



1 Safety

1.1 UV hazards

- Welding hood, gloves and long-sleeved non-synthetic top must be worn for UV protection.
- The welding curtain must be drawn around the area before welding, taking care to close any gaps to protect other people.
- If other people are watching, the user must give a warning before each time they start welding.

1.2 Heat

- The work area must be cleared of all flammable materials prior to welding.
- Workpiece and TIG torch will get very hot so care must be taken around them.
- Leave the curtain drawn around the area when leaving items to cool.

1.3 Fume hazards

- The fan should be run for all usage.
- Special care should be taken when welding on galvanised metal and stainless steel (zinc fumes and hexavalent chromium). The zinc layer should be ground off prior to welding. In both cases, a respirator should be worn and the user should keep their head out of the fumes.

2 Usage

2.1 Gas setup

- The main valve on the gas tank should be opened slowly until the regulator comes up to pressure, then opened another couple of turns.
- To set the flow rate, the following procedure should be used:
 - Holding the TIG torch away from anything else, briefly depress the foot pedal to enable gas flow.
 - While the gas is flowing, set the desired flow on the flow meter.
 - Within 10 seconds, the gas should stop flowing and there should be no leaks from the hose/regulator.
- The main gas valve on the tank must be closed again when welding is finished.

2.2 Machine setup

- Correct setup of torch/ground leads
 - Torch is plugged into the screwed onto the TIG connection on the left.
 - Ground lead must be connected to the positive (+) connection on the right.
 - Ground is usually ok just clamped to the table as long the the workpiece has good contact to the table too. May need to clamp the workpiece to get good contact.
 - Grounding through the table and vice is ok as long as the workpiece has good contact to the *fixed* jaw of the vice.
 - Otherwise, ground directly to the workpiece.
- TIG/MMA selection

- TIG only - we're not setup for MMA (stick welding).
- AC/DC selection
 - AC for aluminium, DC for everything else.
- Torch switch / foot pedal selection
- 2T/4T
 - This gives extra control of ramp-up/ramp-down current when using the torch switch.
 - Always use 2T with the foot pedal.
- Current (on-machine & foot pedal)
 - Give guidance on current selection (there are posters on the wall).
 - When the foot pedal is in use, the knob on the foot pedal overrides the current knob on the machine.
- Post-flow
 - Set to 8-10s and leave it.
- Pulse
 - More of a specialty thing, not used much for beginners.
- AC balance
 - Should be around 35
 - Increased clean width means more cleaning action, but can also overheat/melt the tungsten.

2.3 Torch setup

- Take care with the torch. Parts of it are brittle and will break if dropped.
- Electrode/collet/cup size selection
 - Refer to guidance on the wall.
- Electrode preparation
 - Grind off all contamination, then grind to a point. Taper length should be 2-3 diameters.
 - Grind a small flat on the end of the electrode, removing the sharp point. Don't do this with the grinder running (the tungsten is too brittle and will snap). Use the drill to spin the electrode on the stationary grinding wheel.

2.4 Workpiece prep

- Workpiece must have all paint, scale rust, grease, etc. removed prior to welding. Only weld on clean, bright metal. Easiest way to do the prep is with an angle grinder and a flap disc or wire wheel.

2.5 Welding

- Torch Angle
 - The welding torch should be positioned about 15 degrees from vertical with the electrode pointing in the direction of travel. This 'pushes' the arc force into the parent metal, assisting the progression of the weld whilst preventing the weld pool from becoming overheated. It also makes room to see the weld puddle and to dip the filler.
- Arc Length
 - The tip of the electrode should be within a few mm of the workpiece at all times during welding.
 - A longer arc generates more heat and is prone to wandering and losing focus.

- Too short an arc risks contaminating the electrode with weld material.
- Preflow
 - When initiating the weld, hold the torch away from anything and tap the foot pedal to start the gas flow. This allows the shielding gas to buildup over the weld strike area.
- Arc Initiation
 - The welder is equipped with high frequency start, this enables arc initiation without touching the work piece. On striking the arc, it will take a few moments for the weld puddle to form, allow this to happen prior to moving or adding filler. You should see a 'keyhole' begin to open a head of the arc and it is into this keyhole you can begin to add filler material.
- Speed of Travel
 - With practise speed of travel becomes easier to 'feel', but as a general rule you may need to speed up travel as the weld progresses and the workpiece heats up. If using the foot pedal, you can also reduce amperage as the weld progresses in order to control the total heat.
- Contamination
 - Should the electrode become contaminated, stop welding immediately, allowing for post flow as described below, then regrind the electrode tip being sure to remove all the contamination.
 - You may also need to wire brush the workpiece to clean it again before restarting.
- Finishing welding
 - When you reach the end of the weld, add a little more filler than you normally would, this assists in filling the final crater in the weld.
 - Release the foot pedal gradually while moving the torch around to prevent the weld cooling too quickly.
- Post Flow
 - Do not immediately remove the torch from the weld. There is a configured 'post flow' of gas which continues flowing in order to protect the weld puddle as it solidifies.

2.5.1 Evaluation

The trainee should be able to run a bead under control. It does not need to be perfect - common problems like dipping the tungsten or an inconsistent bead are ok. Particular things to watch out for and correct are:

- Too much heat. The trainee should recognise and stop when they are putting in too much heat and getting out of control.
- Controlled stops. The trainee should stop welding by lifting off the foot pedal while keeping the torch in place. Pulling the torch away and drawing a large arc is not ok.