UNIMIG

RAZOR

ARC140 / ARC180

KUMJRRW180CA / KUMJRRW180CA | Operating Manual

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1. Safety

Welding and cutting equipment can be dangerous to both the operator and people in or near the surrounding working area if the equipment is not correctly operated. Equipment must only be used under the strict and comprehensive observance of all relevant safety regulations.

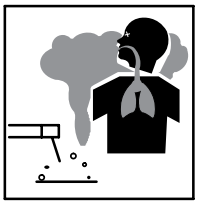
Read and understand this instruction manual carefully before the installation and operation of this equipment.

Machine operating safety

- Do not switch the function modes while the machine is operating. Switching of the function modes during welding can damage the machine. Damage caused in this manner will not be covered under warranty.
- Disconnect the electrode-holder cable from the machine before switching on the machine, to avoid arcing should the electrode be in contact with the workpiece.
- Operators should be trained and or qualified.

Electric shock: it can kill

- Touching live electrical parts can cause fatal shocks or severe burns. The electrode and work circuit is electrically live whenever the output is on. The input power circuit and internal machine circuits are also live when power is on. In MIG/MAG welding, the wire, drive rollers, wire feed housing, and all metal parts touching the welding wire are electrically live. Incorrectly installed or improperly grounded equipment is dangerous.
- Connect the primary input cable, according to Australian and New Zealand standards and regulations.
- Avoid all contact with live electrical parts of the welding/cutting circuit, electrodes and wires with bare hands.
- The operator must wear dry welding gloves while he/she performs the welding/cutting task.
- The operator should keep the workpiece insulated from himself/herself.
- Keep cords dry, free of oil and grease, and protected from hot metal and sparks.
- Frequently inspect input power cable for wear and tear, replace the cable immediately if damaged, bare wiring is dangerous and can kill.
- Do not use damaged, undersized, or badly joined cables.
- Do not drape cables over your body.
- We recommend (RCD) safety switch is used with this equipment to detect any leakage of current to earth.



Fumes and gases are dangerous

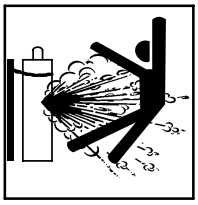
- Smoke and gas generated while welding or cutting can be harmful to people's health. Welding produces fumes and gases. Breathing these fumes and gases can be hazardous to your health.
- Do not breathe the smoke and gas generated while welding or cutting, keep your head out of the fumes.
- Keep the working area well ventilated, use fume extraction or ventilation to remove welding/cutting fumes and gases.
- In confined or heavy fume environments always wear an approved air-supplied respirator.
- Welding/cutting fumes and gases can displace air and lower the oxygen level, causing injury or death. Be sure the breathing air is safe.
- Do not weld/cut in locations near degreasing, cleaning, or spraying operations. The heat and rays of the arc can react with vapours to form highly toxic and irritating gases.
- Materials such as galvanised, lead, or cadmium plated steel, containing elements that can give off toxic fumes when welded/cut. Do not weld/cut these materials unless the area is very well ventilated, and or wearing an air-supplied respirator.

Arc rays: harmful to people's eyes and skin

- Arc rays from the welding/cutting process produce intense visible and invisible ultraviolet and infrared rays that can burn eyes and skin.
- Always wear a welding helmet with the correct shade of filter lens and suitable protective clothing, including welding gloves while the welding/cutting operation is performed.
- Measures should be taken to protect people in or near the surrounding working area. Use protective screens or barriers to protect others from flash, glare and sparks; warn others not to watch the arc.

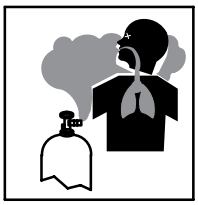
Fire hazard

- Welding/cutting on closed containers, such as tanks, drums, or pipes, can cause them to explode. Flying sparks from the welding/cutting arc, hot workpiece, and hot equipment can cause fires and burns. Accidental contact of the electrode to metal objects can cause sparks, explosion, overheating, or fire. Check and be sure the area is safe before doing any welding/cutting.
- The welding/cutting sparks & spatter may cause fire, therefore remove any flammable materials well away from the working area. Cover flammable materials and containers with approved covers if unable to be moved from the welding/cutting area.
- Do not weld/cut on closed containers such as tanks, drums, or pipes, unless they are correctly prepared according to the required Safety Standards to ensure that flammable or toxic vapours and substances are totally removed, these can cause an explosion even though the vessel has been “cleaned”. Vent hollow castings or containers before heating, cutting or welding. They may explode.
- Do not weld/cut where the atmosphere may contain flammable dust, gas, or liquid vapours (such as petrol)
- Have a fire extinguisher nearby and know how to use it. Be alert that welding/cutting sparks and hot materials from welding/cutting can easily go through small cracks and openings to adjacent areas. Be aware that welding/cutting on a ceiling, floor, bulkhead, or partition can cause a fire on the hidden side.



Gas cylinders

- Shielding gas cylinders contain gas under high pressure. If damaged, a cylinder can explode. Because gas cylinders usually are part of the welding/cutting process, be sure to treat them carefully. CYLINDERS can explode if damaged.
- Protect gas cylinders from excessive heat, mechanical shocks, physical damage, slag, open flames, sparks, and arcs.
- Ensure cylinders are held secure and upright to prevent tipping or falling over.
- Never allow the welding/cutting electrode or earth clamp to touch the gas cylinder, do not drape welding cables over the cylinder.
- Never weld/cut on a pressurised gas cylinder, it will explode and kill you.
- Open the cylinder valve slowly and turn your face away from the cylinder outlet valve and gas regulator.



Gas build-up

- The build-up of gas can cause a toxic environment, deplete the oxygen content in the air resulting in death or injury. Many gases use in welding/cutting are invisible and odourless.
- Shut off shielding gas supply when not in use.
- Always ventilate confined spaces or use approved air-supplied respirator.

Electronic magnetic fields

- MAGNETIC FIELDS can affect Implanted Medical Devices.
- Wearers of Pacemakers and other Implanted Medical Devices should keep away.
- Implanted Medical Device wearers should consult their doctor and the device manufacturer before going near any electric welding, cutting or heating operation.

Noise can damage hearing

- Noise from some processes or equipment can damage hearing.
- Wear approved ear protection if noise level is high.

Hot parts

- Items being welded/cut generate and hold high heat and can cause severe burns.
- Do not touch hot parts with bare hands. Allow a cooling period before working on the welding/cutting gun. Use insulated welding gloves and clothing to handle hot parts and prevent burns.

Caution

Working Environment

- The environment in which this welding/cutting equipment is installed must be free of grinding dust, corrosive chemicals, flammable gas or materials etc., and at no more than a maximum of 80% humidity.
- When using the machine outdoors, protect the machine from direct sunlight, rainwater and snow, etc.; the temperature of the working environment should be maintained within -10°C to +40°C.
- Keep this equipment 30cm distant from the wall.
- Ensure the working environment is well ventilated.

Safety tips

- **Ventilation:** This equipment is small-sized, compact in structure, and of excellent performance in amperage output. The fan is used to dissipate heat generated by this equipment during the welding/cutting operation. Important: Maintain good ventilation of the louvres of this equipment. The minimum distance between this equipment and any other objects in or near the working area should be 30 cm. Good ventilation is of critical importance for the normal performance and service life of this equipment.
- **Thermal Overload Protection:** Should the machine be used to an excessive level, or in a high-temperature environment, poorly ventilated area or if the fan malfunctions the Thermal Overload Switch will be activated, and the machine will cease to operate. Under this circumstance, leave the machine switched on to keep the built-in fan working to bring down the temperature inside the equipment. The machine will be ready for use again when the internal temperature reaches a safe level.
- **Over-Voltage Supply:** Regarding the power supply voltage range of the machine, please refer to the “Main parameter” table. This equipment is of automatic voltage compensation, which enables the maintaining of the voltage range within the given range. In case that the voltage of input power supply amperage exceeds the stipulated value, it is possible to cause damage to the components of this equipment. Please ensure your primary power supply is correct.
- Do not come into contact with the output terminals while the machine is in operation. An electric shock may occur.

Maintenance

Exposure to extremely dusty, damp, or corrosive air is damaging to the welding/cutting machine. To prevent any possible failure or fault of this welding/cutting equipment, clean the dust at regular intervals with clean and dry compressed air of required pressure.

Please note that: lack of maintenance can result in the cancellation of the guarantee; the guarantee of this welding/cutting equipment will be void if the machine has been modified, attempt to take apart the machine or open the factory-made sealing of the machine without the consent of an authorized representative of the manufacturer.

Troubleshooting

Caution: Only qualified technicians are authorized to undertake the repair of this welding/cutting equipment. For your safety and to avoid Electrical Shock, please observe all safety notes and precautions detailed in this manual.

Attention! - Check For Gas Leakage

At initial set up and at regular intervals we recommend to check for gas leakage

Recommended procedure is as follows:

1. Connect the regulator and gas hose assembly and tighten all connectors and clamps.
2. Slowly open the cylinder valve.
3. Set the flow rate on the regulator to approximately 8-10 L/min.
4. Close the cylinder valve and pay attention to the needle indicator of the contents pressure gauge on the regulator, if the needle drops away towards zero there is a gas leak. Sometimes a gas leak can be slow and to identify it will require leaving the gas pressure in the regulator and line for an extended time period. In this situation it is recommended to open the cylinder valve, set the flow rate to 8-10 L/min, close the cylinder valve and check after a minimum of 15 minutes.
5. If there is a gas loss then check all connectors and clamps for leakage by brushing or spraying with soapy water, bubbles will appear at the leakage point.
6. Tighten clamps or fittings to eliminate gas leakage.

IMPORTANT! - We strongly recommend that you check for gas leakage prior to operation of your machine. We recommend that you close the cylinder valve when the machine is not in use.

Welding Guns Of Australia PTY LTD, authorised representatives or agents of Welding Guns Of Australia PTY LTD will not be liable or responsible for the loss of any gas.

2. Machine Features

DC Lift Arc TIG

Lift Arc ignition allows the arc to be started easily in DC TIG by simply touching the tungsten to the work piece and lifting it up to start the arc. This stops the tungsten tip sticking to the work piece and breaking the tip from the tungsten electrode.

Keyable VRD Switch

Voltage Reduction Device can be turned on and off with the supplied key to suit your application. If you're running electrodes that are hard to start, the VRD can be turned off to help with striking an arc.

Hot Start

Hot Start provides an initial burst of current, improving the arc ignition and greatly reducing the chance of sticking.

Arc Force

Arc Force helps to keep the arc stabilised throughout the weld by detecting any short circuits and increasing the peak current to prevent the arc cutting out or electrode sticking.

Anti-Stick

Anti-stick prevents your electrode from sticking to your workpiece. When the machine detects sticking, the current will shut off and unstick the electrode.

Lightweight and Portable

Onsite or off, you can take this machine anywhere.

Generator Compatible

Going off the grid? The RAZOR ARC 180 can be connected to a generator. We recommend one with a 10kVa rating.

Thermal Overload Protection

Prevents machine from exceeding a safe operating temperature.

3. Machine Specifications

3.1 RAZOR ARC 140

3.1.1 Technical Data

Parameter	Values
SKU	KUMJRRW140CA
Primary Input Voltage	240V Single Phase
Supply Plug	10 AMP
Rated Input Power (kVA)	7.0
Ieff (A)	7.9
Rated Output	10-140A
No Load Voltage (V)	78
Protection Class	IP21S
Insulation Class	F
Power Factor	0.7
Minimum Generator (kVA)	8.0
Dinse Connector	10/25
Standard	AS/NZ60974-6
Welds	Mild Steel, Stainless Steel, Copper, Cast Iron
Warranty (Years)	3

3.1.2 TIG Specifications

Parameter	Values
TIG Function Type	DC Lift Arc
TIG Welding Current Range	10-180A
TIG Duty Cycle @ 40°C	20% @ 140A
TIG Welding Thickness Range	1-5mm

3.1.3 STICK Specifications

Parameter	Values
STICK Welding Current Range	10-140A
STICK Duty Cycle @ 40°C	15% @ 140A
STICK Electrode Range	2.5-3.2mm
STICK Welding Thickness Range	2-8mm

3.1.4 Size & Weight

Parameter	Values
Dimensions (mm)	313x250x130mm
Weight (kg)	4.7kg

3.2 RAZOR ARC 180

3.2.1 Technical Data

Parameter	Values
SKU	KUMJRRW180CA
Primary Input Voltage	240V Single Phase
Supply Plug	15 AMP
Rated Input Power (kVA)	7.2
Ieff (A)	14.0
Rated Output	10-180A
No Load Voltage (V)	78
Protection Class	IP21S
Insulation Class	F
Power Factor	0.7
Minimum Generator (kVA)	10.0
Dinse Connector	35/50
Standard	AS/NZ60974-6
Welds	Mild Steel, Stainless Steel, Copper, Cast Iron
Warranty (Years)	3

3.2.2 TIG Specifications

Parameter	Values
TIG Function Type	DC Lift Arc
TIG Welding Current Range	10-180A
TIG Duty Cycle @ 40°C	20% @ 180A
TIG Welding Thickness Range	1-6mm

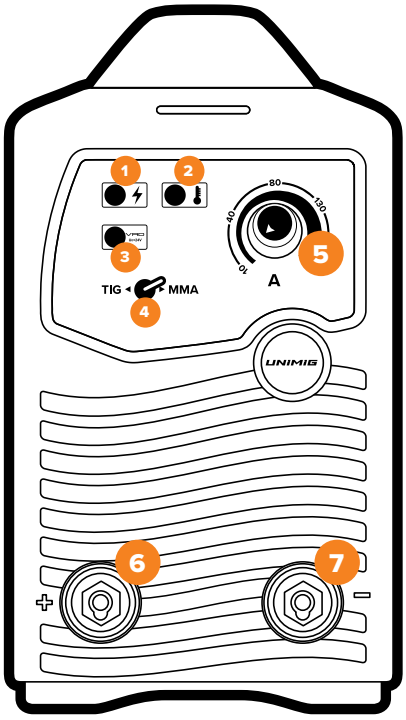
3.2.3 STICK Specifications

Parameter	Values
STICK Welding Current Range	10-180A
STICK Duty Cycle @ 40°C	20% @ 180A
STICK Electrode Range	2.5-3.2mm
STICK Welding Thickness Range	2-12mm

3.2.4 Size & Weight

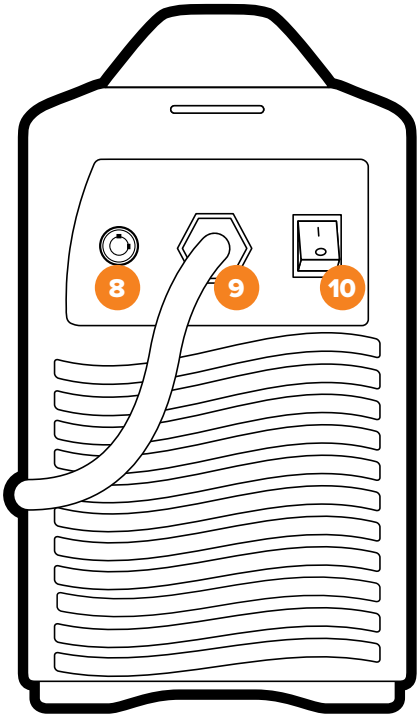
Parameter	Values
Dimensions (mm)	313x250x130mm
Weight (kg)	4.7kg

4. Machine Layout



4.1 Front Panel Layout

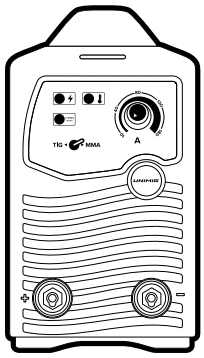
1. Power LED
2. Thermal Overload LED
3. VRD LED
4. Weld Mode Selector
5. Amperage Control Knob
6. Positive Output (+)
7. Negative Output (-)



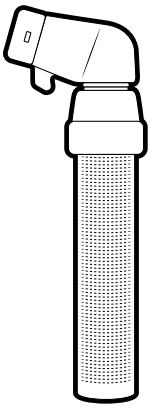
4.2 Rear Panel Layout

8. VRD Switch
9. Power Cable
10. Power Switch

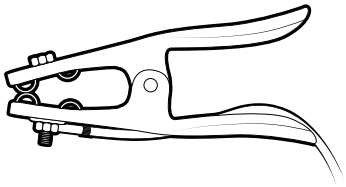
5. Package Contents



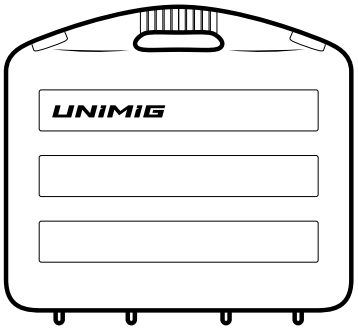
RAZOR ARC 140/180



Electrode Holder



3m 300 AMP Earth Clamp



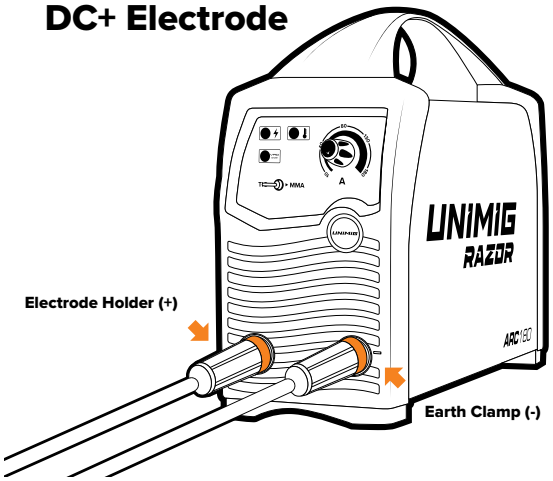
Lightweight Heavy Duty PVC Carry Case

6. MMA: Machine Setup

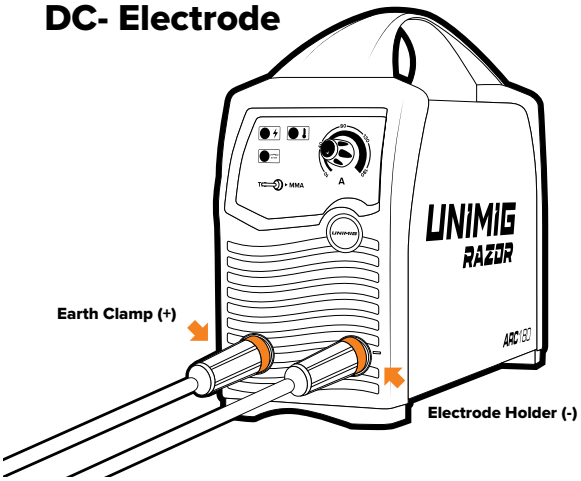
1. For DC+ electrodes, connect earth clamp to the **negative (-)** dinse connection, and electrode holder to the **positive (+)** dinse connection.

2. For DC- electrodes, connect earth clamp to the **positive (+)** dinse connection, and electrode holder to the **negative (-)** dinse connection.

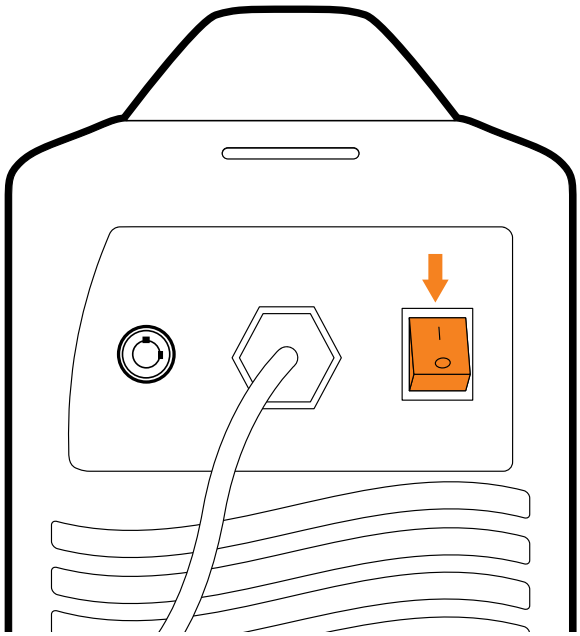
DC+ Electrode



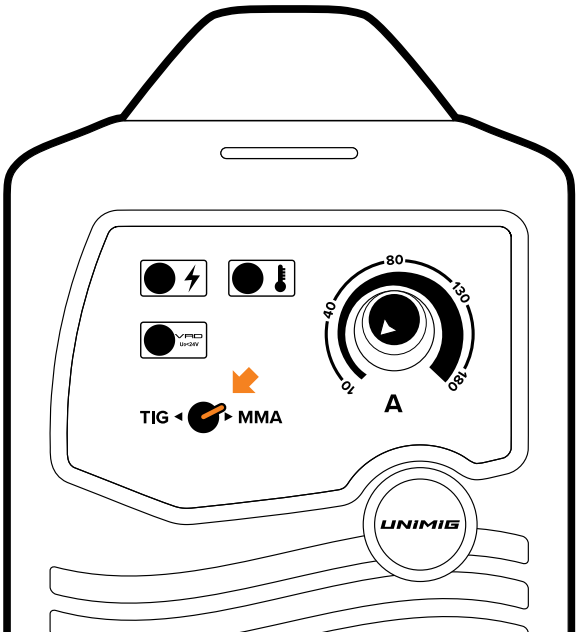
DC- Electrode



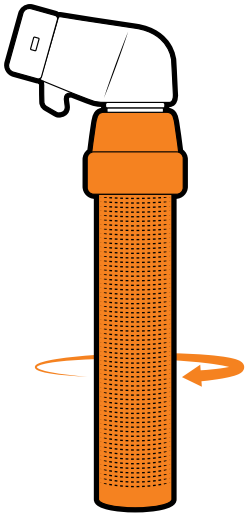
3. Connect the plug into a 15 AMP power point, then switch the machine ON.



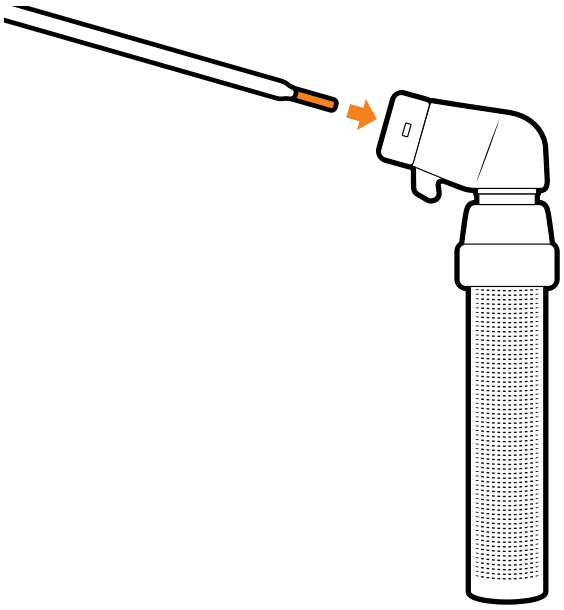
4. Select MMA from the TIG/MMA selector.



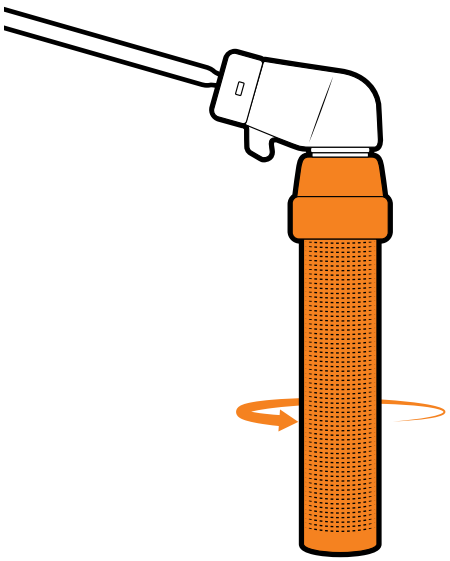
5. Twist electrode holder to loosen grip.



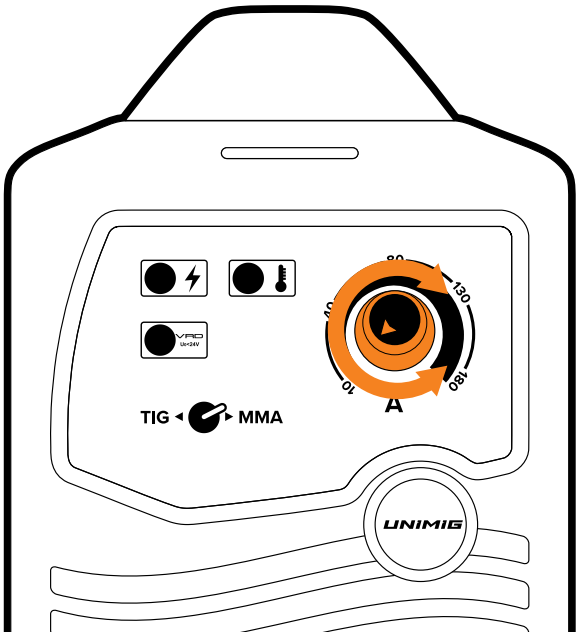
6. Place electrode into electrode holder.



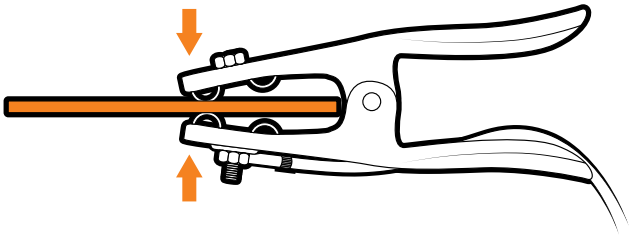
7. Twist electrode holder to tighten and securely grip electrode.



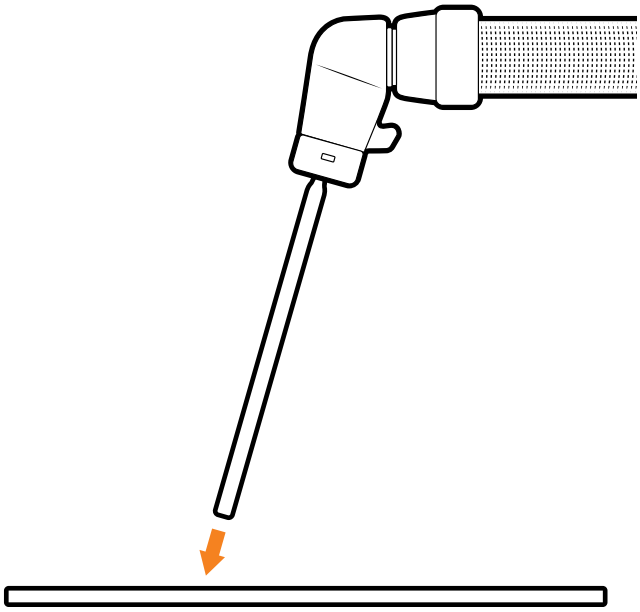
8. Adjust amperage to desired setting.



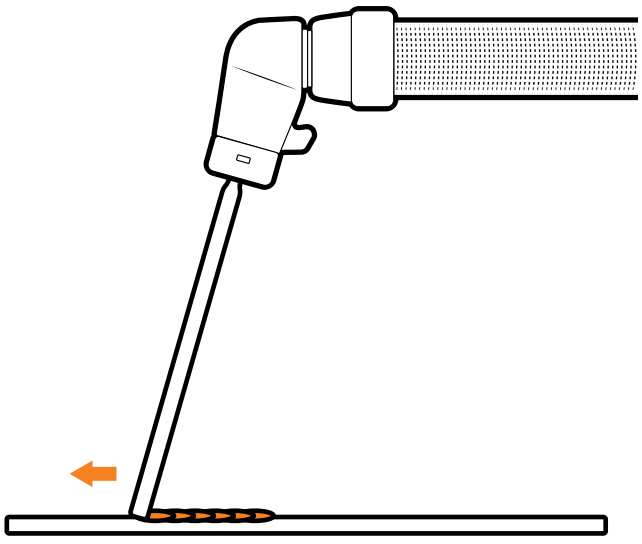
9. Connect earth clamp to your workpiece.



10. Strike electrode against workpiece to initiate arc.

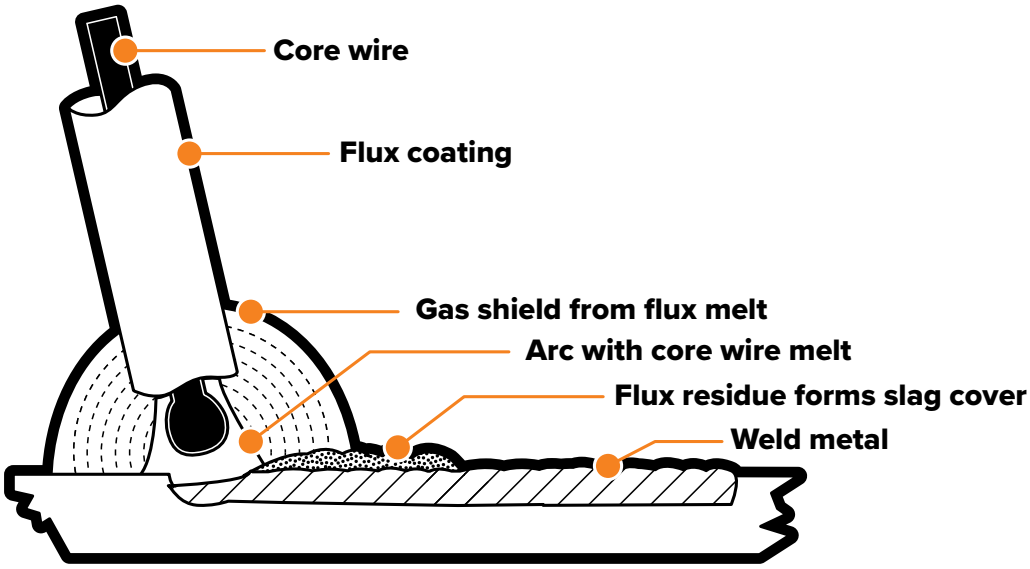


11. Drag along workpiece to weld. Pull the electrode away from the workpiece to finish weld.



7. MMA: Welding Guide

One of the most common types of arc welding is Manual Metal Arc welding, also known as MMA welding. An electric current is used to strike an arc between the base material and a consumable electrode rod or 'stick'. The electrode rod is made of a material that is compatible with the base material being welded. They are covered with a flux that gives off gaseous vapours that serve as a shielding gas and provide a layer of slag, both of which protect the weld area from atmospheric contamination. The electrode core itself acts as filler material. The residue from the flux that forms a slag covering over the weld metal must be chipped away after welding.



- The arc is initiated by momentarily touching the electrode to the base metal.
- The heat of the arc melts the surface of the base metal to form a molten pool at the end of the electrode.
- The melted electrode metal is transferred across the arc into the molten pool and becomes the deposited weld metal.
- The deposit is covered and protected by a slag which comes from the electrode coating.
- The arc and the immediate area are enveloped by an atmosphere of protective gas.

Manual Metal Arc (stick) electrodes have a solid metal wire core and a flux coating. These electrodes are identified by the wire diameter and by a series of letters and numbers. The letters and numbers identify the metal alloy and the intended use of the electrode.

The metal wire core works as a conductor of the current that maintains the arc. The core wire melts and is deposited into the welding pool.

The covering on a shielded metal arc welding electrode is called flux. The flux on the electrode performs many different functions.

These include:

- Producing a protective gas around the weld area.
- Providing fluxing elements and de-oxidisers.
- Creating a protective slag coating over the weld as it cools.
- Establishing arc characteristics.
- Adding alloying elements.

Covered electrodes serve many purposes in addition to adding filler metal to the molten pool. These additional functions are provided mainly by the covering on the electrode.

7.1 Electrode Selection

As a general rule, the selection of an electrode is straight forward, in that it is only a matter of selecting an electrode of similar composition to the parent metal. However, for some metals, there is a choice of several electrodes, each of which has particular properties to suit specific classes of work.

The size of the electrode generally depends on the thickness of the section being welded, and the thicker the section, the larger the electrode required. The table gives the maximum size of electrodes that may be used for various thicknesses of section based on using a general-purpose type 6013 electrode.

Average Thickness of Material	Maximum Recommended Electrode Diameter
1.0 - 2.0mm	2.5mm
2.0 - 5.0mm	3.2mm
5.0 - 8.0mm	4.0mm
8.0 - > mm	5.0mm

Correct current selection for a particular job is an important factor in arc welding. With the current set too low, it is difficult to strike and maintain a stable arc. The penetration is reduced and beads with a distinct rounded profile will be deposited. Too high a current is accompanied by overheating of the electrode, resulting in undercut, burning through of the base metal and producing excessive spatter.

Electrode Size (ø mm)	Current Range (Amps)
2.5mm	60 - 100
3.2mm	100 - 130
4.0mm	130 - 165
5.0mm	165 - 260

7.2 Arc Length

To strike the arc, the electrode should be gently scraped on the work until the arc is established. There is a simple rule for the proper arc length; it should be the shortest arc that gives a good surface to the weld. An arc too long reduces penetration, produces spatter and gives a rough surface finish to the weld. An excessively short arc will cause sticking of the electrode and result in poor quality welds. The general rule of thumb for down hand welding is to have an arc length no greater than the diameter of the core wire.

7.3 Electrode Angle

The angle that the electrode makes with the work is important to ensure a smooth, even transfer of metal. When welding in down hand, fillet, horizontal or overhead, the angle of the electrode is generally between 5 and 15 degrees towards the direction of travel. When vertical up welding, the angle of the electrode should be between 80 and 90 degrees to the workpiece.

7.4 Travel Speed

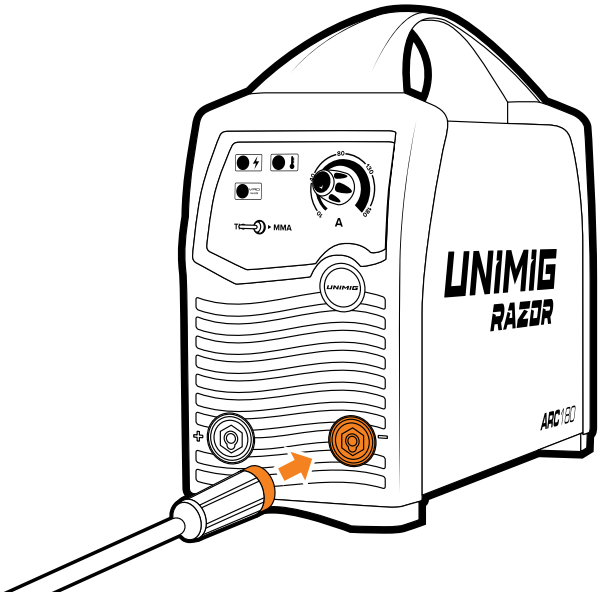
The electrode should be moved along in the direction of the joint being welded at a speed that will give the size of run required. At the same time, the electrode is fed downwards to keep the correct arc length at all times. Excessive travel speeds lead to poor fusion, lack of penetration, etc., while too slow a rate of travel will frequently lead to arc instability, slag inclusions and poor mechanical properties.

7.5 Material and Joint Preparation

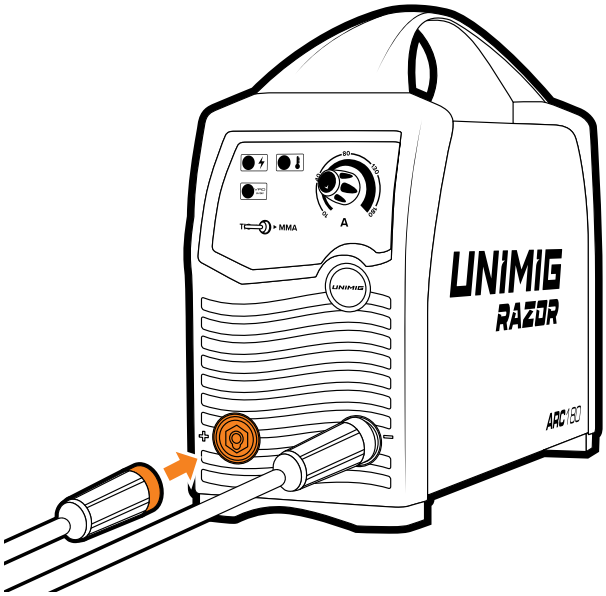
The material to be welded should be clean and free of any moisture, paint, oil, grease, mill scale, rust or any other material that will hinder the arc and contaminate the weld material. Joint preparation will depend on the method used include sawing, punching, shearing, machining, flame cutting and others. In all cases, edges should be clean and free of any contaminates. The chosen application will determine the type of joint.

8. TIG: Machine Setup

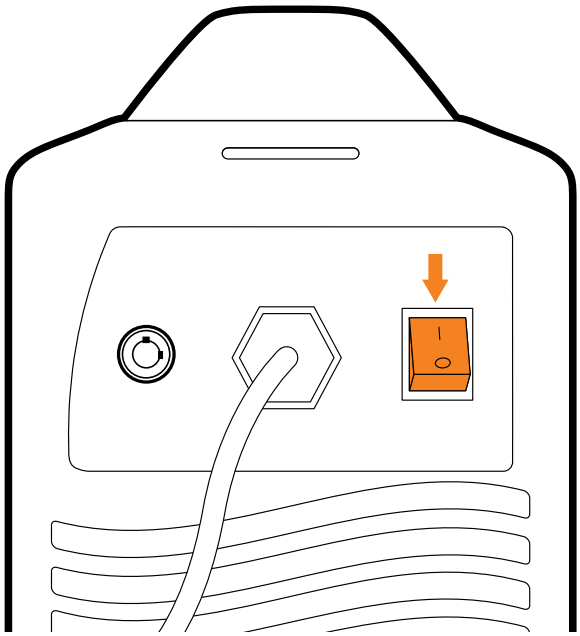
1. Connect the TIG torch to the **negative (-)** dinse connection, twist to lock in place.



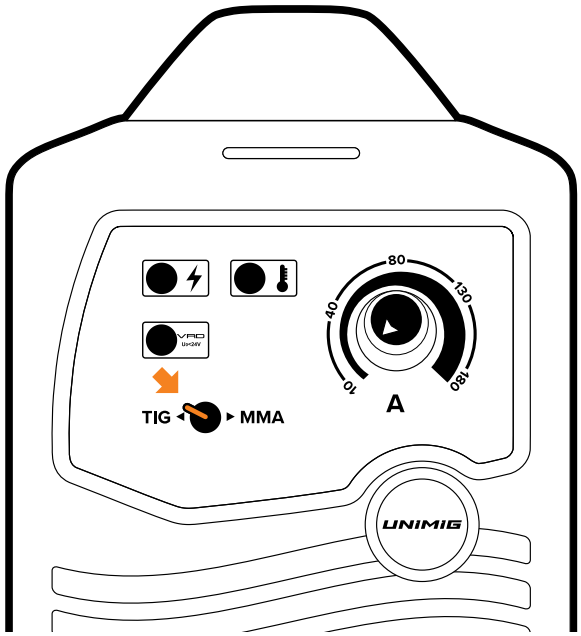
2. Connect the earth clamp to the **positive (+)** dinse connection, twist to lock in place.



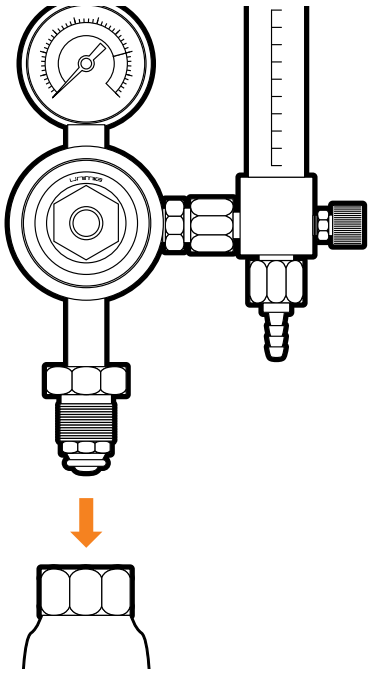
3. Connect the plug into a 15 AMP power point, then switch the machine ON.



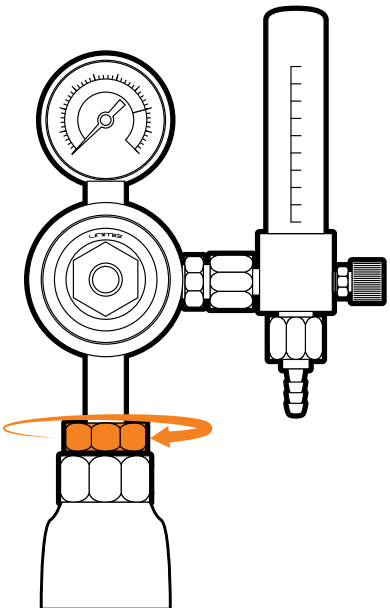
4. Select TIG from the TIG/MMA selector.



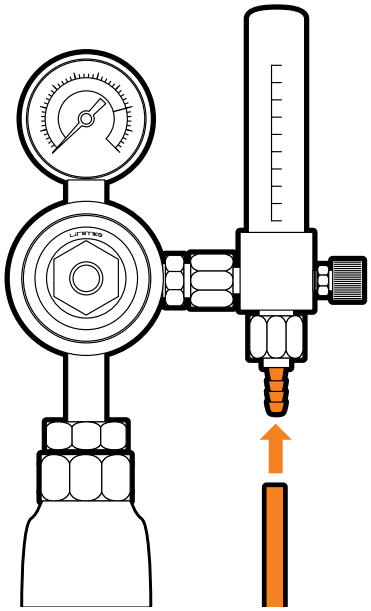
5. Place argon flowmeter regulator into your gas outlet.



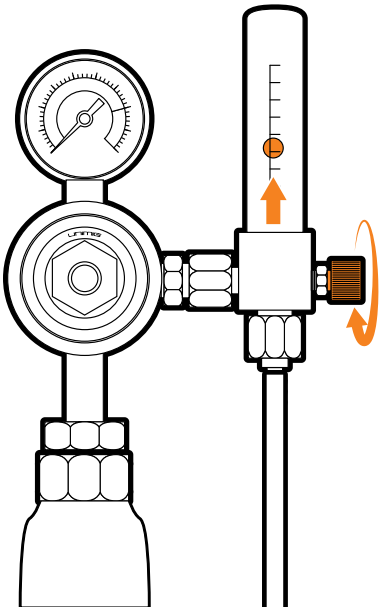
6. Tighten securely with wrench.



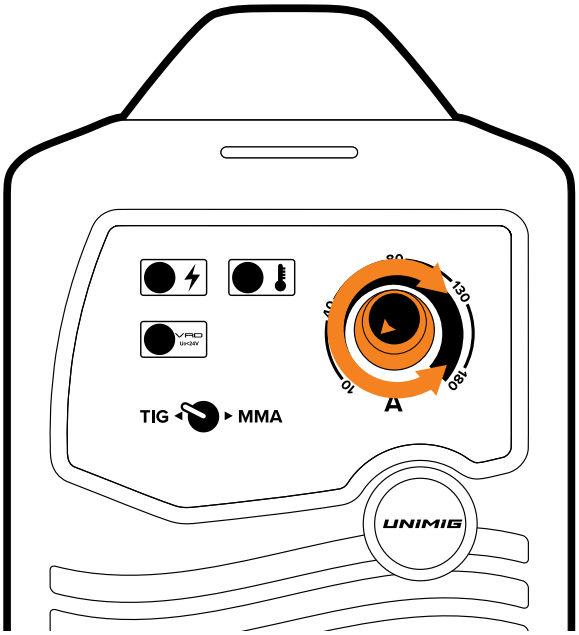
7. Connect gas hose to the flowmeter outlet, and crimp in place.



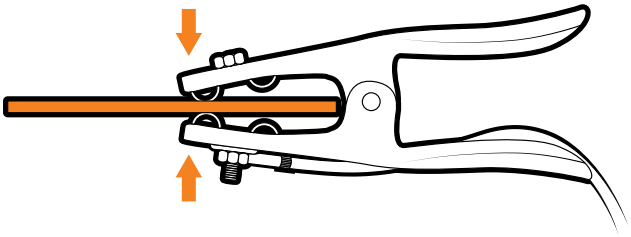
8. Adjust gas flow to 6-12L/min.



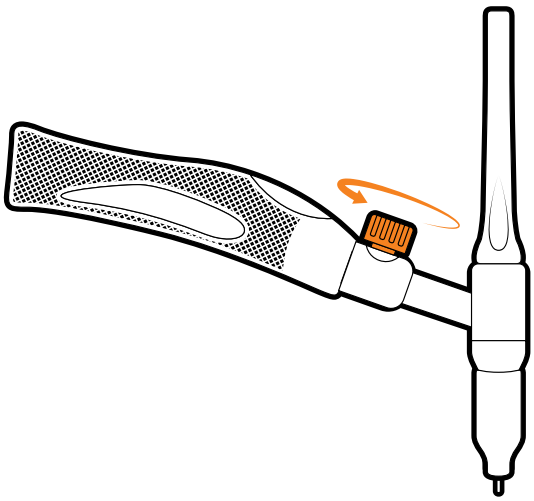
9. Set the welding current using the amperage control dial.



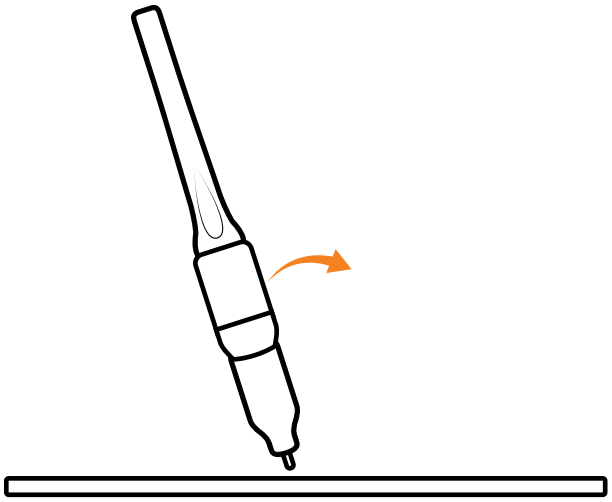
10. Connect earth clamp to your workpiece.



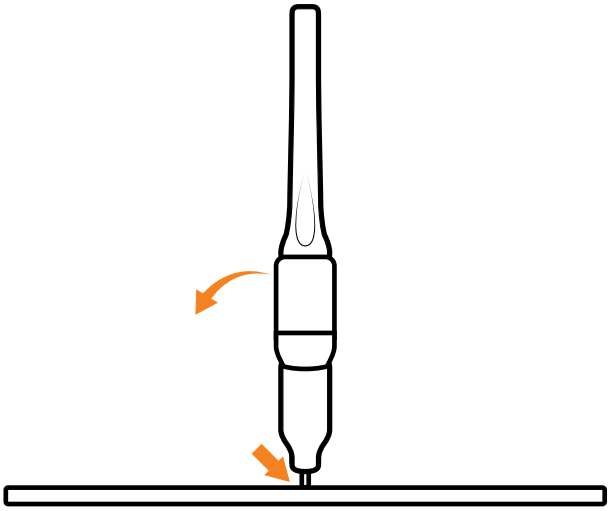
11. Turn on the gas valve located on the TIG torch handle.



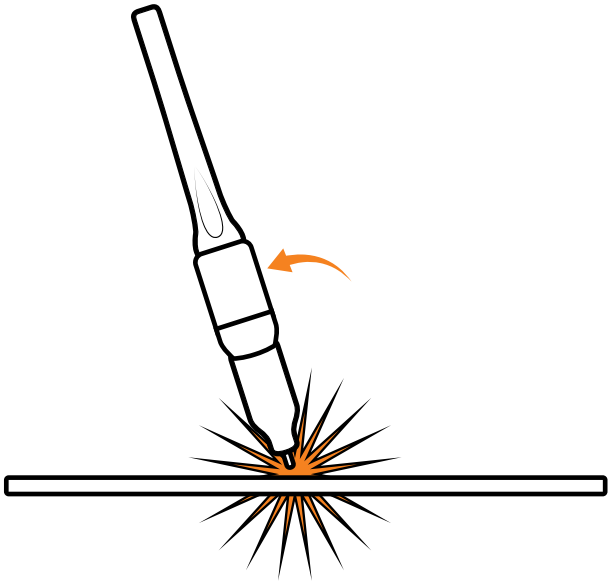
12. Lay the outside edge of the gas cup on the workpiece with the tungsten electrode 1- 2mm from the workpiece.



13. With a small movement rotate the gas cup forward so that the tungsten electrode touches the workpiece.



14. Now rotate the gas cup in the reverse direction to lift the tungsten electrode from the workpiece to create the arc.



IMPORTANT! - We strongly recommend that you check for gas leakage prior to operation of your machine. We recommend that you close the cylinder valve when the machine is not in use.

Welding Guns Of Australia PTY LTD, authorised representatives or agents of Welding Guns Of Australia PTY LTD will not be liable or responsible for the loss of any gas.

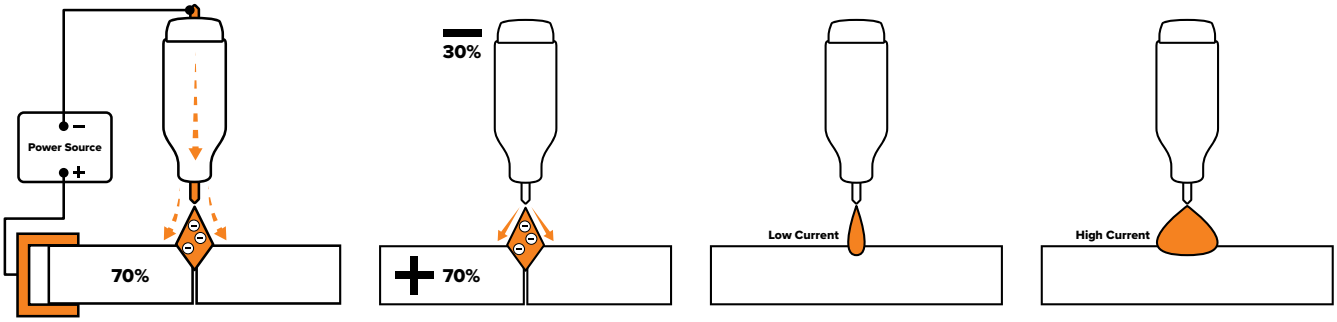
9. TIG: Welding Guide

9.1 DC TIG Welding

The DC power source uses what is known as DC (direct current) in which the main electrical component known as electrons flow in only one direction from the negative pole (terminal) to the positive pole (terminal). In the DC electrical circuit, there is an electrical principle at work which should always be taken into account when using any DC circuit. With a DC circuit, 70% of the energy (heat) is always on the positive side. This needs to be understood because it determines what terminal the TIG torch will be connected to (this rule applies to all the other forms of DC welding as well).

DC TIG welding is a process in which an arc is struck between a tungsten electrode and the metal workpiece. The weld area is shielded by an inert gas flow to prevent contamination of the tungsten, molten pool and weld area. When the TIG arc is struck, the inert gas is ionised and superheated, changing its molecular structure, which converts it into a plasma stream. This plasma stream flowing between the tungsten and the workpiece is the TIG arc and can be as hot as 19,000°C. It is a very pure and concentrated arc which provides the controlled melting of most metals into a weld pool. TIG welding offers the user the highest amount of flexibility to weld the widest range of material thickness and types. DC TIG welding is also the cleanest weld with no sparks or spatter.

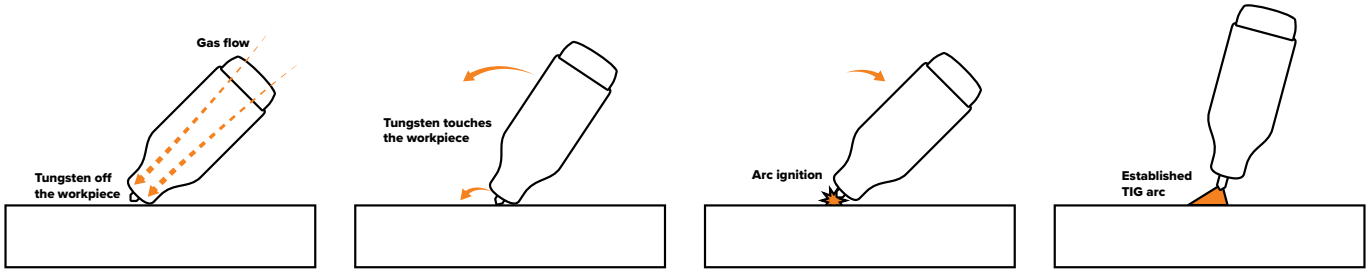
The intensity of the arc is proportional to the current that flows from the tungsten. The welder regulates the welding current to adjust the power of the arc. Typically thin material requires a less powerful arc with less heat to melt the material, so less current (amps) is required. Thicker material requires a more powerful arc with more heat, so more current (amps) are necessary to melt the material.



9.2 Lift Arc Ignition for TIG (Tungsten Inert Gas) Welding

Lift Arc is a form of arc ignition where the tungsten electrode is touched to the workpiece and then pulled upwards to initiate an arc. When the machine detects that the tungsten has left the surface and a spark is present, it immediately (within microseconds) increases power, converting the spark to a full arc. It is a simple, safe, lower-cost alternative arc ignition process to HF (high frequency) and a superior arc start process to scratch start.

Lift Arc ignition allows the arc to be started easily in DC TIG by simply touching the tungsten to the workpiece and lifting it to start the arc. This prevents the tungsten tip from sticking to the workpiece and breaking the tip from the tungsten electrode. There is a particular technique called “rocking the cup” used in the Lift Arc process that provides easy use of the Lift Arc function.



Lay the nozzle on the job without the tungsten touching the work.

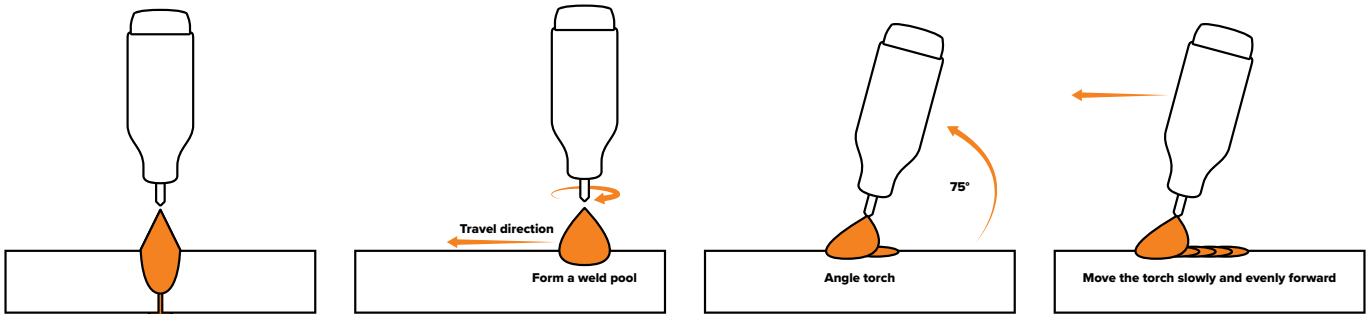
Rock the torch sideways so that the tungsten touches the work & hold momentarily.

Rock the torch back in the opposite direction, the arc will ignite as the tungsten lifts off the work.

Lift the torch to maintain the arc.

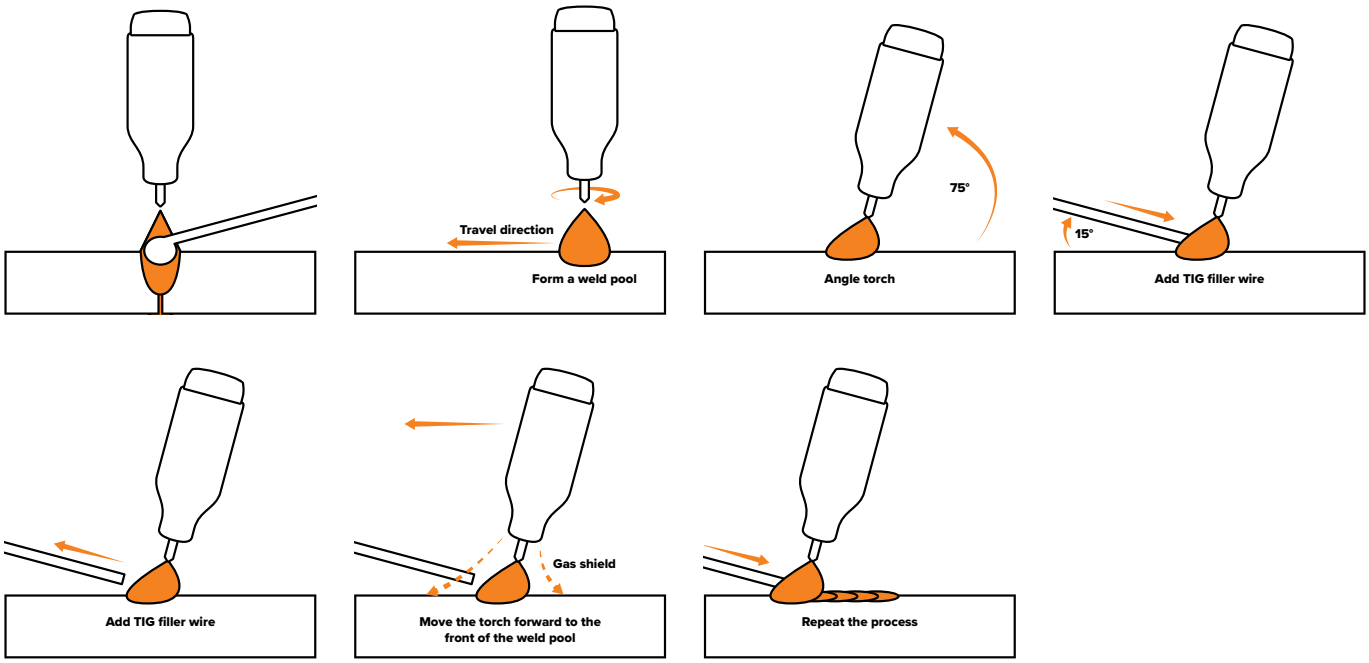
9.3 TIG Welding Fusion Technique

Manual TIG welding is often considered the most difficult of all the welding processes. Because the welder must maintain a short arc length, great care and skill are required to prevent contact between the electrode and the workpiece. Similar to Oxygen Acetylene torch welding, TIG welding typically requires two hands and in most instances requires the welder to manually feed a filler wire into the weld pool with one hand while manipulating the welding torch in the other. However, some welds combining thin materials can be accomplished without filler metal, such as edge, corner, and butt joints. This is known as Fusion welding where the edges of the metal pieces are melted together using only the heat and arc force generated by the TIG arc. Once the arc is started, the torch tungsten is held in place until a weld pool is created, a circular movement of the tungsten will assist in creating a weld pool of the desired size. Once the weld pool is established, tilt the torch at about a 75° angle and move smoothly and evenly along the joint while fusing the materials together.



9.4 TIG Welding with Filler Wire Technique

It is necessary for many situations with TIG welding to add a filler wire into the weld pool to build up weld reinforcement and create a strong weld. Once the arc is started, the torch tungsten is held in place until a weld pool is created, a circular movement of the tungsten will assist in creating a weld pool of the desired size. Once the weld pool is established, tilt the torch at about a 75° angle and move smoothly and evenly along the joint. The filler metal is introduced to the leading edge of the weld pool. The filler wire is usually held at about a 15° angle and fed into the leading edge of the molten pool. The arc will melt the filler wire into the weld pool as the torch is moved forward. Also, a dabbing technique can be used to control the amount of filler wire added. The wire is fed into the molten pool and retracted in a repeating sequence as the torch is moved slowly and evenly forward. It is essential during the welding to keep the molten end of the filler wire inside the gas shield as this protects the end of the wire from being oxidised and contaminating the weld pool.



9.5 TIG Tungsten Selection Guide

	 LANTHANATED (GOLD)	 ZIRCONIATED (WHITE)	 THORIATED (RED)	 RARE EARTH (PURPLE)	 CERIATED (GREY)
AC CURRENT	✓	✓		✓	✓
DC CURRENT	✓		✓	✓	✓
ALUMINIUM	✓	✓		✓	✓
MILD STEEL	✓		✓	✓	✓
STAINLESS STEEL	✓		✓	✓	✓
TITANIUM / COPPER ALLOYS	✓		✓	✓	✓
ARC IGNITION	●●●●●	●●●●●	●●●●●	●●●●○	●●●●○
TUNGSTEN LIFE	●●●●○	●●●○○	●●●●●	●●●●○	●●●●○
ARC STABILITY	●●●●○	●●●●●	●●●●●	●●●●○	●●●●○
RESISTANCE TO CONTAMINATION	●●●○○	●●●●●	●●●●●	●●●●○	●●●○○
AC PERFORMANCE	●●●●○	●●●●●	N/A	●●●○○	●●●○○

This information is intended to act as a guide only, individual results may vary depending on technique, skill and material.

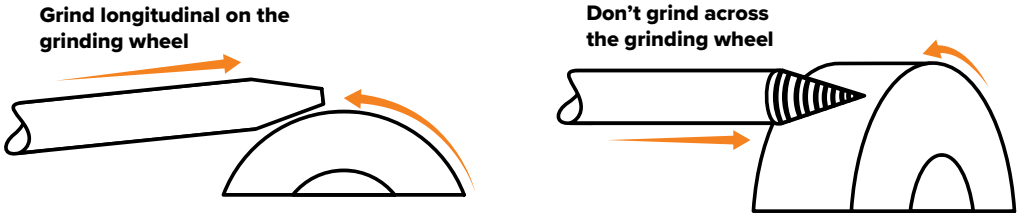
9.6 Tungsten Electrodes Rating for Welding Currents

Tungsten Diameter (mm)	Diameter at the Tip (mm)	Constant Included Angle (°)	Current Range (Amps)	Current Range (Pulsed Amps)
1.0mm	0.25	20	5 - 30	5 - 60
1.6mm	0.5	25	8 - 50	5 - 100
1.6mm	0.8	30	10 - 70	10 - 140
2.4mm	0.8	35	12 - 90	12 - 180
2.4mm	1.1	45	15 - 150	15 - 250
3.2mm	1.1	60	20 - 200	20 - 300
3.2mm	1.5	90	25 - 250	25 - 350

9.7 Tungsten Preparation

Always use DIAMOND wheels when grinding and cutting. While tungsten is a tough material, the surface of a diamond wheel is harder, and this makes for smooth grinding. Grinding without diamond wheels, such as aluminium oxide wheels, can lead to jagged edges, imperfections, or poor surface finishes not visible to the eye that will contribute to weld inconsistency and weld defects.

Always ensure to grind the tungsten in a longitudinal direction on the grinding wheel. Tungsten electrodes are manufactured with the molecular structure of the grain running lengthwise and thus grinding crosswise is "grinding against the grain." If electrodes are ground crosswise, the electrons have to jump across the grinding marks, and the arc can start before the tip and wander. Grinding longitudinally with the grain causes the electrons to flow steadily and easily to the end of the tungsten tip. The arc starts straight and remains narrow, concentrated, and stable.



9.8 Electrode Tip/Flat

The shape of the tungsten electrode tip is an important process variable in precision arc welding. A good selection of tip/flat size will balance the need for several advantages. The bigger the flat, the more likely arc wander will occur and the more difficult it will be to arc start. However, increasing the flat to the maximum level that still allows arc starts and eliminates arc wander will improve the weld penetration and increase the electrode life. Some welders still grind electrodes to a sharp point, which makes arc starting easier. However, they risk decreased welding performance from melting at the tip and the possibility of the point falling off into the weld pool.

9.9 Electrode Included Angle/Taper - DC

Tungsten electrodes for DC welding should be ground longitudinally and concentrically with diamond wheels to a specific included angle in conjunction with the tip/flat preparation. Different angles produce different arc shapes and offer different weld penetration capabilities. In general, blunter electrodes that have a larger included angle provide the following benefits:

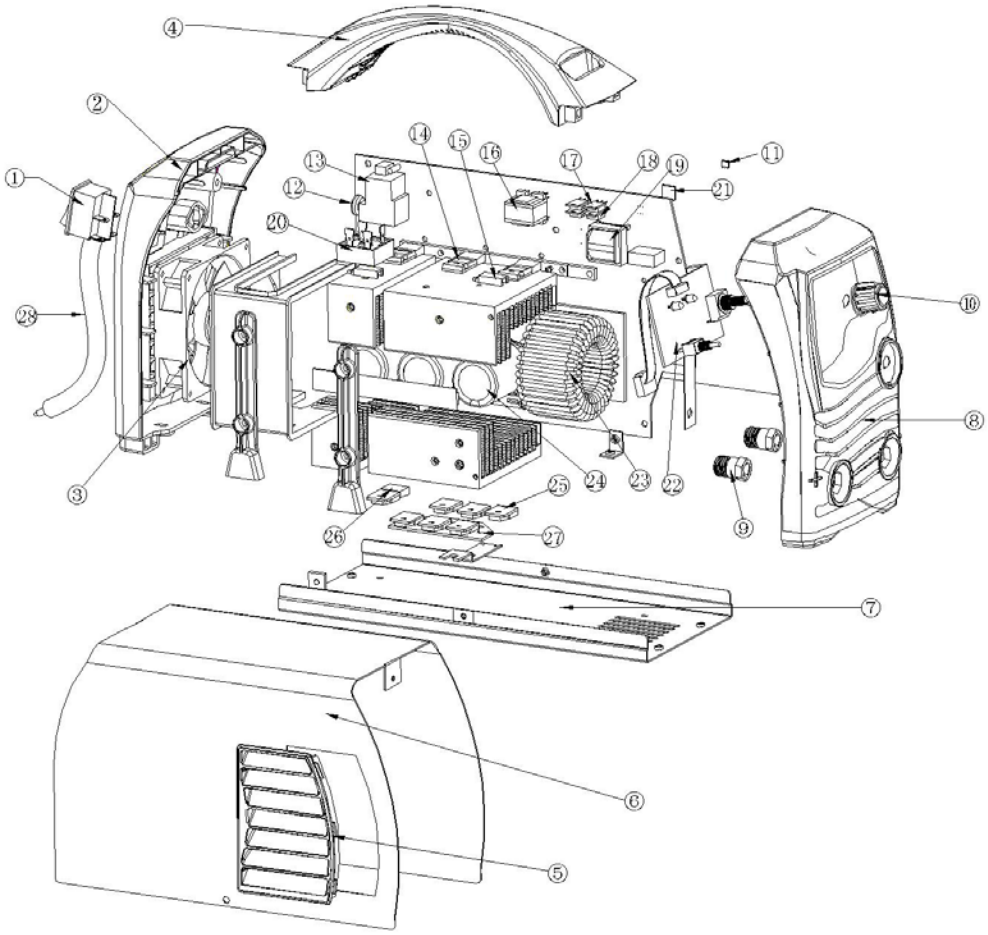
- Last longer
- Have better weld penetration
- Have a narrower arc shape
- Can handle more amperage without eroding

Sharper electrodes with smaller included angle provide:

- Offer less arc weld
- Have a wider arc
- Have a more consistent arc

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

10. Machine Parts Breakdown



Machine Spares		
1	10047746	Power switch
2	10037125	Back panel
3	10037797	Fan
4	10043477	Handle
5	10043689	Louver
6	10056798	Cover for RAZOR ARC 140
	10043024	Cover for RAZOR ARC 180
7	10037113	Base
8	10037128	Front panel for RAZOR ARC 140
	10043405	Front panel for RAZOR ARC 180
9	10037152	Quick socket for RAZOR ARC 140
	10037151	Quick socket for RAZOR ARC 180
10	30000103	Knob
11	10037147	LM79L15ACMX
15	10037859	Thermal switch

Machine Spares		
16	10037135	Drive transformer
17	10006284	IRF9Z24N
18	10006282	IRFZ24N
19	10037134	Switching power transformer
20	10037345	Bridge rectifier for RAZOR ARC 140
	10006650	Bridge rectifier for RAZOR ARC 180
21	10037146	TOP266KG
22	10070616	Control PCB for RAZOR ARC 140
	10070646	Control PCB for RAZOR ARC 180
23	10059799	HF transformer for RAZOR ARC 140
	10059446	HF transformer for RAZOR ARC 180
24	10005801	Electrolytic capacitor for RAZOR ARC 140
	10037138	Electrolytic capacitor for RAZOR ARC 180
25	10043957	Rectifier diode

WARNING: There are extremely dangerous voltage and power levels present inside this unit. Do not attempt to diagnose or repair unit by removing external cover unless you are an authorised repair agent for UNIMIG.

11. TIG Troubleshooting

11.1 Tungsten burning away quickly

- **Incorrect gas or no gas:** Use pure argon. Check cylinder has gas is connected, turned on and torch valve is open.
- **Inadequate gas flow:** Check the gas is connected, check hoses, gas valve and torch are not restricted.
- **Back cap not fitted correctly:** Make sure the torch back cap is fitted so that the O-ring is inside the torch body.
- **Torch connected to DC+:** Connect the torch to the DC- output terminal.
- **Incorrect tungsten being used:** Check and change the tungsten type if necessary.
- **Tungsten being oxidised after weld is finished:** Keep shielding gas flowing 10-15 seconds after arc stoppage. 1 second for each 10 amps of weld current.

11.2 Contaminated tungsten

- **Touching tungsten into the weld pool:** Keep tungsten from contacting weld puddle. Raise the torch so that the tungsten is off of the work piece 2-5mm.
- **Touching the filler wire to the tungsten:** Keep the filler wire from touching the tungsten during welding, feed the filler wire into the leading edge of the weld pool in front of the tungsten.

11.3 Porosity - Poor weld appearance and colour

- **Wrong gas / poor gas flow / gas leaks:** Use pure argon. Gas is connected, check hoses, gas valve and torch are not restricted. Set the gas flow between 6-12 L/min. Check hoses and fittings for holes, leaks etc.
- **Contaminated base metal:** Remove moisture and materials like paint, grease, oil, and dirt from base metal.
- **Contaminated filler wire:** Remove all grease, oil, or moisture from filler metal.
- **Incorrect filler wire:** Check the filler wire and change if necessary.

11.4 Yellowish residue/smoke on the alumina nozzle & discoloured tungsten

- **Incorrect gas:** Use pure argon gas.
- **Inadequate gas flow:** Set the gas flow between 6-12 L/min flow rate.
- **Alumina gas nozzle too small:** Increase the size of the alumina gas nozzle.

11.5 Unstable arc during DC welding

- **Torch connected to DC+:** Connect the torch to the DC- output terminal.
- **Contaminated base metal:** Remove materials like paint, grease, oil, and dirt, including mill scale from base metal.
- **Tungsten is contaminated:** Remove 10mm of contaminated tungsten and re-grind the tungsten.
- **Arc length too long:** Lower torch so that the tungsten is off of the work piece 2-5mm.

11.6 Arc wanders during DC welding

- **Poor gas flow:** Check and set the gas flow between 6-10 L/min flow rate.
- **Incorrect arc length:** Lower torch so that the tungsten is off of the work piece 2-5mm.
- **Tungsten incorrect or in poor condition:** Check that correct type of tungsten is being used. Remove 10mm from the weld end of the tungsten and re-sharpen the tungsten.
- **Poorly prepared tungsten:** Grind marks should run lengthwise with tungsten, not circular. Use proper grinding method and wheel.
- **Contaminated base metal or filler wire:** Remove contaminating materials like paint, grease, oil, and dirt, including mill scale, from base metal. Remove all grease, oil, or moisture from filler metal.

11.7 Arc difficult to start or will not start DC welding

- **Incorrect machine set up:** Check machine set up is correct.
- **No gas, incorrect gas flow:** Check the gas is connected and cylinder valve open, check hoses, gas valve and torch are not restricted. Set the gas flow between 6-10 L/min flow rate.
- **Incorrect tungsten size or type:** Check and change the size and or the tungsten if required.
- **Loose connection:** Check all connectors and tighten.
- **Earth clamp not connected to work:** Connect the earth clamp directly to the workpiece wherever possible.

12. MMA (STICK) Troubleshooting

12.1 No arc

- **Incomplete welding circuit:** Check earth lead is connected. Check all cable connections.
- **Wrong mode selected:** Check the MMA selector switch is selected.
- **No power supply:** Check that the machine is switched on and has a power supply.

12.2 Porosity - Small cavities or holes resulting from gas pockets in weld metal

- **Arc length too long:** Shorten the arc length.
- **Work piece dirty, contaminated or moisture:** Remove moisture and materials like paint, grease, oil, and dirt, including mill scale, from base metal.
- **Damp electrodes:** Use only dry electrodes.

12.3 Excessive Spatter

- **Amperage too high:** Decrease the amperage or choose a larger electrode.
- **Arc length too long:** Shorten the arc length.

12.4 Weld sits on top, lack of fusion

- **Insufficient heat input:** Increase the amperage or choose a larger electrode.
- **Work piece dirty, contaminated or moisture:** Remove moisture and materials like paint, grease, oil, and dirt, including mill scale, from base metal.
- **Poor welding technique:** Use the correct welding technique or seek assistance for the correct technique.

12.5 Lack of penetration

- **Insufficient heat input:** Increase the amperage or choose a larger electrode.
- **Poor welding technique:** Use the correct welding technique or seek assistance for the correct technique.
- **Poor joint preparation:** Check the joint design and fit up, make sure the material is not too thick. Seek assistance for the correct joint design and fit up.

12.6 Excessive penetration - Burn through

- **Excessive heat input:** Reduce the amperage or use a smaller electrode.
- **Incorrect travel speed:** Try increasing the weld travel speed.

12.7 Uneven weld appearance

- **Unsteady hand, wavering hand:** Use two hands where possible to steady up, practise your technique.

12.8 Distortion - Movement of base metal during welding

- **Excessive heat input:** Reduce the amperage or use a smaller electrode.
- **Poor welding technique:** Use the correct welding technique or seek assistance for the correct technique.
- **Poor joint preparation and or joint design:** Check the joint design and fit up, make sure the material is not too thick. Seek assistance for the correct joint design and fit up.

12.9 Electrode welds with different or unusual arc characteristic

- **Incorrect polarity:** Change the polarity, check the electrode manufacturer for correct polarity.

Notes

Notes

Notes

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