X. GTAW Troubleshooting

When troubleshooting Gas Tungsten Arc Welding process and equipment problems, it is ideal to isolate and classify them as soon as possible into one of the following categories:

1. Electrical
2. Mechanical
3. Process

The data collected here discusses some of the common problems of the TIG welding processes.

The assumption of this data is that a proper welding condition has been achieved and has been used until trouble developed. In all cases of equipment malfunction, the manufacturer's recommendations should be strictly adhered to and followed.

PROBLEM 1: Burning Through Tungsten Fast	
PROBABLE CAUSES	SUGGESTED REMEDY
1. Inadequate gas flow.	Check to be sure hose, gas valve, and torch are not restricted or the tank is not out of gas. Gas flow should typically be set at 15 to 20 cfh.
2. Operation on electrode positive (DCEP).	Switch to electrode negative (DCEN).
3. Improper size tungsten for current used.	General purpose tungsten size is 3/32" diameter at a maximum of 220 amps.
4. Excessive heating in torch body.	Air-cooled torches do get very warm. If using a water-cooled torch, coolant flow may be restricted or coolant may be low.
5. Tungsten oxidation during cooling.	Keep shielding gas flowing 10–15 seconds after arc stoppage. 1 second for each 10 amps of weld current.
6. Use of gas containing oxygen or CO_2.	Use argon gas.
7. Tungsten melting back into cup (AC).	If using pure tungsten, change to ceriated or lanthanated. If machine has Balance Control, adjust setting towards maximum penetration (70-90). Tungsten diameter may be too small for the amount of current being used. Increase tungsten size.

PROBLEM 2: Tungsten Contamination	
PROBABLE CAUSES	SUGGESTED REMEDY
1. Tungsten melting into weld puddle.	Use less current or larger tungsten. Use ceriated (AC), thoriated (DC), or lanthanated tungsten.
2. Touching tungsten to weld puddle.	Keep tungsten from contacting weld puddle. Raise the torch so that the tungsten is off of the work piece 1/8" to 1/4".

PROBLEM 3: High-Frequency Present — No Arc Power	
PROBABLE CAUSES	SUGGESTED REMEDY
1. Incomplete weld circuit.	Check work connection. Check all cable connections.
2. No shielding gas.	Check for gas flow at end of torch. Check for empty cylinder or closed shut-off valve. Gas flow should typically be set at 15 to 20 cfh.

PROBLEM 4: Porosity and Poor Weld Bead Color	
PROBABLE CAUSES	SUGGESTED REMEDY
1. Condensation on base metal.	Blow out all air and moisture condensation from lines. Remove all condensation from base metal before welding. Metals stored in cold temperatures will condensate when exposed to warm temperatures.
2. Loose fittings in torch or hoses.	Tighten fittings on torch and all hoses.
3. Inadequate gas flow.	Adjust flow rate as necessary. Gas flow should typically be set at 15 to 20 cfh.
4. Defective gas hose or loose connection.	Replace gas hose and check connections for leaks, cuts, or pin holes.
5. Contaminated or improper filler metal.	Check filler metal type. Remove all grease, oil, or moisture from filler metal.
6. Base metal is contaminated.	Remove paint, grease, oil, and dirt, including mill scale from base metal.

PROBLEM 5: Yellow Powder or Smoke on Cup—Tungsten Discolor	
PROBABLE CAUSES	SUGGESTED REMEDY
1. Shielding gas flow rate too low.	Increase flow rate. Gas flow should typically be set at 15 to 20 cfh.
2. Incorrect shielding gas or mixture.	Use argon gas.
3. Inadequate post flow.	Increase post flow time. Set at 10 to 15 seconds.
4. Improper tungsten size or cup size.	Match tungsten size and cup size to joint being welded. General purpose tungsten size is 3/32" diameter and #8 cup.

PROBLEM 6: Unstable Arc	
PROBABLE CAUSES	SUGGESTED REMEDY
While AC Welding	
1. Excessive rectification in base metal.	Increase travel speed. Increase balance control toward more penetration. Add filler metal.
2. Improper shielding gas.	In some cases, when welding on 3/8" to 1/2" thick aluminum, argon/helium is used.
3. Incorrect arc length.	Use correct arc length. Adjust the torch so that the tungsten is off of the work piece 1/8" to 1/4".
4. Tungsten is contaminated.	Remove 1/2" of contaminated tungsten and repoint tungsten.
5. Base metal is contaminated.	Remove paint, grease, oil, and dirt, including mill scale from base metal.
6. Frequency set too low.	On welders with adjustable AC frequency, increase frequency to give proper arc stability and direction. 100 to 180 Hertz is acceptable.
7. Improperly prepared tungsten.	With Squarewave and inverter machines, use pointed tungsten. Point will eventually round off after welding.

PROBLEM 6: Unstable Arc	
PROBABLE CAUSES	SUGGESTED REMEDY
While DC Welding	
1. Weld circuit polarity is incorrect.	Check polarity switch on welder. Select DCEN (Direct Current Electrode Negative).
2. Tungsten is contaminated.	Remove 1/2" of contaminated tungsten and repoint tungsten.
3. Arc too long.	Shorten arc length. Lower torch so that the tungsten is off of the work piece no more than 1/8" to 1/4".
4. Base metal is contaminated.	Remove paint, grease, oil, and dirt, including mill scale from base metal.

PROBLEM 7: Arc Wanders	
PROBABLE CAUSES	SUGGESTED REMEDY
While DC Welding	
1. Improper arc length/tungsten in poor condition.	Lower the torch so that the tungsten is off of the work piece 1/8" to 1/4". Clean and sharpen tungsten.
2. Improperly prepared tungsten.	Grind marks should run lengthwise with tungsten, not circular. Use proper grinding method and wheel.
3. Light gray frosted appearance on end of tungsten.	Remove 1/2" of tungsten and repoint tungsten.
4. Improper gas flow.	Gas flow should typically be set at 15 to 20 cfh.
While AC Welding	
1. Improper tungsten preparation.	With Squarewave and inverter machines, use pointed tungsten. Point will eventually round off after welding.
2. Tungsten is contaminated.	Remove 1/2" of contaminated tungsten and repoint tungsten.
3. Base metal is contaminated.	Remove paint, grease, oil, and dirt, including mill scale from base metal.
4. Incorrect balance control setting.	Increase balance toward more penetration. Normal Balance Control setting is 70 - 90.
5. Improper tungsten size and type.	Select proper size and type. General purpose tungsten size is 3/32" diameter and ceriated or thoriated.
6. Excessive rectification in base metal.	Increase travel speed. Increase balance setting toward more penetration. Add filler metal.
7. Improper shielding gas flow.	Gas flow should typically be set at 15 to 20 cfh.
8. Frequency set too low.	Increase AC frequency on machines so equipped to stabilize and direct the arc. The higher the frequency, the narrower and deeper the penetration.

PROBLEM 8: Arc Will Not Start or is Difficult to Start	
PROBABLE CAUSES	SUGGESTED REMEDY
While DC Welding	
1. No shielding gas.	Gas flow should typically be set at 15 to 20 cfh.
2. Incorrect power supply switch positions.	Place switches in proper positions, either HF impulse or start HF.
3. Improper tungsten electrode.	Use ceriated or thoriated tungsten.
4. Loose connections.	Tighten all cable and torch connections.
5. Incomplete weld circuit.	Make sure work clamp is connected.
6. Improper tungsten size.	Use smallest tungsten possible. Most common tungsten size is 3/32" diameter.
While AC Welding	
1. Incomplete weld circuit.	Check work clamp to assure it is securely fastened to work.
2. Incorrect cable installation.	Check circuit breakers and fuses. Check and tighten all cable connections.
3. No shielding gas.	Check for gas flow at end of torch. Check for empty cylinder or closed shut-off valve. Gas flow should typically be set at 15 to 20 cfh.
4. Loss of high frequency.	Check torch and cables for cracked insulation or bad connections. Check spark gaps and adjust if necessary.
5. Improper tungsten size.	Use smallest tungsten possible. Most common tungsten size is 3/32" diameter.
6. Incorrect tungsten type.	Use ceriated, thoriated, or lanthanated tungsten.