

# TIG Welder Safety and Basics



# Overview

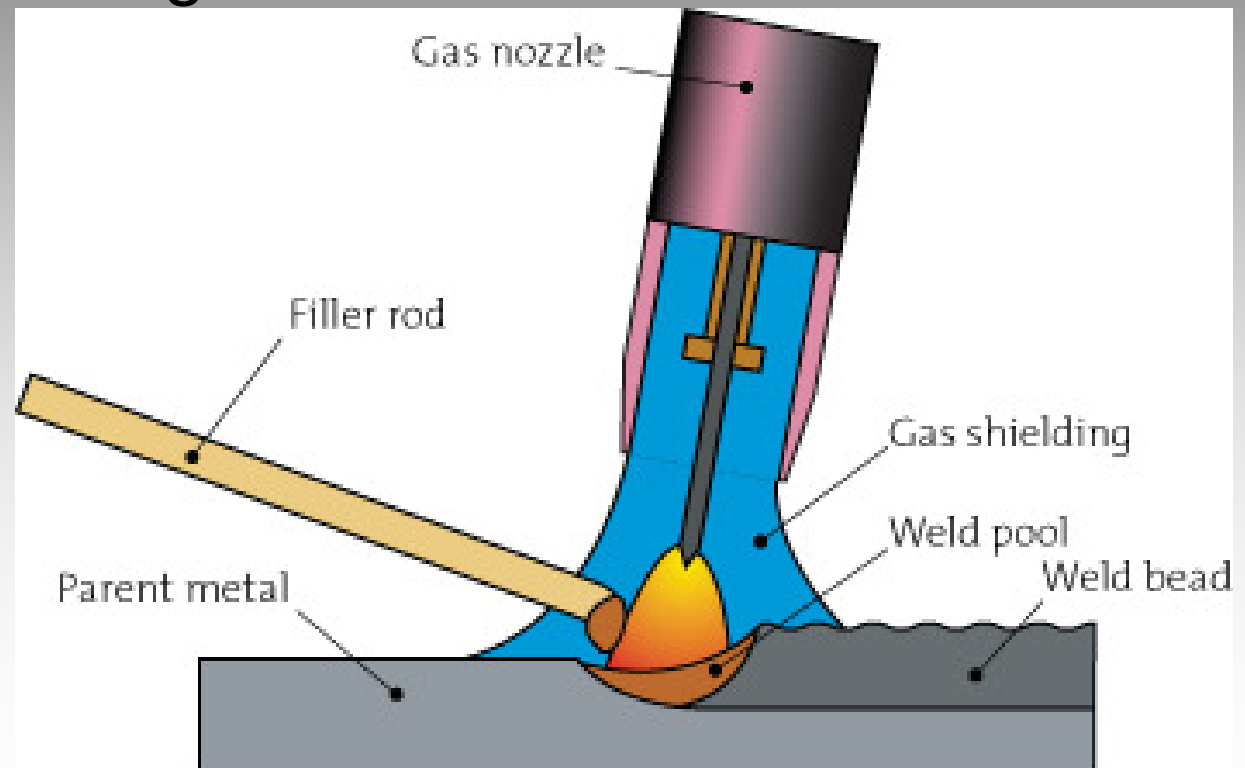
- Safety
- What is TIG
- Equipment
- Setup
- Basics

# Safety 3rd

- Equipment
  - Welding hood
  - Long sleeves
  - Close toed shoes
  - Gloves
- Environment
  - Hot metal
  - Tripping hazards
  - Flammable liquids

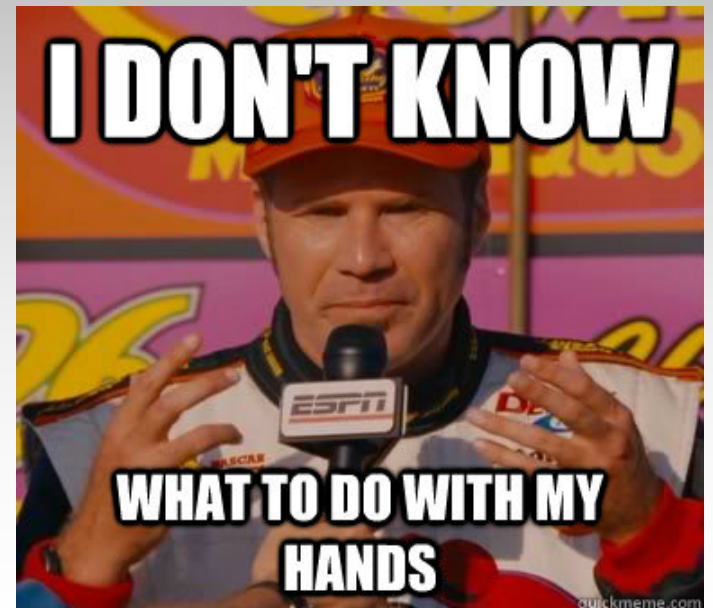
# TIG Welding

- Tungsten Inert Gas
  - Tungsten rods
  - Shielding Gas: Argon
  - Filler Metals

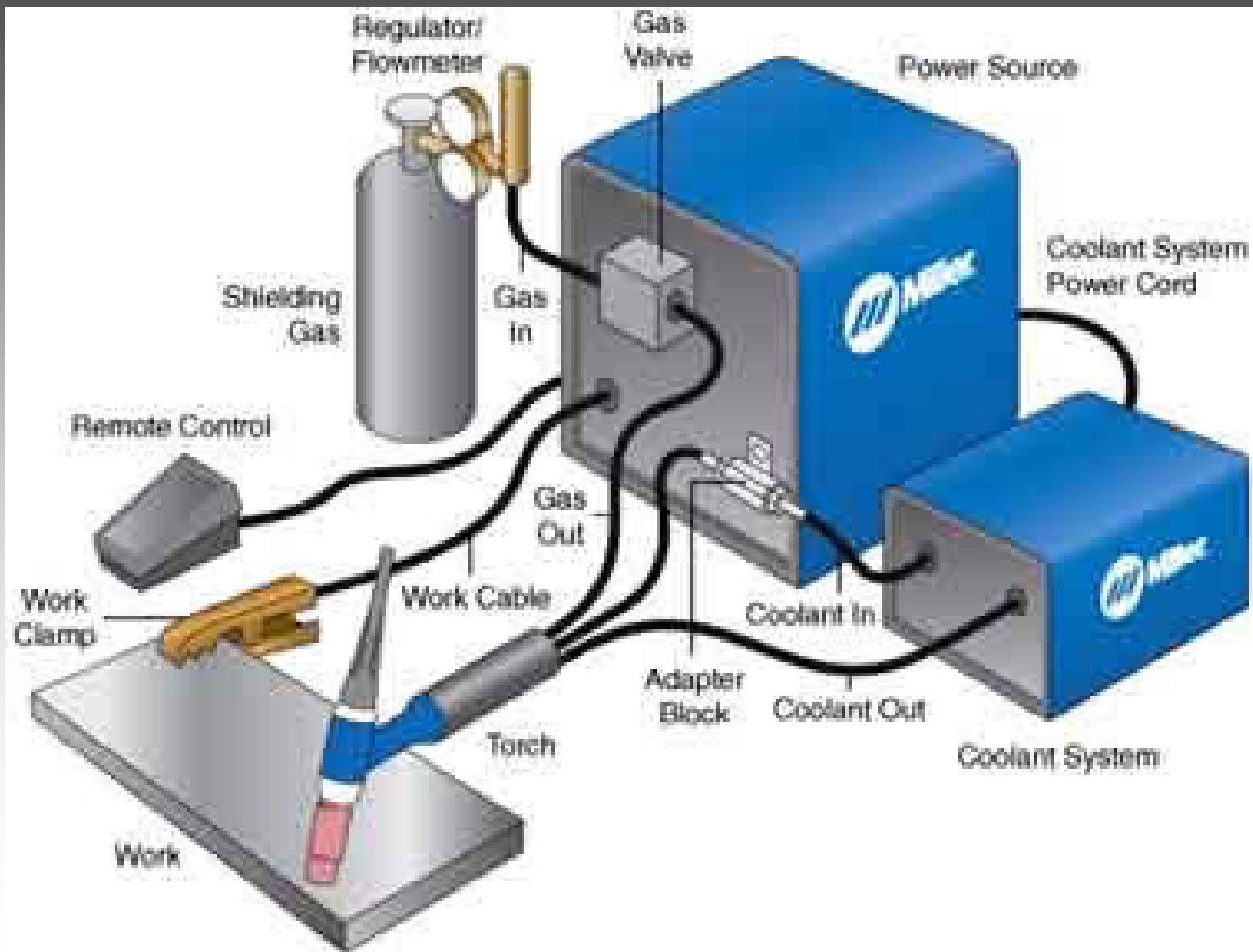


# Pros and Cons

- Benefits
  - Versatility: If its metal, you can weld it
  - Clean
  - Aesthetic welds
- Cons
  - Two handed process
  - Cleaner material
  - Slower



# Equipment



# Torch Parts



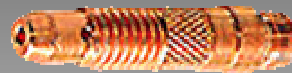
Gas Lens Cup



Gas Lens Body



Ceramic Cup



Collet Body



Collet

Standard Heatshield



Torch Head

Gas Lens Heatshield

Long Back Cap



Short Back Cap

- Nozzle-Ceramic
- Collet Body / Gas lens body
- Collet 3/32, 1/8
- Tungsten
  
- Limited Stock at TM, Suggest you get your own collet and nozzles

# Gas Lens

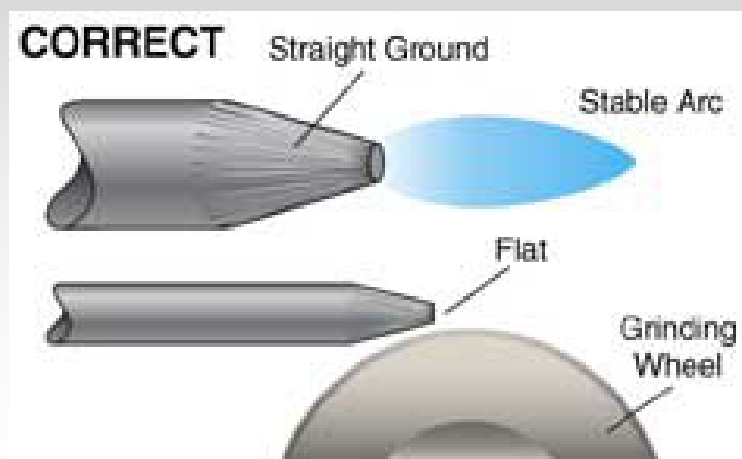
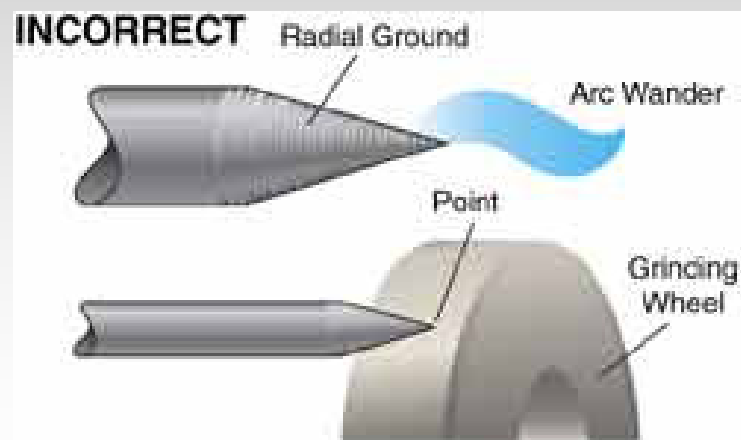
- Improves gas coverage and joint accessibility
- Tungsten can stick out more
- Reduce oxidation
- \$\$





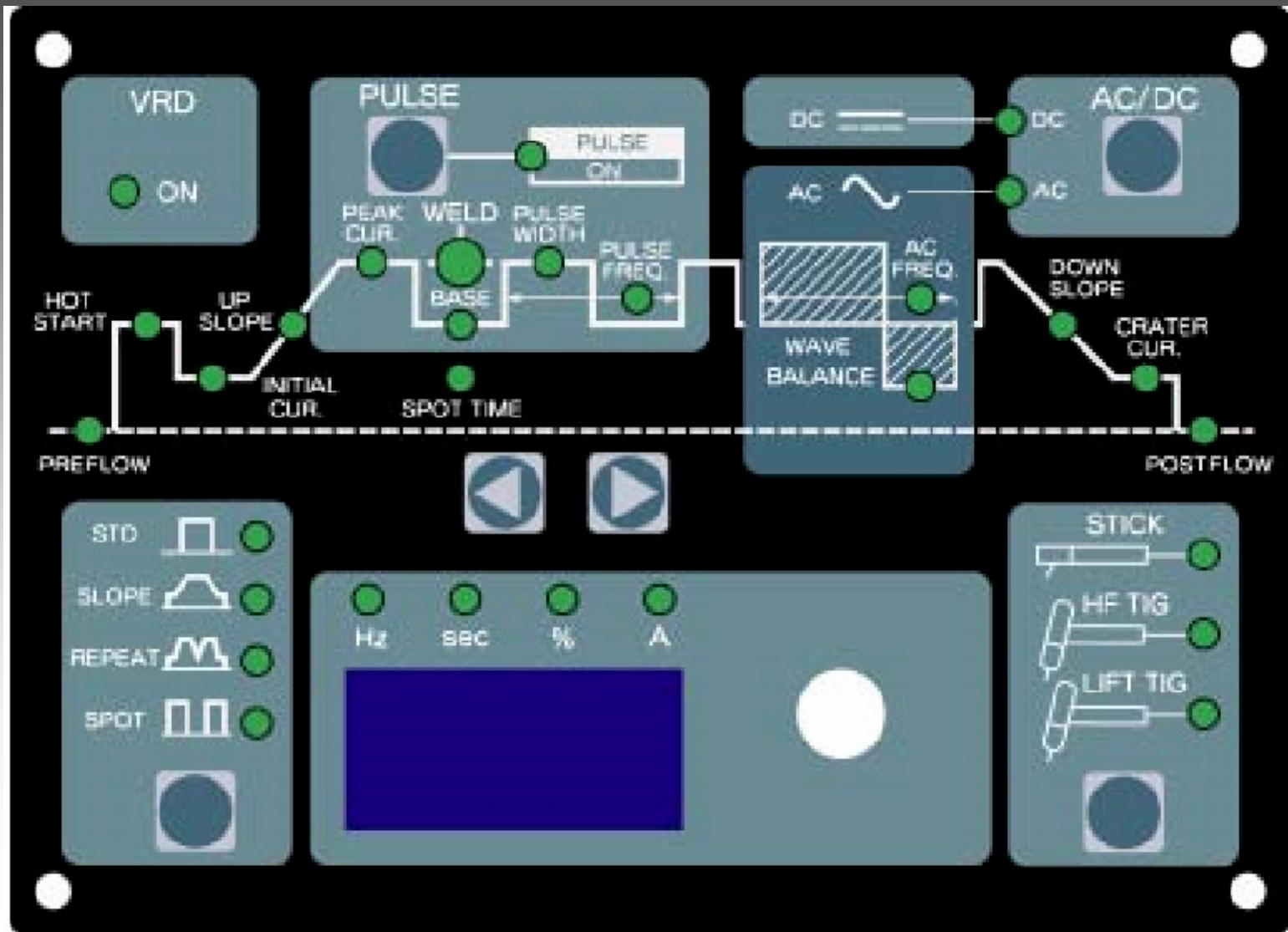
# Tungsten

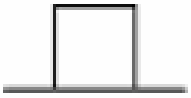


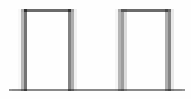


- GRIND YOUR TUNGSTEN AFTER USE




<b>Electrode Type (Ground Finish)</b>	<b>Welding Application</b>	<b>Features</b>	<b>Color Code</b>
Thoriated 2%	DC welding of mild steel, stainless steel and copper.	Excellent arc starting, Long life, High current carrying capacity.	Red
Zirconated 1%	High quality AC welding of aluminium, magnesium and their alloys.	Self cleaning, Long life, Maintains balled end, High current carrying capacity.	White
Ceriated 2%	AC & DC welding of mild steel, stainless steel, copper, aluminium, magnesium and their alloys	Longer life, More stable arc, Easier starting, Wider current range, Narrower more concentrated arc.	Grey

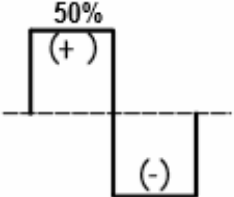
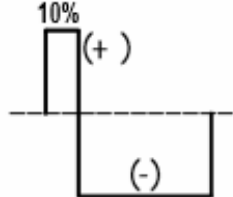
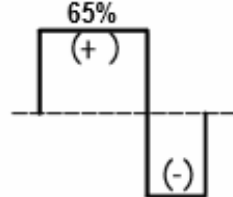



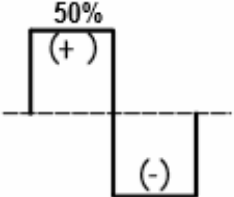
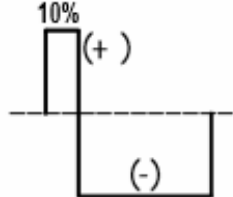
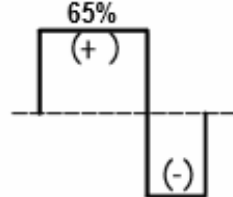



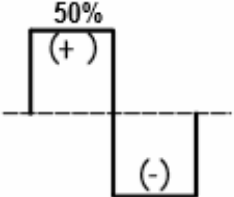
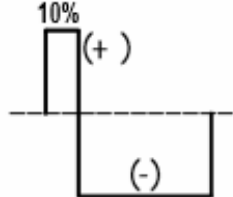
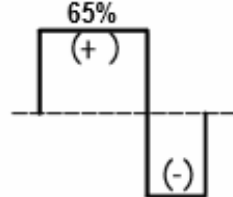



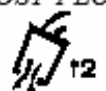
# Settings



Weld Process Selection	Weld Mode			Description
	STICK	HF TIG	LIFT TIG	
 <i>STD</i>	Yes	Yes	Yes	2T operation in TIG Modes using remote devices to control contactor & current
 <i>SLOPE</i>	No	Yes	Yes	4T operation in TIG Modes with crater fill using a remote contactor device to control sequence.
 <i>REPEAT</i>	No	Yes	Yes	4T operation in TIG Modes with repeat operation and crater fill using a remote contactor device.
 <i>SPOT</i>	No	Yes	No	2T operation spot welding in HF TIG using a remote contactor device.
 <i>PULSE ON/OFF</i>	No	Yes	Yes	Pulse operation in TIG Modes
	Yes	Yes	Yes	Selects AC or DC weld current

**Table 3 – Weld Process selection verses Weld Mode for Pro-Wave 185TSW**

Parameter	Description
 <i>PRE-FLOW</i>	<p>This parameter operates in TIG modes only and is used to provide gas to the weld zone prior to striking the arc, once the torch trigger switch has been pressed. This control is used to dramatically reduce weld porosity at the start of a weld.</p>
<i>HOT START</i>	<p>This parameter operates in all weld modes except Lift TIG mode and is used to heat up the weld zone in TIG modes or improve the start characteristics for stick electrodes. e.g. low hydrogen electrodes. It sets the peak start current on top of the <i>BASE (WELD)</i> current.  e.g. <i>HOT START</i> current = 130 amps when <i>BASE (WELD)</i> = 100 amps &amp; <i>HOT START</i> = 30 amps</p>
<i>INITIAL CUR.</i>	<p>This parameter operates in <i>SLOPE</i> or <i>REPEAT</i> (4T) TIG modes only and is used to set the start current for TIG. The Start Current remains on until the torch trigger switch is released after it has been depressed.</p>
<i>UP SLOPE</i>	<p>This parameter operates in TIG modes only and is used to set the time for the weld current to ramp up, after the torch trigger switch has been pressed then released, from <i>INITIAL CUR</i> to <i>PEAK</i> or <i>BASE</i> current</p>
<i>PEAK CUR.</i>	<p>This parameter sets the <i>PEAK</i> weld current when in <i>PULSE</i> mode</p>
<i>WELD</i>	<p>This parameter sets the TIG <i>WELD</i> current in <i>STD</i>, <i>SLOPE</i>, <i>REPEAT</i> and <i>SPOT</i> modes when <i>PULSE</i> is off. This parameter also sets the <i>STICK</i> weld current.</p>
<i>BASE</i> <i>(Background Current)</i>	<p>This parameter sets the Background current when in Pulse TIG mode.</p>

Parameter	Description												
<i>SPOT TIME</i>	This parameter sets the duration of the <i>SPOT TIME</i> in <i>HF TIG</i> mode only												
<i>PULSE WIDTH</i>	This parameter sets the percentage on time of the <i>PULSE FREQUENCY</i> for <i>PEAK</i> weld current when the <i>PULSE</i> is on.												
<i>PULSE FREQ.</i>	This parameter sets the <i>PULSE FREQUENCY</i> when the <i>PULSE</i> is on.												
<i>AC FREQUENCY</i>	This parameter operates in AC mode only and is used to set the frequency for the AC weld current.												
<i>WAVE BALANCE</i>	<p>This parameter is used for aluminum AC TIG mode and is used to set the penetration to cleaning action ratio for the AC weld current. Generally <i>WAVE BALANCE</i> is set to 50% for AC <i>STICK</i> welding. The <i>WAVE BALANCE</i> control changes the ratio of penetration to cleaning action of the AC TIG welding arc. Maximum weld penetration is achieved when the <i>WAVE BALANCE</i> control is set to 10%. Maximum cleaning of heavily oxidised aluminium or magnesium alloys is achieved when the <i>WAVE BALANCE</i> control is set to 65%.</p> <table border="1" style="width: 100%; text-align: center;"> <thead> <tr> <th>WAVE BALANCE=50%</th> <th>WAVE BALANCE=10%</th> <th>WAVE BALANCE=65%</th> </tr> </thead> <tbody> <tr> <td>  <p>50% (+) 50% (-)</p> </td> <td>  <p>10% (+) 90% (-)</p> </td> <td>  <p>65% (+) 35% (-)</p> </td> </tr> <tr> <td>Balanced with 50% penetration and 50% cleaning</td> <td>Maximum Penetration and reduced cleaning</td> <td>Maximum Cleaning and reduced penetration</td> </tr> <tr> <td></td> <td></td> <td></td> </tr> </tbody> </table>	WAVE BALANCE=50%	WAVE BALANCE=10%	WAVE BALANCE=65%	 <p>50% (+) 50% (-)</p>	 <p>10% (+) 90% (-)</p>	 <p>65% (+) 35% (-)</p>	Balanced with 50% penetration and 50% cleaning	Maximum Penetration and reduced cleaning	Maximum Cleaning and reduced penetration			
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Balanced with 50% penetration and 50% cleaning	Maximum Penetration and reduced cleaning	Maximum Cleaning and reduced penetration											
													
<i>DOWN SLOPE</i>	This parameter operates in TIG modes only and is used to set the time for the weld current to ramp down, after the torch trigger switch has been pressed, to <i>CRATER CUR.</i> This control is used to eliminate the crater that can form at the completion of a weld.												
<i>CRATER CUR.</i>	This parameter operates in <i>SLOPE</i> or <i>REPEAT (4T)</i> TIG modes only and is used to set the finish current for TIG. The <i>CRATER</i> Current remains on until the torch trigger switch is released after it has been depressed.												
<i>POST-FLOW</i> 	This parameter operates in TIG modes only and is used to adjust the post gas flow time once the arc has extinguished. This control is used to dramatically reduce oxidation of the tungsten electrode.												

# Tig welding steps

## 6.02 AC or DC HF TIG Welding

- Connect work lead to positive terminal
- Connect TIG torch to negative terminal
- Switch machine on
- Set *AC* or *DC* weld current. If *AC* is selected then set *AC FREQ* & *WAVE BALANCE*
- Connect remote control device. . See section 4.01, section 2 “*Remote Control Socket*”, for complete details of the remote device.

Use the Scroll Buttons to move to the parameter to be set. The LED will show which function is being adjusted on the weld sequence graph. Use the control knob to adjust each parameter.

- Set *PRE-FLOW* time
- Set *HOT START* current
- Set *POST-FLOW* time
- Set *WELD* current
- Set *POST-FLOW* time

Slope Mode Parameters if required

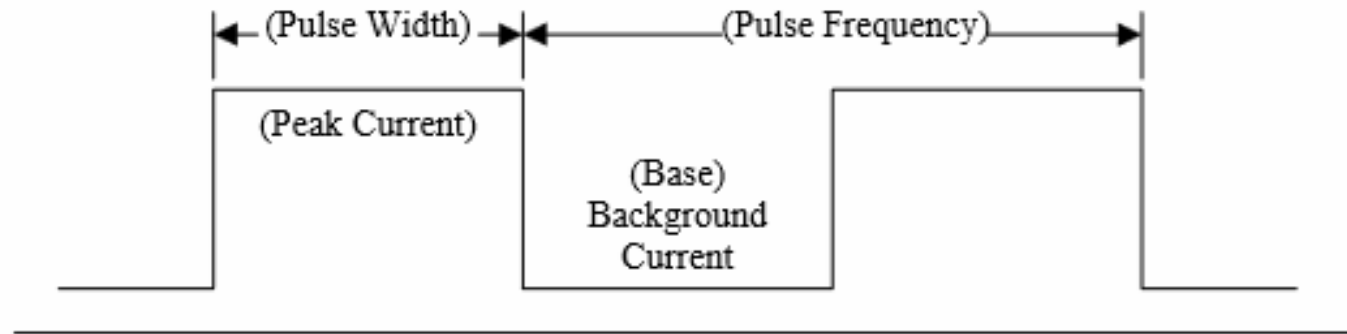
- Set *INITIAL CUR* current
- Set *UP SLOPE* time
- Set (WELD) *PEAK CUR* current
- Set *BASE* current
- Set *DOWN SLOPE* time
- Set *CRATER CUR* current

Pulse Mode parameters if required

- Set *PULSE WIDTH %* for *PEAK CURRENT*
- Set *PEAK CURRENT*
- Set *PULSE FREQ*

Commence welding

- Why use pulses?



The Pulse controls are used primarily to control heat input. Pulse offers a number of advantages as follows:

- 1) Control puddle – size and fluidity (especially out of position).
- 2) Increase penetration
- 3) Travel speed control
- 4) Better consistent quality
- 5) Decreased distortion on lighter or thinner materials.

- Peak current = heating/melting
- Background current = cooling/solidify
- Pulse Width – time in one cycle at peak current
- Pulse frequency- cycles/sec between peak and background

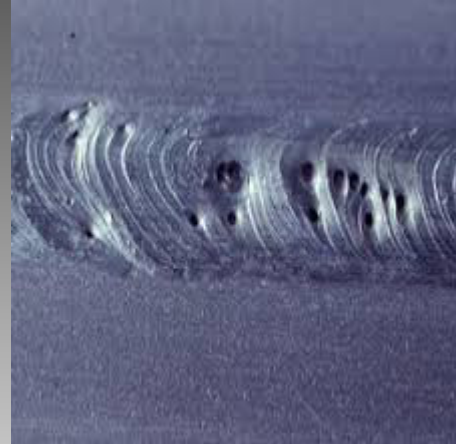


# Basic settings

- Mild Steel
  - DCEN, Thorium Tungsten, Amps and tungsten size depends on metal thickness
- Stainless
  - Similar to steel, super clean material, slightly lower amps to prevent too much heat
- Aluminum
  - Pure Tungsten or Zirconium Tungsten, Ball end, AC current, darker shield

# Weld Issues

- Porosity
  - Dirty Material
  - Arc length too long
  - Too little gas
- Tungsten issues
  - Too little gas
  - Arc length too long
  - Polarity
  - Too low amp



# Sources

- <http://www.burnsstainless.com/Newsletters/Articles/Welding/TIG%20Figure.jpg>
- [https://www.millerwelds.com/-/media/miller-electric/images/resources/do-it-yourself/tig-welding-tips/tigsetup\\_000.jpg?la=en](https://www.millerwelds.com/-/media/miller-electric/images/resources/do-it-yourself/tig-welding-tips/tigsetup_000.jpg?la=en)
- <https://jbin.files.wordpress.com/2014/05/tig-exploded-view-converted.png?w=434&h=333>
- [http://i877.photobucket.com/albums/ab333/wings\\_of\\_fire/Tig%20Welding/TIG-shielding-gas-flows-TIG-cup-selection.jpg~original](http://i877.photobucket.com/albums/ab333/wings_of_fire/Tig%20Welding/TIG-shielding-gas-flows-TIG-cup-selection.jpg~original)
- <https://www.millerwelds.com/resources/welding-resources/tig-welding-resources/tig-welding-tips-intro/tig-welding-setup>