) Balanced Wave, AC	
		Ceriated Thoriated Lanthanated LaYZr™	Zirconiated	Ceriated Thoriated Lanthanated LaYZr™	Zirconiated Pure LaYZr™	Ceriated Thoriated Lanthanated LaYZr™
.040" (1.0mm)	#6 (3/8")	15–80 amps	20–60 amps	15–80 amps	10–30 amps	20–60 amps
1/16" (1.6mm)	#6 (3/8")	70–150 amps	50–100 amps	70–150 amps	30–80 amps	60–120 amps
3/32" (2.3mm)	#8 (1/2")	150–250 amps	100–160 amps	140–235 amps	60–130 amps	100–180 amps
1/8" (3.2mm)	#8 (1/2")	250–400 amps	150–200 amps	225–325 amps	100–180 amps	160–250 amps

All values are based on the use of Argon as a shielding gas. Other current values may be employed depending on the shielding gas, type of equipment, and application. DCEN = Direct Current Electrode Negative (Straight Polarity)

WELD PENETRATION PROFILE

Gas Type	 30° Angle .005" FLAT	 60° Angle .010" FLAT	 90° Angle .020" FLAT
100Ar 100% Argon			
75Ar-25He 75% Argon 25% Helium			
50Ar-50He 50% Argon 50% Helium			
25Ar-75He 25% Argon 75% Helium			
100He 100% Helium			
95Ar-5H_2 95% Argon 5% Hydrogen			

ALUMINUM (ACHF)

METAL GAUGE	JOINT TYPE	TUNGSTEN SIZE	FILLER ROD SIZE	CUP SIZE	SHIELD GAS FLOW TYPE	SHIELD GAS FLOW CFH (L/MN)	SHIELD GAS FLOW PSI	WELDING AMPERES	TRAVEL SPEED
1/16" (1.6mm)	BUTT	1/16" (1.6mm)	1/16" (1.6mm)	4, 5, 6	ARGON	15 (7)	20	60–80	12" (307.2mm)
	FILLET							70–90	10" (256mm)
1/8" (3.2mm)	BUTT	3/32" (2.4mm)	3/32" (2.4mm) 1/8" (3.2mm)	6, 7	ARGON	17 (8)	20	125–145	12" (307.2mm)
	FILLET		3/32" (2.4mm) 1/16" (1.6mm)					140–160	10" (256mm)
3/16" (4.8mm)	BUTT	1/8" (3.2mm)	1/8" (3.2mm)	7, 8	ARGON/ HELIUM	21 (10)	20	195–220	11" (258.6mm)
	FILLET							210–240	9" (230.4mm)
1/4" (6.4mm)	BUTT	3/16" (4.8mm)	1/8" (3.2mm)	8, 10	ARGON/ HELIUM	25 (12)	20	260–300	10" (256mm)
	FILLET							280–320	8" (204.8mm)

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 (121°C) before using. Although ACHF is recommended, DCRP has been successful up to 3/32" (2.4mm), DCSP with helium shield gas is successful in mechanized applications.

TITANIUM (DCSP)

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

TITANIUM

Small amounts of impurities, particularly oxygen and nitrogen, cause embrittlement of molten or hot titanium when above 500°F (260°C). The molten weld metal in the heat-affected zones must be shielded by a protective blanket of inert gas. 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.

MAGNESIUM (ACHF)

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

MAGNESIUM

Magnesium was one of the first metals to be welded commercially by TIG. 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 requires a positive pressure of argon as a backup on the root side of the weld.

DEOXIDIZED COPPER (DCSP)

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

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" (3.2mm) because of the improved weld metal fluidity. Preheating recommendations should be followed.

STAINLESS STEEL (DCSP)

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

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. Light gauge metals less then 1/16" (1.6mm) 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, keep stainless from coming in contact with other metals.

LOW ALLOY STEEL (DCSP)

METAL GAUGE	JOINT TYPE	TUNGSTEN SIZE	FILLER ROD SIZE	CUP SIZE	SHIELD GAS FLOW			WELDING AMPERES	TRAVEL SPEED
					TYPE	CFH (L/MN)	PSI		
1/16" (1.6mm)	BUTT	1/16" (1.6mm)	1/16" (1.6mm)	4, 5, 6	ARGON	15 (7)	20	95-135	15" (384mm)
	FILLET							95-135	15" (384mm)
1/8" (3.2mm)	BUTT	1/16" (1.6mm) 3/32 (2.4mm)	3/32" (2.4mm)	4, 5, 6	ARGON	15 (7)	20	145-205	11" (258.6mm)
	FILLET							145-205	11" (258.6mm)
3/16" (4.8mm)	BUTT	3/32" (2.4mm)	1/8" (3.2mm)	7, 8	ARGON	16 (6.5)	20	210-260	10" (256mm)
	FILLET							210-260	10" (256mm)
1/4" (6.4mm)	BUTT	1/8" (3.2mm)	5/32" (4.0mm)	8, 10	ARGON	18 (8.5)	20	240-300	10" (256mm)
	FILLET (2)							240-300	10" (256mm)

LOW ALLOY STEEL

Mild and low carbon steels with less then 0.30% carbon and less than 1" (2.5cm) 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 (10 to 38°C) 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 (93 to 204°C) preheat temperature will slow the cooling rate and prevent the martensitic structure.

TROUBLESHOOTING GUIDE

PROBLEM	CAUSE	SOLUTION
Excessive Electrode Consumption	Inadequate gas flow	*Increase gas flow*
	Improper size electrode for current required	*Use larger electrode*
	Operating of reverse polarity	*Use larger electrode or change polarity*
	Electrode contamination	*Remove contaminated portion, then prepare again*
	Excessive heating inside torch	*Replace collect, try wedge collet or reverse collet*
	Electrode oxidizing during cooling	*Increase gas post flow time to 1 sec. per 10 amps*
	Shield gas incorrect	*Change to proper gas (no oxygen or Co2)*
Erratic Arc	Incorrect voltage (arc too long)	*Maintain short arc length*
	Current too low for electrode size	*Use smaller electrode or increase current*
	Electrode contaminated	*Remove contaminated portion, then prepare again*
	Joint too narrow	*Open joint groove*
	Contaminated shield gas, dark stains on the electrode or weld bead indicate contamination	*Most common cause is moisture or aspirated air in gas stream. Use welding grade gas only. Find the source of the contamination and eliminate it promptly.*
	Base metal is oxidized, dirty or oily	*Use appropriate chemical cleaners, wire brush or abrasives prior to welding.*
Inclusion of Tungsten or Oxides in Weld	Poor scratch starting technique	*Many codes do not allow scratch starts. Use copper strike plate. Use high-frequency arc starter.*
	Excessive current for tungsten size used	*Reduce current or use larger electrode*
	Accidental contact of electrode with puddle	*Maintain proper arc length*
	Accidental contact of electrode to filler rod	*Maintain a distance between electrode and filler metal*
	Using excessive electrode extension	*Reduce electrode extension to recommended limits*
	Inadequate shielding or excessive drafts	*Increase gas flow, shield arc from wind, or use gas lens*
	Wrong gas	*Do not use Ar-02 or Ar-Co2 GMA (MIG) gases for TIG welding*
	Heavy surface oxides not being removed	*Use ACHF, adjust balance control for maximum cleaning, or wire brush and clean the weld joint prior to welding.*
Porosity in Weld Deposit	Entrapped impurities, hydrogen, air, nitrogen, water vapor	*Do not weld on wet material. Remove condensation from line*
	Defective gas hose or loose connection	*Check hoses and connections for leaks*
	Filler material is damp (particularly aluminum)	*Dry filler metal in oven prior to welding*
	Filler material is oily or dusty	*Replace filler metal*
	Alloy impurities in the base metal such as sulphur, phosphorus, lead and zinc	*Change to a different alloy composition which is weldable. These impurities can cause a tendency to crack when hot.*
	Excessive travel speed with rapid freezing of weld trapping gases before they escape	*Lower the travel speed*
	Contaminated gas shield	*Replace the shielding gas*
Cracking in Welds	Hot cracking in heavy section or with metals which are hot shorts	*Preheat, increase weld bead cross-section size, change weld bead contour.*
	Crater cracks due to improperly breaking the arc or terminating the weld at the joint edge	*Reverse direction and weld back into previous weld at edge. Use remote or foot control to manually down slope current.*
	Post weld cold cracking, due to excessive joint restraint, rapid cooling, or hydrogen embrittlement	*Preheat prior to welding, use pure to non-contaminated gas. Increase the bead size. Prevent craters or notches. Change the weld joint design.*
	Centerline cracks in single pass welds	*Increase bead size. Decrease root opening, use preheat, prevent craters.*
	Underbead cracking from brittle microstructure	*Eliminate sources of hydrogen, joint restraint, and use preheat.*
Inadequate Shielding	Gas flow blockage or leak in hoses or torch	*Locate and eliminate blockage or leak.*
	Excessive travel speed exposes molten weld to atmospheric contamination	*Use slower travel speed or carefully increase the flow rate to a safe level below creating excessive turbulence. Use trailing shield cup.*
	Wind or drafts	*Set up screens around the weld area*
	Excessive electrode stickout	*Reduce electrode stickout. Use a larger size cup.*
	Excessive turbulence in gas stream	*Change to gas saver parts or gas lens parts.*
Arc Blow	Induced magnetic field from DC weld current	*Change to ACHF current. Rearrange the split ground connection.*
	Arc is unstable due to magnetic influences	*Reduce weld current and use arc length as short as possible.*
Short Parts Life	Short water cooled leads life	*Verify coolant flow direction, return flow must be on the power cable lead.*
	Cup shattering or breaking in use	*Change cup size or type, change tungsten position, refer to CK Worldwide technical specifications available at www.CKWorldwide.com*
	Short collet life	*Ordinary style is split and twists or jams, change to wedge style.*
	Short torch head life	*Do not operate beyond rated capacity, use water cooled model, do not bend rigid torches.*
	Gas hoses ballooning, bursting or blowing off while hot	*Incorrect flowmeter, TIG flowmeters operate at 35 psi with low flows. MIG flowmeters operate with high flows at 65 psi or more.*

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