UNIMIG®

THE ULTIMATE WELDING GUIDE


TIG
LIFE
UNIMIG

CONTENTS

CHOOSING THE RIGHT SAFETY GEAR

Wearing the correct clothing is essential. This includes a flame-resistant and long-sleeve jacket, leather gloves, long pants, leather shoes or boots, a welding helmet, safety glasses and a bandana or hood.

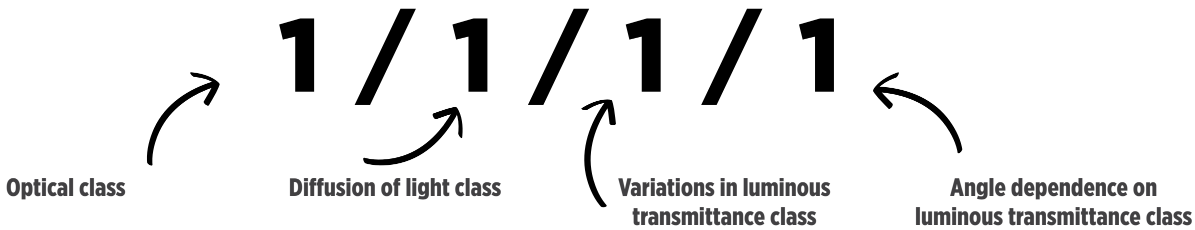
WELDING HELMETS

Your welding helmet is one of the most important safety items that you'll need for any weld. They protect your eyes and skin from the UV and IR rays, plus the blue light emitted from the arc during a weld. They also protect from sparks and smoke.

Merely having the helmet is not enough though, it'll only be useful if it's being used correctly. Auto-darkening helmets come with a range of shades, but you'll still need to select the correct shade or the right mode to ensure you're getting the proper coverage for your eyes. While a 'bucket hat' helmet, one of the older versions of helmet, may be cheaper, is it really worth sacrificing your eyes to save a few bucks?

OPTICAL CLARITY CLASSIFICATIONS

Every auto-darkening helmet has four critical categories evaluated to determine its optical clarity. The optical clarity boils down to how well you can see out of the helmet. These tests are rated from 1 to 3, with 1 being the best and 3 being the worst. The four tests are:



Optical class: how distorted is the image through the lens? If you look through the lens and it's like looking through rippled water, then it's not a good helmet. The image should be clear and crisp to obtain a 1 rating.

Diffusion of light class: are there impurities in the lens from the manufacturing process? These impurities make the lens unclear and hard to see out of, like fingerprints or scratches on glasses. The lens should be uniform and clear to obtain a 1 rating.

Variations in luminous transmittance class: focuses on the lens's adjustable shade function. Once a shade has been selected, how consistent is it across the lens? A quality lens will be the same shade up or down, left to right, and in the corners. There should be no areas that are too bright or too dark, as this affects the optical clarity. An even shade across the entire lens is needed to obtain a 1 rating.

Angle dependence on luminous transmittance class: there should be a clear view with no stretching, dark areas, blurriness, or problems when looking at an angle. This is similar to variations in luminous transmittance, as it measures the consistency of the shades across the lens but at an angle. It should look the same downwards or upwards as it does straight through to obtain a 1 rating.

When you're looking for a helmet, you'll want one that has a good score on these classifications (1/1/1/1 is the best), as well as one that meets the Australian and New

Zealand standards. Every UNIMIG helmet meets the required standards AS/NZS 1338.1 and AS/NZS 1337.1B (high impact), so you can't go wrong regardless of which helmet you buy. However, we do still recommend safety glasses for that added protection.

NOTE: the Aussie and Kiwi standards are not interchangeable with European ones, so make sure you purchase a helmet from a reputable brand that meets the local requirements for the safest weld.

SHADE RANGE

The shade range of a helmet is how light or dark your helmet filter can get. The higher the number, the darker the shade.

It's important to find a balance between adequately protecting your eyes while still clearly seeing your workpiece. Several factors should be considered when picking a shade:

- Weld type
- Amperage
- Switching between jobs

There are recommended shades for each type of welding and the amps you're welding at.

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<tr><th>MIG PLATE WELDING</th><td colspan="12">Shade 10</td><td colspan="3">Shade 11</td><td colspan="5">Shade 12</td><td colspan="4">Shade 13</td><td></td></tr>
<tr><th>MIG SHEET METAL</th><td colspan="12">Shade 10</td><td colspan="3">Shade 11</td><td colspan="3">Shade 12</td><td colspan="3">Shade 13</td><td colspan="4"></td></tr>
<tr><th>TIG</th><td colspan="7">Shade 9</td><td colspan="2">Shade 10</td><td colspan="3">Shade 11</td><td colspan="3">Shade 12</td><td colspan="3">Shade 13</td><td colspan="7"></td></tr>
<tr><th>MAG</th><td colspan="11">Shade 10</td><td colspan="2">Shade 11</td><td colspan="2">Shade 12</td><td colspan="5">Shade 13</td><td colspan="5"></td></tr>
<tr><th>ARC GOUGING</th><td colspan="15">Shade 10</td><td colspan="2">Shade 11</td><td colspan="2">Shade 12</td><td colspan="2">Shade 13</td><td colspan="4"></td></tr>
<tr><th>PLASMA CUTTING</th><td colspan="14">Shade 11</td><td colspan="4">Shade 12</td><td colspan="7">Shade 13</td></tr>
<tr><th>PLASMA WELDING</th><td>4</td><td>5</td><td>6</td><td>7</td><td>8</td><td>9</td><td colspan="2">Shade 10</td><td colspan="2">Shade 11</td><td colspan="3">Shade 12</td><td colspan="4">Shade 13</td><td colspan="8"></td></tr>
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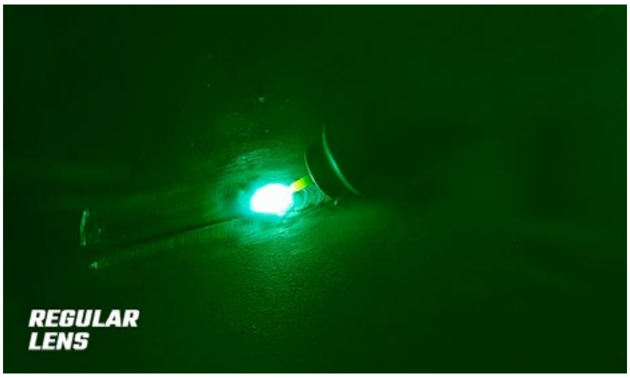
ELITEVISION™ LENS TECHNOLOGY

The ELITEVISION technology in UNIMIG helmets allows for true colour view. True colour means that more colours from the spectrum can pass through the lens (more reds and blues, less green) for better optical clarity. It makes it much easier to clearly see the weld at all stages of the process, and it reduces eye fatigue so that you can weld for longer periods.



BACKUP BATTERY

A solar panel powers every UNIMIG helmet. This doesn't mean you need to sit it out in the sun every time you want to use it, though. Because a welding arc produces UV rays (which is what the helmet is protecting you from), the helmet charges at the same time as it's being used. Solar panel powered helmets still include an internal battery (this is what's being charged) which powers up the helmet, but they're not removable or replaceable. There is usually a power bar indicator inside the helmet, so you can keep an eye on how much power it has.

Some helmets also come with a backup battery, which will kick in if your helmet does run out of power. The battery will keep the filter working if you're in the middle of a weld, rather than having it turn off and flash you unexpectedly. These batteries are replaceable as well if the backups do, themselves, run out.

HARNESSES

When you're welding, especially if it's for long periods, comfort is essential. The harness on the helmet is what makes them comfortable. UNIMIG sells 3-point and 5-point harnesses. The more points of contact on the harness, the comfier it's going to be. Each point of contact allows for adjusting, so you can better fit the helmet to your head, and they help distribute the weight evenly so it's not straining your neck.

MAGNIFYING LENSES

Mag (or cheater) lenses lets you zoom in and get a closer view of your weld. Each UNIMIG helmet comes with the ability to insert a mag lens.

UNIMIG HELMETS

Every UNIMIG helmet is suitable for MIG, TIG, stick, plasma and grinding. On a 9-13 helmet, low amp TIG welding (3-5A) will not be possible. You'll need a shade 5-9 helmet for low amp TIG.

Each helmet comes with the following settings:

- Weld/Grind – weld mode or grind mode
- Shade – select the shade needed for your type of weld
- Sensitivity – how sensitive to the light your helmet is, turning this up will make the helmet auto-darken faster with more ambient light (e.g. if you're welding outside, turn it up for the helmet to more easily recognise when an arc has ignited)
- Delay – how quickly the helmet goes from dark to light, the delay is used a lot with pulse welding, as you don't want the helmet to lighten as the arc fades during the cycles

High-end helmets also come with three memory profile buttons on the inside.

RESPIRATORS

While your helmet is one of the most crucial items of Personal Protective Equipment (PPE), sparks and blindness are not the only health risks when you're welding. The fumes released from the metals as they're ground or welded can be toxic, so if you can't properly ventilate the space you're in, a respirator is essential.

The **ELIPSE Half-Mask P2 Respirator** is approved to AS/NZS 1716:2012, lightweight, low profile for full visibility and compatible with every UNIMIG and most other helmets available.

Otherwise, you can also get a **Powered Air Purifying Respirator Helmet**. This features a powered respirator, which sits on your hips like a bum bag and feeds air in through a hose to the back of the helmet. It will keep fresh air blowing through your helmet for several hours, so you won't need to worry about breathing in any dirty outside air.

Both of these options will keep your lungs safe from the fumes as you weld.

WELDING JACKETS

There are a number of welding jackets that are available at UNIMIG. The first is the **ROGUE Welding Jacket**, which is made from flame retardant treated cotton. It's ideal for light duty welding, and the cotton material makes it lightweight as well, great for hotter conditions.

The second option, the **ROGUE Leather Sleeved Welding Jacket**, is a hybrid of sorts, with a treated cotton torso and full leather sleeves. The leather sleeves help with extra protection against spatter, and this jacket is recommended for both light and heavy-duty welding.

Our final jacket, the **ROGUE Full Leather Welding Jacket**, is a fully protective, fully leather piece. It's great for both light and heavy-duty welding but is definitely the best option if you're going to be doing overhead welds, as it gives that bit extra against any dripping molten metal.

WELDING GLOVES

Jackets aren't the only apparel that comes with multiple options. There are also a range of welding gloves available depending on the type of welding you're doing. The first pair of gloves are our **ROGUE Heavy Duty Welding Gloves**, which are quite thick. They're designed for high heat MIG and plasma cutting, so you can go for longer stretches before your hands start to feel the heat from the gun.

The second set of gloves are the **Medium Duty Welding Gloves**, which are a nice middle ground. They're not as thick and bulky as the Heavy Duty, but they'll still keep your hands from feeling the heat of the weld.

Our third pair are the **ROGUE TIG Welding Gloves**. These are, as it says, designed for TIG welding. They're thinner, with a much tighter fit, so that you can get a proper feel for your filler metal, which is important for a good TIG weld. TIG is also usually done at a lower heat level than other welding, so you can get away with thinner gloves as your torch won't heat up as fast either.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BUILT FOR WELDERS

There are a few factors that will influence the type of welding that will work best for you. How big is the job? Are you welding indoors or outdoors? How thick is the metal you want to weld? What's your budget? These are all things to consider when deciding which type of welder you'll need.

WHAT IS MIG WELDING?

Metal Inert Gas (MIG) welding is an arc welding process in which a solid wire (the filler metal) is continuously fed through the welding machine and into the weld pool that's created by the arc to form a weld. The process of MIG welding is semi-automatic, as the machine does all the wire feeding for you. This is why MIG welding is considered one of the easiest types of welding to learn and a great place to start for beginners.

MACHINE SETUP

1. Gas vs gasless
2. Rollers
3. Torch
4. Wire spool
5. Voltage/wire speed setup

1. GAS VS GASLESS

There are two ways to MIG weld. The first (and most common) is with gas. The gas is used to shield the weld metal from any outside contaminants when welding. The second is gasless, and the filler metal used has a flux core, which protects the weld instead of gas.

PROS OF GAS	PROS OF GASLESS
• Less spatter • Less fumes • Welding quality • Better performance on thinner materials	• Lighter & more portable • Lower setup cost • Outdoor use

If you're using a shielding gas for your weld, there are a few to choose from, as different metals require different shields. The best gas to use for mild steel and stainless steel is a mixture of argon and carbon dioxide (75% Ar/25% CO_2); however, straight carbon dioxide works as well. You can also add a small amount of oxygen to the $ArCO_2$ mix. If you're welding with aluminium, then you'll need pure argon for your shielding gas.

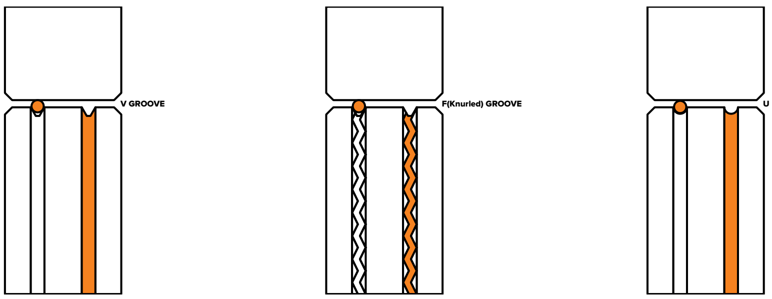
When you're using gas, all you need to do is attach the regulator to the tank, attach the gas hose from the welding machine to the regulator and set your gas flow. Every UNIMIG machine comes with a gas regulator, so don't worry about having to buy your own. The regulator comes with two dials. One shows how much gas is still in the tank, and the second shows your gas flow rate. Twist the regulator valve to set how much gas flow you want for the weld. UNIMIG recommends an 8-12L per minute gas flow rate for all MIG welding, and these recommended settings can be found on the guide table inside each machine.

If you're welding outdoors with gas, you'll find you may need to turn up the gas flow or set up a cover, as the breeze can affect how much gas is reaching the weld pool. If you're shielding gas is being blown away, then the weld will be prone to defects like porosity (the Swiss cheese look).

The polarities will also require different setups depending on whether you have chosen gas or gasless welding. Gas welding with aluminium, stainless steel, and mild steel all require an electrode positive polarity. This means that you need to insert the polarity cable into the **Positive (+)** panel mount and the earth clamp (which comes provided) into the **Negative (–)** panel mount. If you are using gasless wire, then the polarity is switched; the polarity cable would go into the **Negative (–)** and the earth clamp into the **Positive (+)**. While some machines are limited to gas or gasless only, at UNIMIG, all of our MIG welders are capable of both processes. A good example is the **VIPER 185 MIG/TIG/Stick Welder**, a multi-process machine made specifically for home welders, which will let you trial every type of welding you can think of (except AC TIG).

Regardless of whether you are using gas or gasless wire, your earth clamp will need to be attached to your workpiece (the metal you're welding) or something metal that will conduct to your workpiece nearby; otherwise, the machine won't weld.

2. ROLLERS



METAL	Mild & Stainless Steel	Gasless Steel	Aluminium
ROLLER	V Groove	F or K Groove	U Groove

Each roller comes with two grooves; these are the wire sizes (e.g. 0.6mm & 0.8mm). You'll need to make sure the roller groove size is the same as the wire you are using. To replace a roller, unscrew the retaining cap and take the old roller off. Place the new roller on (lining up the keyway on the roller with the key on the machine) and re-screw the retaining nut.

3. TORCH

MIG welding torches come with a Euro connection which plugs directly into the front of the machine.

3 TYPES OF MIG TORCHES

- Binzel style

- Tweco style
- Bernard style

The main difference between these three torch types is that they were initially made by different manufacturers. Though the consumables for each look the same, you have to match your consumable type to the torch type; otherwise, they won't fit.

Every UNIMIG MIG machine comes with a Binzel style torch, but all three are available for purchase.

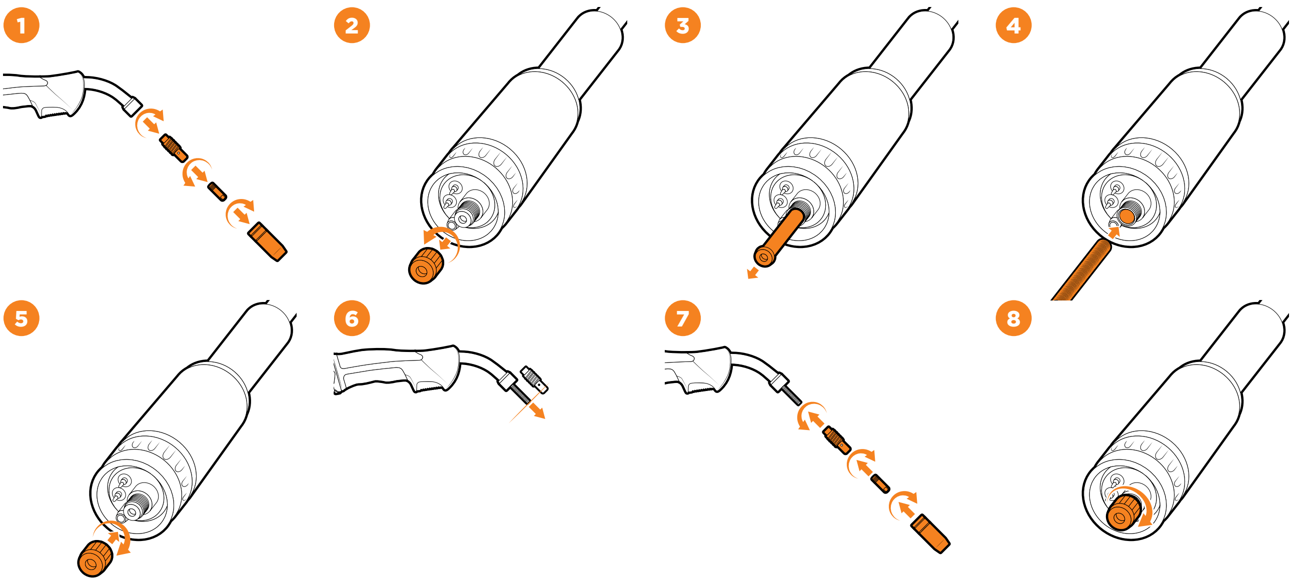
LINERS

A liner guides your wire inside the torch lead, and this liner ensures the wire makes it out of the torch tip. You may need to change your liner before you feed your wire through, as these liners – much like the rollers – will only fit specific sizes.

Let's use an example. The **RAZOR 200 MIG/Stick Welder** has a wire size range of 0.6mm-1mm. If you started with a weld that only needed 0.6mm wire and then changed to a weld that needed 1mm wire, you'd need to change liners.

To change a liner:

1. Remove MIG torch front end parts.
2. Remove the liner retaining nut.
3. Carefully pull out and completely remove the existing liner. Ensure MIG torch is completely unravelled until setup is complete.
4. Carefully feed in the new liner down the torch lead all the way to exit the torch neck.
5. Fit the liner retaining nut and screw only 1/2 way down.
6. Snip the excess liner off, about the length of the where tip holder sits past the end of the torch neck.
7. Replace the front end parts.
8. Fully screw down the liner retaining nut and nip it up tight. This compresses the liner inside the torch cable assembly preventing it from moving during use and ensures good wire feed.



When you're changing your liner, it's best to keep the torch entirely straight and go slowly, as you don't want to kink the liner itself.

There are separate liners for steel wires and aluminium wires. If you're going to use a standard MIG torch for an aluminium wire, you'll need an aluminium specific liner (in the correct size). This liner goes in and out the same way as steel liners, but you have to attach a neck spring on the top of the liner before inserting it. The neck spring keeps the liner ridged so it can be fed into the torch with no issues and keeps the wire from kinking.

When you're welding, try to keep the torch hose as loosely looped (or straight) as possible because it will minimise the chance of kinking the wire inside.

SPOOL GUN

As well as your standard MIG torches, you can also get an aluminium specific torch, called a 'spool gun'. Spool guns are set up slightly differently than the MIG torches, as the wire spool is not connected in the machine but in the gun itself. The spool holder can only hold 1kg rolls, so if you're doing a lot of aluminium welding, it'll run out faster than in a machine, and the gun is going to fatigue your hands faster.

The benefits of a spool gun for aluminium are worth it, though. Aluminium is a softer metal than steel, so it has its own roller grooves and specific torch liners. The softness of aluminium means that it'll kink way easier than steel will in a 4m torch despite all that. There's no stopping it; it's just a more difficult metal.

This is where your spool gun comes in. Because the wire is loaded into the gun (and then fed through the engine on the gun the same way the wire is fed through a machine's roller mechanism), it has less distance to travel and less chance to kink.

Aluminium and soft wires are best for spool guns, though you can still run steel through them, as there are rollers available for both.

Most machines will include a switch inside it that is labelled 'standard/spool gun'. Make sure this is flipped to the type of torch you have connected; the torch won't run if the switch is on the wrong setting.

NOTE: If you have a water-cooling torch, you will also need to attach the blue and red water cables to the welding machine and the water cooler so that the water can flow through the torch.

4. WIRE SPOOL

Before you begin, it's essential that the filler metal you purchase matches the metal you plan to weld (your parent metal). Thanks to chemical compounds, mismatched metals won't weld together properly unless you are using a filler metal capable of doing this, and the weld will be terrible quality.

The wire spool is like a loaded spring, so when you first undo the wire, don't place it straight down onto a table or other surface as it will unravel, and you'll have to clip off everything that has unwound. Unfortunately, you won't be able to rewind it because it'll no longer be precision wound, and there'll be a much higher chance that the wire will birdnest inside the wire feed mechanism, halting your weld.

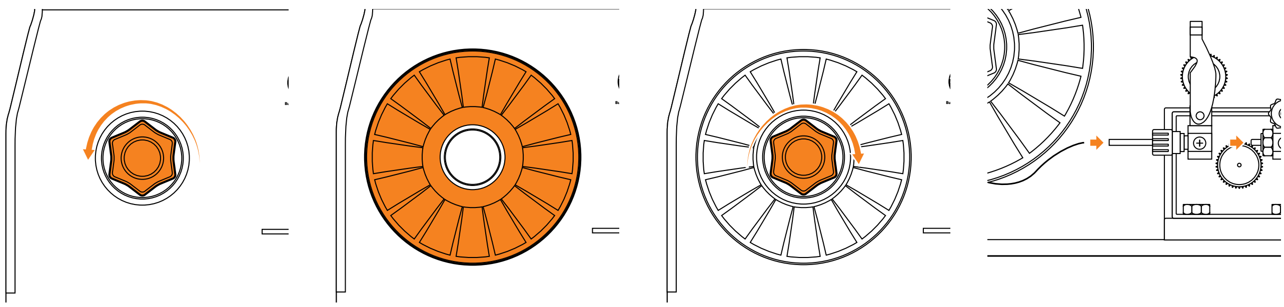
The spool attaches inside the machine on the spool holder, which consists of a shaft and a nut. There is a locating lug on the back plastic plate of the spool holder that you need to line up with the locating hole on the wire spool. These look like a small round bump and dent, respectively. Once you've lined them up, slide your spool onto the shaft and screw your nut back in to lock the spool into place.

You'll need to feed the first part of the wire into the inlet guide, over the roller and into the beginning of the guide tube before you let go of it to stop it from unravelling.

Now that the wire spool is attached inside the machine, feed it through the torch until it sticks out of the torch nozzle. You can feed the wire through in two ways; hold down the trigger on the torch or press the feed wire button inside the machine. When feeding through a new spool of wire, it's a good idea to remove the nozzle and contact tip from the end of the torch so that the wire doesn't catch on them and birdnest inside the machine. Both parts screw on and off with ease, so there's no hassle.

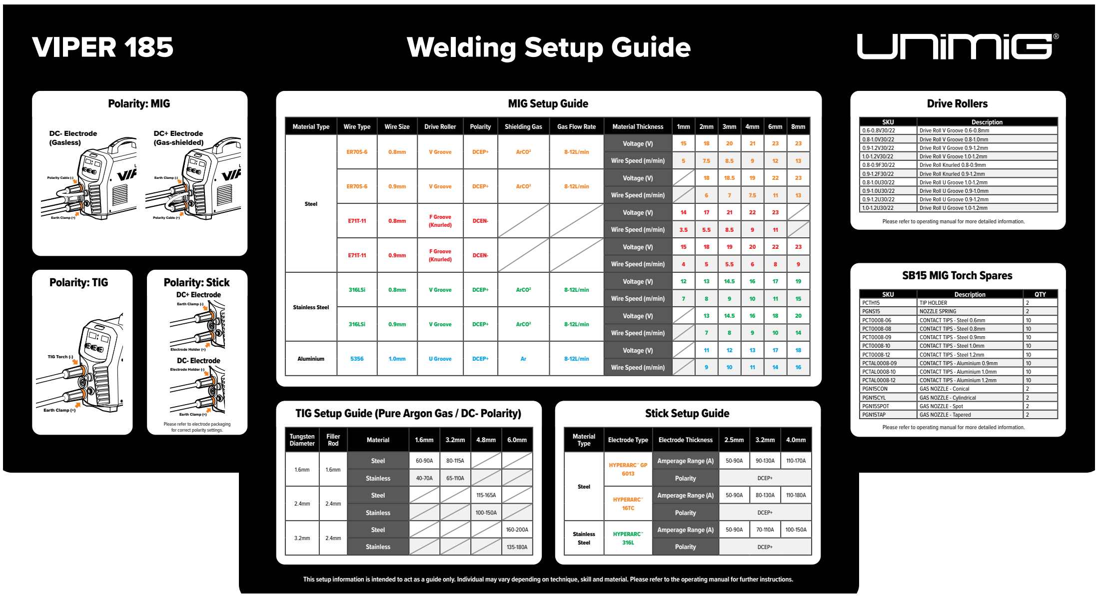
With a new spool, you'll also need to adjust the tension on the wire. Feed your wire until about 50mm (5cm) hangs out of the torch tip. Lock the tension lever and decrease the tension by rotating counter-clockwise so that the wire slips (the rollers are spinning, but the wire doesn't move) when the trigger is pulled. Now turn your tension lever clockwise 180° to increase your tension and grip the exposed wire between your thumb and forefinger (in gloves, the wire gets hot) with light pressure. Pull the trigger again while holding the wire. If the wire slips again, repeat the process, rotating the tension lever clockwise by 180° each time, until you can't stop it with your fingers, and it feeds smoothly. Be careful though, too much tension can flatten your wire.

Once you've sorted your tension, trim any excess wire hanging out of the tip. You want your wire to stick out of the torch nozzle by roughly 1cm. If the wire sticks out too far, trim it back. If you start with too much wire, it will just burn off. Some machines have a burnback function that allows you to determine the wire's burnback after your finish welding as well.



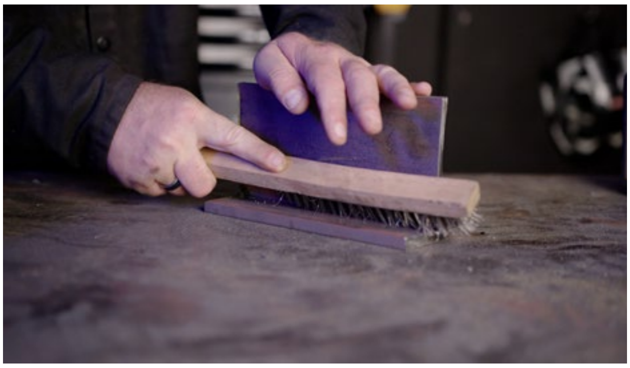
5. VOLTAGE AND WIRE SPEED

Every UNIMIG welding machine comes with a User Manual and Setup Guide, which provides a good starting point for your machine settings. It gives a detailed description of which wire speed and voltage you'll need for a range of metal types, wire sizes and parent metal thicknesses. It also includes the gas flow rate that is recommended for each of these.



METAL PREPARATION

Unfortunately, MIG isn't as forgiving as stick welding, so you'll need to either wire brush or grind your workpiece so that it's clean. Otherwise, you won't get a quality weld.



STARTING YOUR WELD

Now that your machine and workpiece are set up, you're ready for the next step: starting the weld. With the voltage and wire speed set, the rest of the welding is up to you.

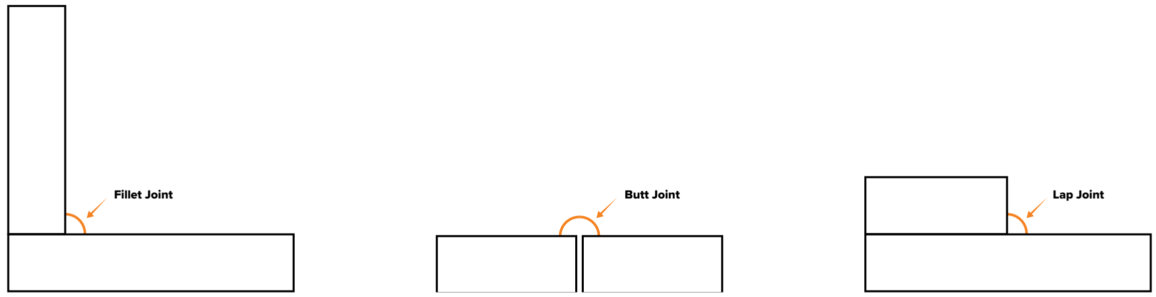
There are three main factors to consider when doing a weld:

1. Work angle
2. Travel angle & distance
3. Travel speed

This is true regardless of whether you are TIG, MIG or stick welding.

1. WORK ANGLE

Your work angle is your torch in relation to the angle of the joint. There are a few different joint types, and several positions these joints can be found.

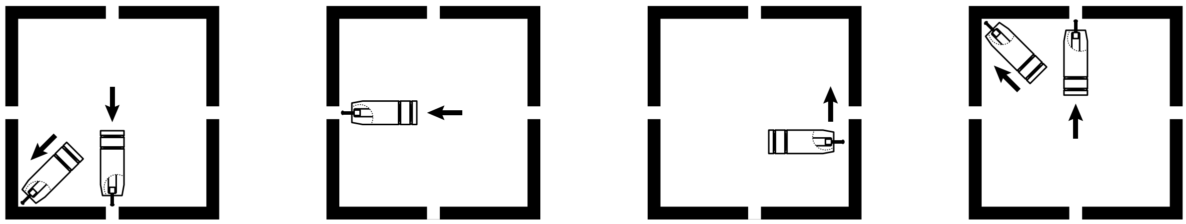


T-joint / Fillet Joint	Butt Joint	Lap Joint
90° joint angle	180° joint angle	90° joint angle
45° work angle	90° work angle	60°/70° work angle

(These angles do not include your travel angle, which we'll talk about next.)

POSITIONS

Flat (butt & fillet) **Horizontal** **Vertical** **Overhead (butt & fillet)**

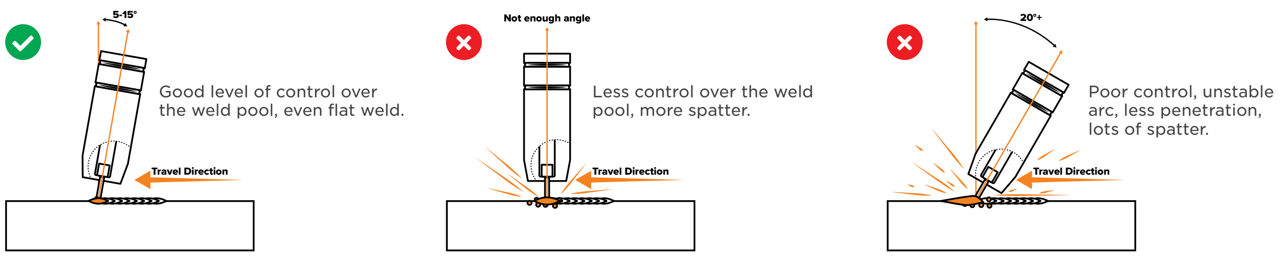


The main thing that your weld's position will affect is whether or not you'll be fighting against gravity as you go. You'll usually need to increase your travel speed and lower your amps to keep the molten metal from dripping, so while you're learning, flat positions are best.

2. TRAVEL ANGLE & DISTANCE

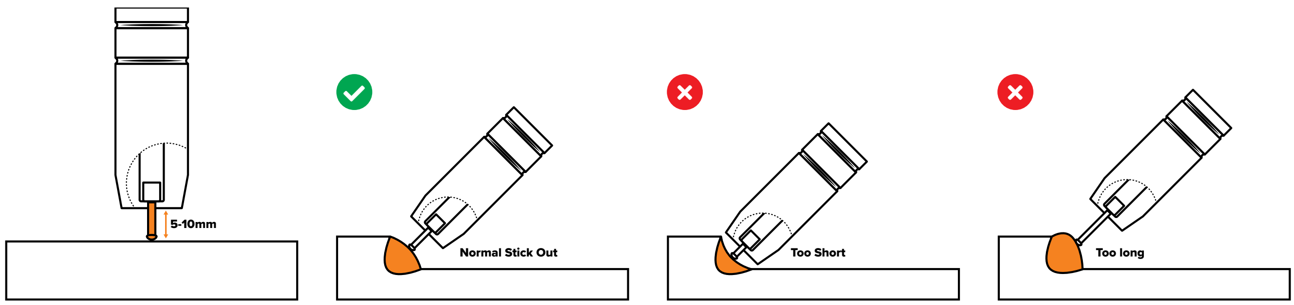
When MIG welding, you can travel at a pushing or a pulling angle, though it does depend on which wire is in the machine. If you're using mild steel, stainless steel or aluminium, you'll want to travel at a pushing angle (torch over the weld pool pushing towards the metal). If you're using flux-cored wire (gasless), you'll want to travel at a pulling angle (torch in front of the weld pool and dragging towards the metal).

Whether you're pushing or pulling, you want to keep your torch at a 10° to 15° angle. If your angle becomes too deep or parallel with the metal you're welding, you increase the spatter amount, decrease penetration, and create more mess that you'll have to clean up later.



For example, say you're welding in a fillet joint (a corner join) with a standard steel wire. Your torch will be angled into it at a 45° angle, and then you'll angle slightly to the side (in a push direction) so that your gas can cover the weld pool and in front of the weld as you go.

The other important thing to watch is the distance of your wire 'stickout'. You want to maintain the 1cm of stickout throughout the joint for the best weld. If your wire is sticking out too far as it's feeding and your torch nozzle is getting further away from your workpiece, it will cause a few problems.



Even arc, good penetration even fusion, good finish.

Unstable arc, spatter, overheat contact tip.

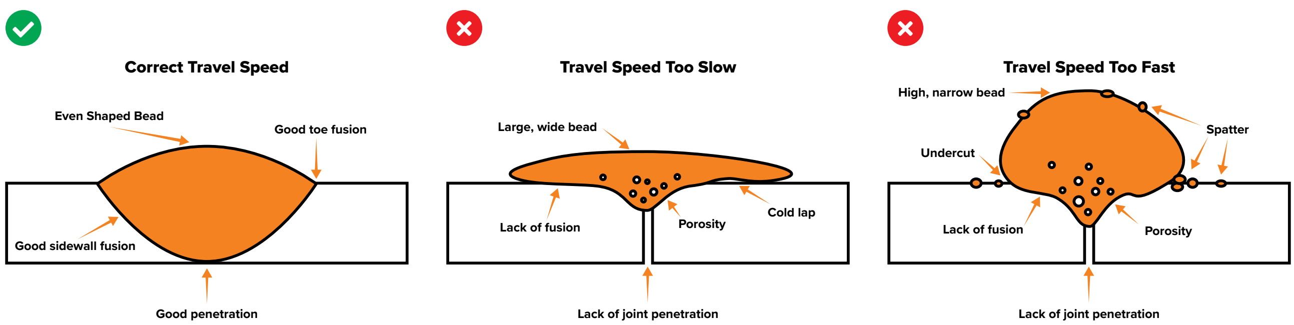
Unstable arc, spatter, poor penetration and fusion.

The first problem is that your feeding wire acts as a resistor, so the longer it is coming out of the torch and into the weld pool, the lower your machine will drop the amps, so it won't run as well. The second problem is that your shielding gas will no longer be able to reach your weld pool, and you'll increase the number of defects – like porosity – in your weld.

3. TRAVEL SPEED

Travel speed is how fast you are moving the torch along the weld. This is separate from the wire speed, but the two do impact each other. If you're moving too fast for your set wire speed, then there'll be nothing being fed into the weld pool to create a proper weld. On the other hand, if you're moving too slowly or you have too much wire being fed through, you're going to have a fat weld join that will need to be ground back, causing a lack of fusion on the toes (edges of the weld). You want to move at a speed that corresponds with your settings.

Keep your travel speed consistent across the entire weld for the best quality result.



MAKING THE WELD

Place your cleaned workpiece in front of you in a way that when you begin welding, your hands can move freely and steadily all the way along the joint. It's a good idea to have something to steady your hands against as they go along the weld so that you can maintain your angle and distance.

Check that your earth clamp has been attached to a metal surface, such as a (clean) metal workbench or the workpiece, because if your earth clamp isn't grounded, your machine won't start. If you're making a fillet join, you can use a magnetic welding clamp to hold your two pieces of metal together. Aluminium isn't magnetic, however, so a manual clamp will be needed.

The kind of wire you are using, will determine the technique required when welding.

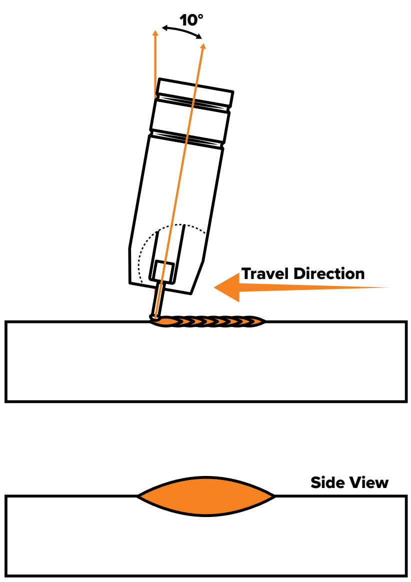
PUSH TECHNIQUE (GAS-SHIELDED WIRES)

The wire is located at the leading edge of the weld pool and pushed towards the un-melted work surface. This technique offers a better view of the weld joint and direction of the wire into the weld joint. The push technique directs the heat away from the weld puddle, allowing faster travel speeds and providing a flatter weld profile with light penetration - useful for welding thin materials. The welds are wider and flatter, allowing for minimal clean up/grinding time.

PULL TECHNIQUE (GASLESS WIRES)

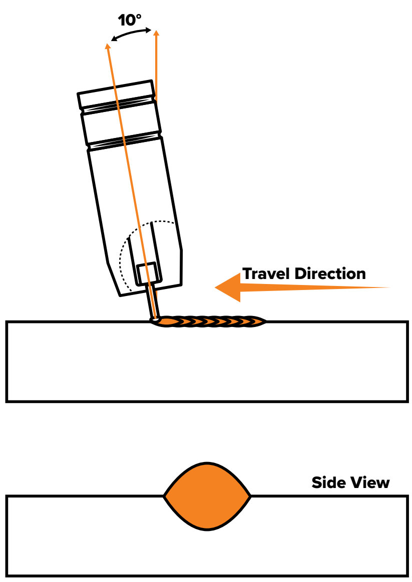
The gun and wire are pulled away from the weld bead. The arc and heat are concentrated on the weld pool. The base metal receives more heat, deeper melting, more penetration and the weld profile is higher with more build-up

PUSH TECHNIQUE



Flat, even weld profile, light penetration.

PULL TECHNIQUE



Narrower and higher weld profile, more penetration.

Start with your tacks. Remember to flip your welding helmet down before you ignite your arc. Tacks are used to fuse the metals together at the edges, so you don't have to hold them together while you're trying to weld.

Line your torch tip and wire up with where you want to make your tacks (usually on the edges of the piece) and press the trigger of your torch. You'll need to hold it continuously to maintain the arc. Hold it for a second or two until a small weld has formed, and then let go. These won't take more than a few seconds each to make; they only need to hold your joint together so you can make the proper weld without needing a clamp.

MIG welding itself is relatively easy once you've got the hang of your angles and speed; all you need to do is press the trigger and start pushing or pulling your weld along the joint. A good way to tell if it's going well is by how it sounds and how it looks while you're doing it. A proper weld should sound like crackling bacon. Being able to identify this is something that takes a bit of experience, but if something is really wrong, you'll notice pretty fast.

If you're trying to weld thicker pieces of metal together, adjust your volts and wire speed accordingly.

Once you've run your weld along the joint, you're done. You've made your first weld!

Because MIG welds do make spatter, and if you use a gasless wire with a flux core, some post weld work needs to be done. If you've used a flux wire, you'll need to use a chipping hammer to take off the slag that formed its protective layer over the top of the weld. If there is spatter everywhere, you can grind this off for a cleaner looking weld or, alternatively, you can use an anti-spatter spray before welding. If the weld is just for practice, it doesn't matter how good it looks.

Just remember that dry runs and scrap metal are your friends. Practice running your welding torch across a piece of metal, maintaining your travel angle, distance and speed until you're confident that you can keep all three of them consistent. Once you're happy with your performance on a dry run, try it again on some scrap metal before you move on to the piece you're planning on welding. If you don't get it the first attempt, that's fine; no one's expecting you to be a welding expert on your first go. Practice makes perfect.

THE ULTIMATE GUIDE TO TIG WELDING

If you've just bought yourself a TIG welder, or you're tossing up about whether you want to get one, but it seems too complicated, then you're not alone. TIG welding can seem intimidating, but you'll be an expert in no time if you follow our simple guide.

WHAT IS TIG WELDING?

Tungsten Inert Gas (TIG) welding is the process in which an arc is formed between a tungsten electrode and the workpiece to join the metals together. A filler rod is often fed into the weld pool by the operator to create a weld. A shielding gas is also required to protect the weld from atmospheric contaminants that could cause weld defects such as porosity. TIG welding is considered the most challenging type of welding to learn as there is a lot more room for human error.

TUNGSTEN CHOICE

There are several different types of tungsten, each with their own unique properties and limitations.

- Pure tungsten (Green tipped)
- Thoriated 2% (Red tipped)
- Ceriated 2% (Grey tipped)
- Lanthanated 1.5% (Gold tipped)
- Zirconiated 0.8% (White tipped)
- Rare Earth (Purple tipped)

	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.

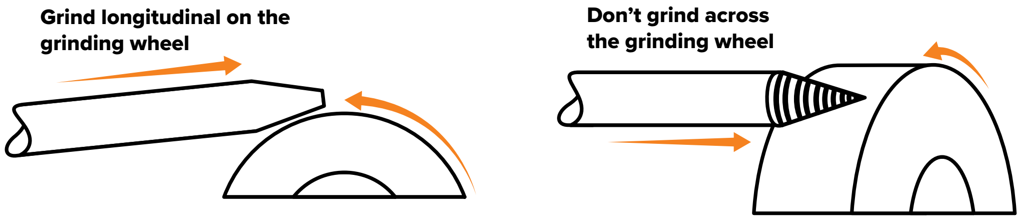
The tungsten that best fits your job will mainly depend on your parent metal and application, as not every tungsten will work with every metal. The thickness of your workpiece will also be a factor in which tungsten you'll need. Each type of tungsten comes in a range of diameters so that you can do precise and appealing welds. A good rule of thumb is the thicker your workpiece, the thicker your tungsten and vice versa.

If you're just starting out and learning TIG, we recommend using the gold tipped Lanthanated or the grey tipped Ceriated. They're both great general purpose, AC/DC compatible, and weld well on all metals, including aluminium (which is a much harder metal to work with, so don't worry about it just yet).

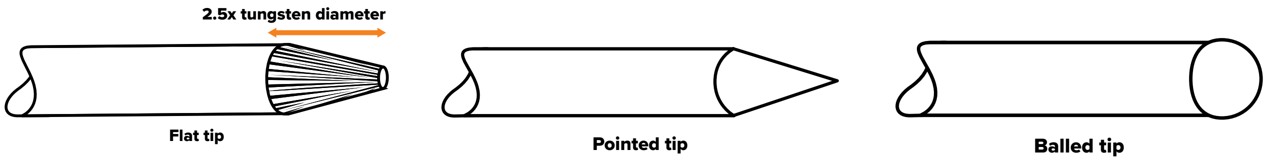
TUNGSTEN PREPARATION

Now that you've selected the tungsten that fits your job, the next step is to prepare it for the weld.

Before you start, make sure that you are prepping the non-coloured end of your tungsten. The tungstens are colour coded because they are almost identical in appearance. You don't want to grind off your coloured end, as you won't know what it is later.



There are a few different ways to prepare your tungsten, and different shapes will give different results on different applications.



A balled tip is usually recommended if you are using a pure or zirconiated tungsten and welding aluminium. This is a pretty easy shape to make, as you simply set your machine to the recommended amps on AC, turn it on, and the tungsten will automatically form a ball on the tip. The other option is to set your machine to DC electrode positive (DCEP), hold the torch 90° on a piece of copper and start the arc to form a ball. This tungsten preparation method happens after you have set up your gun and machine, though not before.

The most common tungsten shape to weld stainless and mild steel with is pointed, which produces a focused and stable arc, and works for all DC applications. To get this pointed shape, you'll need a tungsten grinder or a bench grinder (a diamond wheel is best). If you use a bench grinder, it needs to be dedicated to tungsten preparation, as you can contaminate your tungsten with anything that's leftover on the grinder. Press your tungsten vertically to the grinder at a 30° angle and rotate at a consistent pace until a point has formed.

It's essential to grind with the tungsten's grain (lengthwise) and not against it (horizontal on the grinder) for a few reasons. The main reason is that it lowers the number of ridges in the tip of the tungsten. More ridges mean that the arc has more surface to cover, increasing your chances of it wandering or the tip melting off and falling into your weld pool. Your tungsten will also stay sharper for longer if you follow the grain, so you won't need to re-grind it as often.

A truncated tip follows the same preparation as a pointed tip but with the added step of grinding the end, so you get a flat top. This shape works well for both AC and DC applications.

For now, though, if you've opted for a gold or grey tipped tungsten, let's stick with a 30° point.

METAL PREPARATION

When you're TIG welding, your workpiece must be clean. If the metals you want to join are rusted, have paint on them, are oily or otherwise coated in some way, you'll need to grind the metal until it's squeaky clean. If you leave anything on your workpiece, your weld could be contaminated, and it won't be a quality weld.

If you're working with aluminium, your metal still needs to be cleaned, but you'll need to prep it with acetone and a wire brush rather than grinding it. Aluminium is soft, so taking a grinder to it will ruin the metal before you've even attempted to weld it.

MACHINE SETUP

1. Gas
2. Torch
3. Machine Settings

1. GAS

TIG welding requires a shielding gas to protect the weld from outside contaminants. The good news is it doesn't matter what kind of metal you're welding; pure argon gas alone will cover almost every TIG application, so you won't need to swap between bottles. (You can still get gas mixtures for specific applications, however.)

TIG welding requires a flow meter so you can adjust the gas flow rate. Every UNIMIG TIG welding machine comes with the needed flow meter, which you insert into the top of your gas tank. The flow meter has two parts: a pressure gauge and a flow tube. The pressure gauge tells you how much gas is left in the tank and the tube (which is adjusted by a valve on the side) shows you how much gas is pumping into your torch per minute.

Turn the valve so that it's fully closed before you open your gas bottle. An 8-10L per minute gas flow is a standard amount that will cover all metal types and keep your weld safe.

2. TORCH SETUP

There are two different types of TIG torch that you can use. One comes with a button and one doesn't. The type of torch that you have will determine the ways you can ignite your arc.

3 TYPES OF TIG

- **Scratch start**
  Scratch Start is the most basic form of TIG welding, and requires dragging the electrode across the surface of a workpiece to initiate the weld cycle.
- **Lift Arc**
  Lift Arc requires touching the workpiece and lifting the torch to initiate the weld cycle.
- **High frequency**
  A High-Frequency start allows you to initiate the weld cycle by pressing a button, or foot pedal.

If you have a High Frequency torch, you can activate it with the button (or foot control), which also controls your gas. If you have a Lift Arc torch (which comes with a valve), you are limited to lift starts and scratching (however, scratching isn't recommended as you can cause tungsten inclusions at the beginning of your weld). Neither scratching nor lift starting will work on AC, so you must have a High Frequency torch if you're using AC. The **VIPER 180 AC/DC TIG/Stick Welder** comes with a high-performance T2 TIG Torch, which is a High Frequency torch, and if you're a home DIY welder, you'll want to learn with the easiest arc ignition.

There are two variations of the High Frequency torch: one with only a button and one with a button and a potentiometer (pot). The potentiometer torch gives a welder more manual control over the number of amps they're using during a weld when the welder is set to remote mode.

You can also decide if you want a rigid head or a flex head on your torch. A rigid head means the neck won't bend, making it harder to get into tight corners. A flex head can bend, making it a lot easier to get into tight spaces and awkward angles. The **VIPER 180 AC/DC** & **RAZOR 200 AC/DC** TIG/Stick Welder's both come with flex head torches.

STANDARD TORCH SIZES

TIG torches come in a number of sizes: 9, 17, 18 & 26. The 18 torch is the same size as the 17, but it is water-cooled rather than air-cooled. Each torch uses the same types of consumables (see below) but will have their own sizes that fit inside when it is put together. A size 9 torch will have much smaller consumables than a size 26. The smaller the torch you purchase, the lighter it will be, but the hotter it will get at higher amps. Professional welders often prefer a lighter torch so that they can weld for longer before their hand gets fatigued. On the flip side, the bigger the gun you get, the higher amperage it can take. A size 26 torch can use more power and stay cooler for longer than a size 9.

POLARITY

Regardless of the type or size of torch you have, the next thing you'll need to do is plug it in. TIG welding is always done in negative polarity, which means that the torch goes into the **Negative (–)** panel mount and the earth clamp goes into the **Positive (+)** panel mount on the front of your welder.

If you get the polarity wrong, you can burn your tungsten up into the torch, so double-checking before you start is a good idea.

After you've locked your torch into place, if you have a High Frequency torch, attach the power cable plug into the socket and the gas hose into the gas connector at the front of the welder to finish your torch setup.

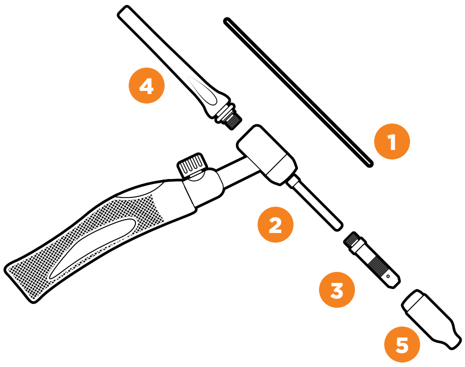
NOTE: if you have a water-cooling torch, you will also need to attach the blue and red water cables to the welding machine and the water cooler so that the water can flow through the torch.

The correct polarity setup is available in our User Manual that comes with each machine (and is available online), so don't stress if you forget.

BUILDING YOUR TIG TORCH

To set up your torch you should have:

1. Your chosen tungsten
2. Collet
3. Collet body
4. Back cap
5. Ceramic cup (gas shroud)



The collet and collet body should match the size of your tungsten (if your tungsten is 2.4mm thick, the borehole in your collet and collet body need to be 2.4mm wide).

Your ceramic cup is marked with a number indicating how large the cup's opening is, which will determine how much gas coverage you will get to protect the weld. They also come in a variety of materials, such as Quartz (Glass).

Quartz cups work the same way as ceramic cups, but they allow for a lot more visibility because they're clear. Quartz cups use a gas lens rather than a collet body to achieve this additional coverage, so their shrouds are wider, which protects more of the weld while it's liquid. Gas lenses are an optional accessory on TIG torches which replace the collet body inside the torch. They're especially useful when welding inside corners or in tight spaces because you can stick the tungsten out further thanks to the extra gas coverage.

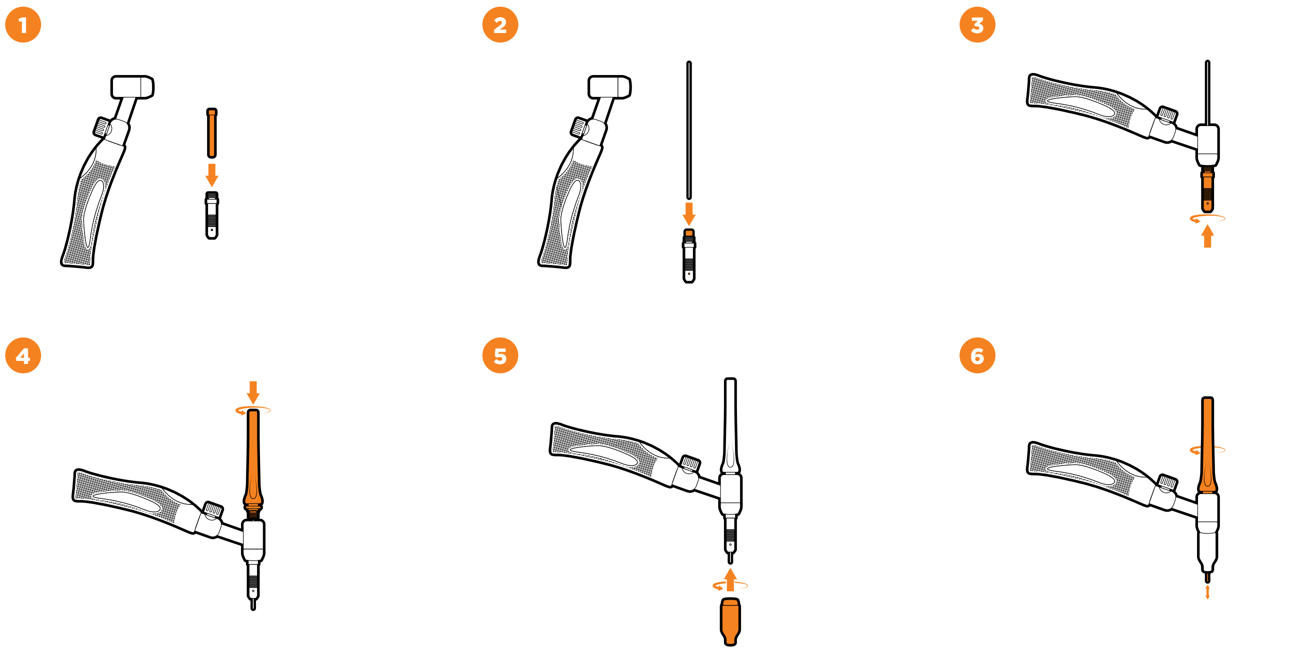
STANDARD LENS VS GAS LENS

Standard nozzles release a broad plume of shielding gas over your weld. In comparison, a gas lens improves shielding gas coverage by distributing gas around the tungsten more efficiently with less turbulence. You can also have the tungsten stick out further with a gas lens, giving you better manoeuvrability and visibility of the weld pool. This is great for when you need to weld in tight spaces.

If you are using a gas lens, you'll need a gas lens ceramic cup, as a standard one won't fit. The below steps don't change much if you're using a gas lens.

TORCH ASSEMBLY

1. Fit the collet into the collet body.
2. Fit the tungsten through the collet and collet body.
3. Screw the collet body into the torch head.
4. Screw the back cap onto the torch head. Don't fully tighten just yet.
5. Screw in the ceramic cup onto the front of the torch.
6. Finally, adjust the tungsten to your desired length, then fully tighten the back cap.



Keep in mind that the tungsten shouldn't stick out further than the inner width of the ceramic cup. For example, a #7 cup is 11mm wide, so the tungsten shouldn't sit further out than 11mm from the top of the cup. It's okay if your tungsten is sticking out too far after you've screwed the back cap on; just unscrew it until the tungsten becomes loose, slide the tungsten back until it's the correct length and then re-screw the back cap until the tungsten is snug again.

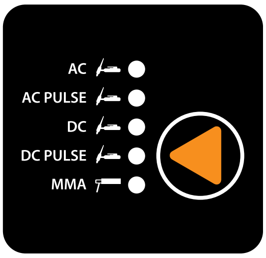
Now your torch is complete and ready for use.

3. MACHINE SETTINGS

The first time you look at a TIG machine, you're first thought might be along the lines of, 'that's a lot of lights and buttons'. You'd be correct. Compared to MIG and stick machines, a TIG welder can seem super complicated. Don't stress; it's easier than it looks. Using the **RAZOR 200 AC/DC** TIG Welder as a guide, let's run through what they do.

Starting on the far left is a column of five, with the following options:

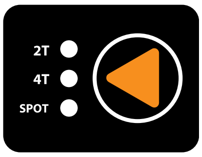
- AC
- AC PULSE
- DC
- DC PULSE
- MMA



These are our welding process settings. MMA (manual metal arc) is also known as stick welding. All TIG welders can stick weld, so you would switch to that setting if you attached an electrode holder to your machine. The other four options are what we use to TIG weld with. AC currents are used when working with aluminium, and DC is used for steel and stainless steel. The AC and DC settings will provide a constant running current, while the PULSE options will give a pulsating current (imagine a flickering light bulb). The pulse options are often used for very precise or artistic welds on thinner material, as it does not penetrate as deeply.

Moving slightly to the right is a column of three options:

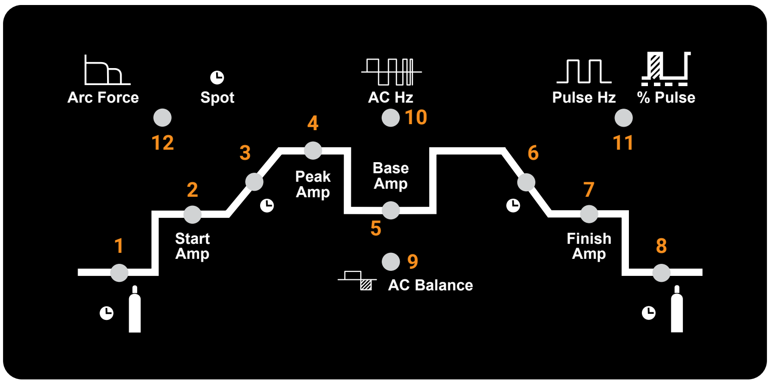
- 2T
- 4T
- SPOT



These stand for two touch, four touch and spot.

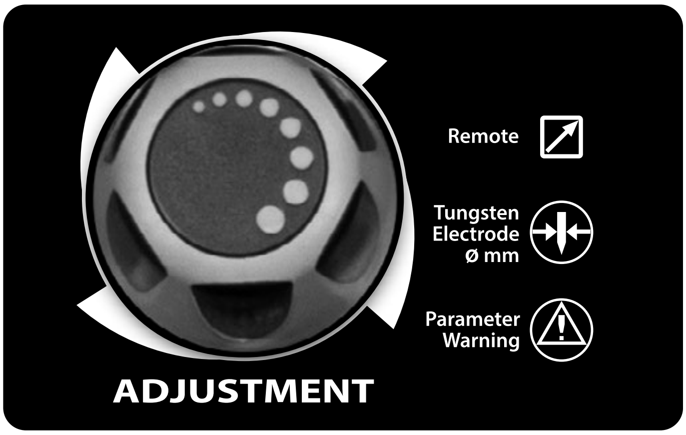
2T (two touch) means you will need to hold the button down on your High Frequency torch while you weld. In 4T (four touch) mode, you will only need to click the button to ignite the arc and the torch will continue to weld until you click it again to turn it off. SPOT is precisely what it says, consecutive and evenly timed arcs that work well if you want perfectly even tacks and small welds. If you're using a foot pedal, you'll need to set it to 2T as it won't work otherwise, but more on that later.

Next up is the pyramid steps. These are the parameter settings and are the ones you'll need to change when swapping between welds. In order from left to right, they are:



1. **Pre-gas:** this is the gas that shields the tungsten and area you are about to start welding from the atmosphere. Use the knob to select how long you would like your pre-gas to flow before the arc ignites.
2. **Start amps:** these allow for a lower or higher amp start, depending on your material. If you have a thicker piece of metal, you'll want to start on higher amps than if you're welding a thinner piece.
3. **Up slope:** your up slope will dictate the amount of time (in seconds) it will take to reach your peak amps from your start amps. The more time you input, the longer it will take for the amps to increase. A longer up slope is recommended for thinner metals to prevent burning straight through.
4. **Peak amps:** these are the amps you will do your welding on until you have finished the joint. If you are set to AC/DC pulse, this will be the high part of your amp cycle.
5. **Base amps:** you will only use base amps in PULSE modes. This is the low part of your amp cycle. The closer your amp range from peak to base (e.g. 80 peak – 70 base), the hotter your weld will be. The more significant the gap (e.g. 100 peak – 70 base), the cooler your weld will be.
6. **Down slope:** your down slope will dictate the time (in seconds) between your peak amps and your finish amps. This will taper the arc to prevent crater holes and cracks in the weld.
7. **Finish amps:** this is the final amp level that the machine will reach before your arc extinguishes. If you turn this up, it will be a hotter finish, suited to thicker materials. Turning it down will provide a cooler finish suited for thinner materials.
8. **Post gas:** this is the gas that flows for a set time once your arc has turned off, to shield and cool the tungsten as well as the weld. The longer you leave this on, the less likely you are to have pinholes and craters. The thinner the metal, the less time it needs to be on.
9. **AC Balance:** this is automatically calibrated based on your other parameters; however, you can manually adjust it. If you set it to above 0, you will increase the cleaning but decrease the penetration, and if you set it below 0, you will decrease the cleaning and increase the penetration of the weld. (Only for AC & AC pulse.)
10. **AC Hertz:** this is the number of times per second that the current completes a full cycle. If you turn this up, it will increase the cycle speed and create a thinner, more prominent weld appearance as the arc will be more focused. The lower you turn this, the flatter your weld will be. (Only for AC & AC pulse.)
11. **Pulse Hz / Pulse %:** Pulse Hz is the number of times per second the current cycle will switch between peak amps and base amps. The faster the amp switches, the narrower the weld. (AC/DC pulse only.) Pulse % is the percentage of time the peak amps are on during the pulse cycle. A high percentage will have a hotter weld, and a low percentage will have a cool weld. (AC/DC pulse only.)
12. **Arc force / Spot:** this is only for stick welding (MMA) and helps with the penetration of the stick weld; the higher this is, the more penetrative the weld. This will only be available if you have set your machine to 'Spot' mode and is the timer you'd like to have your arc last for during each tack or small weld.

On the right side of the adjustable knob are three lights:



These lights won't always be illuminated, and you definitely don't want the parameter warning light to be on.

Remote: this light will turn green if you are in remote mode. You can activate remote mode on the High Frequency torch. Turn it on by holding the button on your torch down for 5 seconds until the machine beeps and the light turns on. Remote gives you more manual control over the amps; however, a foot pedal can only be used in 2T mode, as letting go of the pedal will kill the arc.

Tungsten Electrode mm: input your tungsten width here. The machine will only provide a limited number of options, as there are only so many tungsten sizes. You can navigate to this setting with the control knob.

Parameter Warning: this light will turn yellow if you've put in amp settings that the machine thinks are too low for your tungsten. If you have told the welder that your tungsten is 2.4mm and then set your peak amps to 40, this light will come on to let you know that you're going to have a weak arc.

MIXED ARC AC/DC WELDING

Mixed AC/DC welding is the combination of TIG AC and TIG DC- in one weld. There are quite a few benefits from this type of weld, including higher welding speeds and penetration, and a faster weld puddle on cold workpieces. Mixed AC/DC also means that you can weld on thicker materials.

There are two periods during a mixed weld. The first is the AC period, where the oxide film is broken and surface impurities are flushed out. Second, the DC- period, where the arc becomes narrower and penetrative. The operator can select the percentage of AC and DC- during a full period, which can be varied from 5-95%, though it's a good idea not to have more than 50% DC-.

This feature is pretty specialised, and only the **RAZOR 320 AC/DC** TIG/Stick Welder has this option available on UNIMIG machines.

FILLER METALS

The second part of TIG welding is your filler rod – the metal you'll be using to feed into the weld pool. You need to match your filler rod metal to your parent metal, as dissimilar metals only weld together if you have the right filler. These rods usually come in 50cm or 1m lengths, so it's a good idea to cut them down to a comfortable size as it'll make it easier to feed.

There are a few different classifications for each type of filler rod available.

STEEL RODS:

- **ER70S-2:** best quality and most common
- **ER70S-4**
- **ER70S-6**

STAINLESS STEEL RODS:

- **308L:** mainly used on austenitic stainless steels
- **309L:** used for welding dissimilar metals
- **316L:** marine grade, recommended for anything that will be used in water, will only weld to 316 graded parent metal

The 'L' refers to the extra low levels of carbon in the rods, which helps prevent corrosion in the welds.

ALUMINIUM RODS:

- **4043:** use on 4000 to 6000 series aluminium, contains silicon
- **5356:** use on 3000, 5000 & 6000 series aluminium, marine grade, contains magnesium

Just like with your tungsten, you want your filler rod size to fit your workpiece size. A good rule of thumb here is to match your rod size to the tungsten. Let's use an example: 3mm steel. You'll be using a 1.6mm tungsten on this metal thickness, so a 1.6mm filler rod will be perfect.

STARTING YOUR WELD

Once your equipment is all set up, you're ready for the fun part: starting a weld.

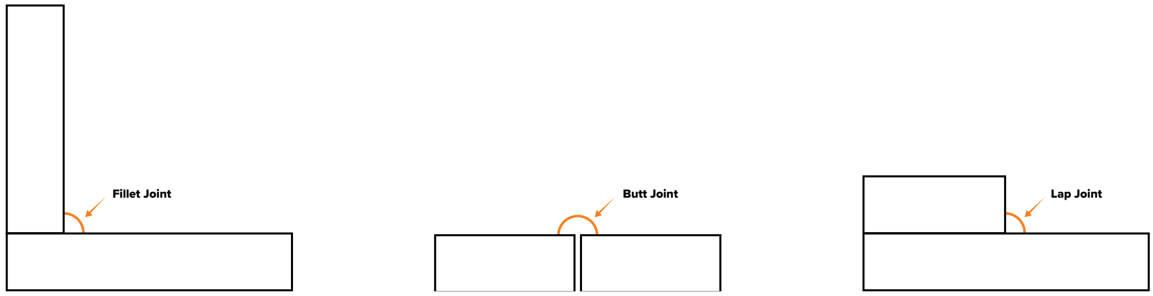
Three main factors need to be considered when doing a weld:

1. Work angle
2. Travel angle & distance
3. Travel speed

This is true regardless of whether you are TIG, MIG or stick welding.

1. WORK ANGLE

Your work angle is your torch position in relation to the angle of the joint. There are a few different joint types, and several positions these joints can be found.

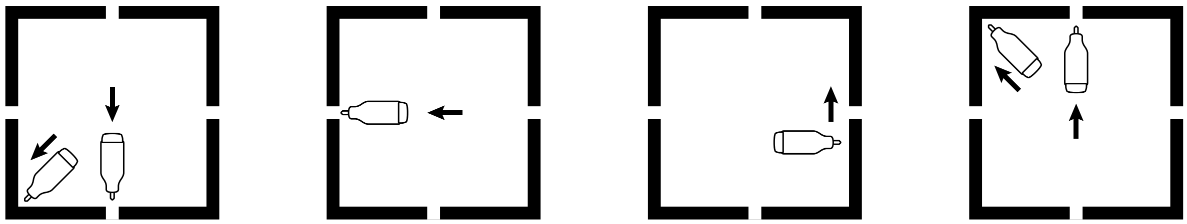


T-joint / Fillet Joint	Butt Joint	Lap Joint
90° joint angle	180° joint angle	90° joint angle
45° work angle	75° work angle	75° work angle

(These angles do not include your travel angle, which we'll talk about next.)

POSITIONS

Flat (butt & fillet) **Horizontal** **Vertical** **Overhead (butt & fillet)**



The main thing that your weld's position will affect is whether or not you'll be fighting against gravity as you go. While you're learning, flat positions are best.

2. TRAVEL ANGLE & DISTANCE

TIG welding is always done at a push angle. A push angle means your torch is over the weld, and you push the weld pool along the joint. Dragging (pulling) while TIG welding won't penetrate or properly cover your weld, resulting in porosity in the joint as the gas from your cup won't reach the liquified metal.

You also want to keep your torch at a 75° angle as you push. If you're welding in a fillet joint (a corner join), your torch will be angled into it at a 45° angle, then you'll angle slightly to the side so that your gas can cover the weld pool and in front of the weld as you go.

The filler wire will be in whichever hand is not holding your torch. Your filler wire should come in from relatively low, almost parallel with the joint, with a slight 10° to 15° angle (back end in the air) when it is introduced.

The distance between the tungsten and the weld is also something you need to watch as you go about your weld. The best length to keep your tungsten from the workpiece is around 3mm. This will give you the best control over the arc and your weld. It also gives you space so that the filler rod is unlikely to touch the tungsten.

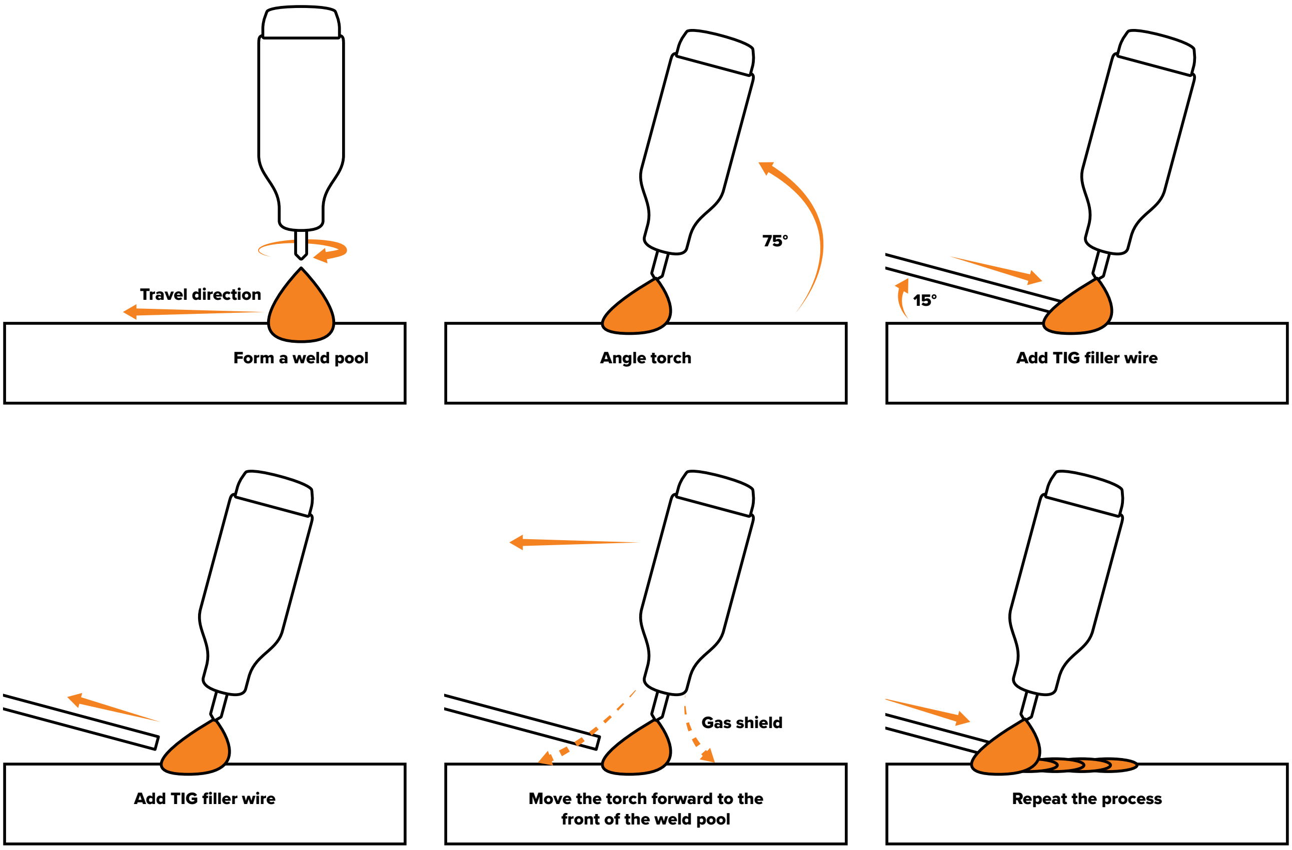
If your torch is angled too far or is too far away from your workpiece (creating a long and unstable arc), you will likely have a weld with much more oxidation. The filler wire also won't melt into the joint because there'll be a lack of heat. If your tungsten touches the weld pool, then you'll have to stop the weld and re-grind the tungsten. If you do touch your tungsten into the weld pool, don't try to snap it off. Turn your torch off without moving it and allow it to cool slightly. Then you can loosen the back cap of the torch and simply slide the tungsten out. This way, you don't risk damaging the collet body inside your torch.

3. TRAVEL SPEED

Travel speed is how fast you are moving the torch along the weld. The speed you travel affects how far the weld penetrates. Too fast, and it won't go far enough, too slow, and you could burn a hole straight through. Your travel speed also dictates the weld's conformity; if you're speeding up or slowing down, then the weld won't be even.

Keep your travel speed consistent! This applies to all types of welding. Inconsistent travel speed or incorrect travel speed will result in a bad weld.

MAKING THE WELD



Place your cleaned workpiece in front of you in a way that when you begin welding, your hands can move freely and steadily, and you can comfortably complete the joint. It's a good idea to have something to steady your hands against as they go along the weld so that you can maintain your angle and distance.

Check that your earth clamp has been attached to a metal surface, such as a (clean) metal workbench or the workpiece, because if your earth clamp isn't grounded, your machine won't start. If you're making a fillet join, you can use a magnetic welding clamp to hold your two pieces of metal together. Aluminium isn't magnetic, however, so a manual clamp will be needed.

Start with your tacks. Remember to flip your welding helmet down before you ignite your arc. Tacks are used to fuse the metals together at the edges, so you don't have to hold them together while you're trying to weld. This is especially important when TIG welding as you don't have any free hands.

Hold your torch in your dominant hand and your filler rod in your other hand. Press the button on your torch to start the arc (keeping pressure on it in 2T mode) until you see a wet pool forming. Dab a small bit of filler rod into this pool and then release your button. You've just made your first tack. Repeat this process on both edges so that your workpiece stays lined up how you want it. If the metal you're welding is completely flush, and there is no gap at all at the join, you can get away with just fusing the two pieces together with the torch for your tacks. With your tacks done, you can remove the magnetic clamp.

To make the weld, start the same way as you did to make the tack. Press the button (holding it down if you need to) until the metal begins to pool. Then dab the filler wire into the leading edge of the weld pool. You don't want to touch it onto the tungsten in the middle of the arc. You are aiming to push the filler wire into your pool to make the best weld. When adding filler wire, a good rule of thumb is to add the same amount on each dab as the wire's width. For example, if your wire rod is 1.6mm in diameter, you want to add about 1.5mm of the rod into each dab. Also, make sure you're feeding the filler rod into the pool in sections rather than constantly holding it in. Take pauses between each dab to let your weld pool reform.

Once you've run your weld, release the button, and the torch will cool down and then pump your post gas out over your weld. Having this 'post flow' over your weld as it cools will help to keep it free of contaminants, but you'll need to remember to keep your torch over the weld for this to work. It's super tempting to pull your hands away immediately to check out your weld, but you'll lose your post flow if you do.

Congrats, your weld is done, and you can now take a look at your handiwork. A good TIG weld should look like an even and straight stack of dimes with no porosity or other signs of contamination when you're done.

FUSION WELDING

Fusion welding follows the same process as previously described, except you don't add any extra metal. This is nowhere near as strong as a standard weld, and so it's best to use it for practice only. It's a great way to get a feel of the TIG torch while you're still learning, and you can fusion weld on your scrap metal to practice creating consistently sized weld pools and running beads.

BACK PURGING

If you're going to be welding on piping or tubing, then it's a good idea to back purge as you go. Back purging is the process of shielding the back of your weld from carbide precipitation (your metal reacting to the atmosphere). If you don't shield the inside of your pipe, the weld's backside will look like it's covered in granules (which is why this is called 'sugaring'), and it means your weld will be prone to cracking. In simple terms: it's a failed weld.

To back purge, first, you'll need an extra gas tank, or a dual regulator, as you need to pump gas to your torch and into the pipe at the same time, but at different flow rates, which requires two hoses.

Plug up the ends of your pipe – you can get specifically designed purging plugs for this – or tin foil works as well if you're on a budget (glad wrap doesn't work, it's too weak to hold the gas in). It's essential to make sure you have a ventilation hole on either end, as you need to insert your gas hose in one side and have an exit hole for the atmospheric gas to escape. If you don't leave a vent hole, the gas will make its own as you reach the last part of your weld and it becomes trapped.

If you've purged correctly, your weld should be smooth inside and look similar to the outside weld. This can take a bit of fiddling with because your pipe size and the material will determine how much gas you need to be pumping in to cover the weld fully. There's no one size fits all rule with this.

The best way to get better at something is to practice, practice, practice! You can make dry runs as many times as you need to feel comfortable with the motion before starting an actual weld. If you've got some spare or scrap metal, you can practice making beads on the parent metal (make a weld pool, push it along the metal at a steady pace, repeat) without adding any filler metal (fusion) to practice the torch motion and to get a feel for how long it takes for the pool to form each time.

Once you've got the hang of making a clean, quality TIG weld, you can play around with the gas and other settings to make more colourful and artistic welds.

HYPERTIG™ MILD STEEL TIG WIRE

BUTT WELD - STANDARD

Material Thickness	Tungsten Diameter	Tungsten Type	Ceramic Cup Size	TIG Filler Wire Diameter	Polarity	Gas	Gas Flow	Pre-Gas	Start Amp	Up-Slope	Peak Amp	Down-Slope	Finish Amp	Post Gas
1mm	1.6mm	Lanthanated / Ceriated	6	1.6mm	Torch Negative	Pure Argon	8L/min	1.0s	45A	1.0s	50A	1.0s	45A	2.0s
2mm	1.6mm	Lanthanated / Ceriated	6	1.6mm	Torch Negative	Pure Argon	8L/min	1.0s	48A	1.0s	55A	1.0s	48A	2.0s
3mm	1.6mm	Lanthanated / Ceriated	6	1.6mm	Torch Negative	Pure Argon	8L/min	1.0s	50A	1.0s	60A	1.0s	50A	2.0s
4mm	2.4mm	Lanthanated / Ceriated	8	2.4mm	Torch Negative	Pure Argon	8L/min	1.0s	60A	1.0s	70A	1.0s	60A	2.0s
5mm	2.4mm	Lanthanated / Ceriated	8	2.4mm	Torch Negative	Pure Argon	8L/min	1.0s	75A	1.0s	85A	1.0s	75A	2.0s
6mm	3.2mm	Lanthanated / Ceriated	10	3.2mm	Torch Negative	Pure Argon	8L/min	1.0s	100A	1.0s	120A	1.0s	100A	2.0s
8mm	3.2mm	Lanthanated / Ceriated	10	3.2mm	Torch Negative	Pure Argon	8L/min	1.0s	105A	1.0s	140A	1.0s	105A	2.0s

BUTT WELD - PULSE

Material Thickness	Tungsten Diameter	Tungsten Type	Ceramic Cup Size	TIG Filler Wire Diameter	Polarity	Gas	Gas Flow	Pre-Gas	Start Amp	Up-Slope	Peak Amp	Base Amp	Down-Slope	Finish Amp	Post Gas	Pulse Hz	% Pulse
1mm	1.6mm	Lanthanated / Ceriated	6	1.6mm	Torch Negative	Pure Argon	8L/min	1.0s	40A	1.0s	55A	45A	1.0s	40A	2.0s	0.9	50%
2mm	1.6mm	Lanthanated / Ceriated	6	1.6mm	Torch Negative	Pure Argon	8L/min	1.0s	70A	1.0s	85A	60A	1.0s	70A	2.0s	0.9	50%
3mm	2.4mm	Lanthanated / Ceriated	8	2.4mm	Torch Negative	Pure Argon	8L/min	1.0s	80A	1.0s	110A	65A	1.0s	80A	2.0s	1.2	50%

This setup information is intended to act as a guide only. Individual may vary depending on technique, skill and material. Please refer to your machine's operating manual for further instructions.

HYPERTIG™ MILD STEEL TIG WIRE

FILLET/LAP WELD - STANDARD

Material Thickness	Tungsten Diameter	Tungsten Type	Ceramic Cup Size	TIG Filler Wire Diameter	Polarity	Gas	Gas Flow	Pre-Gas	Start Amp	Up-Slope	Peak Amp	Down-Slope	Finish Amp	Post Gas
1mm	1.6mm	Lanthanated / Ceriated	6	1.6mm	Torch Negative	Pure Argon	8L/min	1.0s	45A	1.0s	50A	1.0s	45A	2.0s
2mm	1.6mm	Lanthanated / Ceriated	6	1.6mm	Torch Negative	Pure Argon	8L/min	1.0s	48A	1.0s	55A	1.0s	48A	2.0s
3mm	1.6mm	Lanthanated / Ceriated	6	1.6mm	Torch Negative	Pure Argon	8L/min	1.0s	60A	1.0s	70A	1.0s	60A	2.0s
4mm	2.4mm	Lanthanated / Ceriated	8	2.4mm	Torch Negative	Pure Argon	8L/min	1.0s	60A	1.0s	80A	1.0s	60A	2.0s
5mm	2.4mm	Lanthanated / Ceriated	8	2.4mm	Torch Negative	Pure Argon	8L/min	1.0s	85A	1.0s	100A	1.0s	85A	2.0s
6mm	3.2mm	Lanthanated / Ceriated	10	3.2mm	Torch Negative	Pure Argon	8L/min	1.0s	100A	1.0s	130A	1.0s	100A	2.0s
8mm	3.2mm	Lanthanated / Ceriated	10	3.2mm	Torch Negative	Pure Argon	8L/min	1.0s	105A	1.0s	145A	1.0s	105A	2.0s

FILLET/LAP WELD - PULSE

Material Thickness	Tungsten Diameter	Tungsten Type	Ceramic Cup Size	TIG Filler Wire Diameter	Polarity	Gas	Gas Flow	Pre-Gas	Start Amp	Up-Slope	Peak Amp	Base Amp	Down-Slope	Finish Amp	Post Gas	Pulse Hz	% Pulse
1mm	1.6mm	Lanthanated / Ceriated	6	1.6mm	Torch Negative	Pure Argon	8L/min	1.0s	40A	1.0s	65A	45A	1.0s	40A	2.0s	0.9	50%
2mm	1.6mm	Lanthanated / Ceriated	6	1.6mm	Torch Negative	Pure Argon	8L/min	1.0s	70A	1.0s	95A	60A	1.0s	70A	2.0s	0.9	50%
3mm	2.4mm	Lanthanated / Ceriated	8	2.4mm	Torch Negative	Pure Argon	8L/min	1.0s	80A	1.0s	125A	65A	1.0s	80A	2.0s	1.2	50%

This setup information is intended to act as a guide only. Individual may vary depending on technique, skill and material. Please refer to your machine's operating manual for further instructions.

HYPERTIG™ STAINLESS STEEL TIG WIRE

BUTT WELD - STANDARD

Material Thickness	Tungsten Diameter	Tungsten Type	Ceramic Cup Size	TIG Filler Wire Diameter	Polarity	Gas	Gas Flow	Pre-Gas	Start Amp	Up-Slope	Peak Amp	Down-Slope	Finish Amp	Post Gas
1mm	1.6mm	Lanthanated / Ceriated	8	1.6mm	Torch Negative	Pure Argon	8L/min	1.0s	50A	1.0s	60A	1.0s	50A	2.0s
2mm	1.6mm	Lanthanated / Ceriated	8	1.6mm	Torch Negative	Pure Argon	8L/min	1.0s	60A	1.0s	65A	1.0s	60A	2.0s
3mm	2.4mm	Lanthanated / Ceriated	8	2.4mm	Torch Negative	Pure Argon	8L/min	1.0s	60A	1.0s	70A	1.0s	60A	2.0s
5mm	3.2mm	Lanthanated / Ceriated	10	3.2mm	Torch Negative	Pure Argon	8L/min	1.0s	90A	1.0s	115A	1.0s	90A	2.0s
6mm	3.2mm	Lanthanated / Ceriated	10	3.2mm	Torch Negative	Pure Argon	8L/min	1.0s	95A	1.0s	120A	1.0s	95A	2.0s
8mm	3.2mm	Lanthanated / Ceriated	10	3.2mm	Torch Negative	Pure Argon	8L/min	1.0s	105A	1.0s	130A	1.0s	105A	2.0s

BUTT WELD - PULSE

Material Thickness	Tungsten Diameter	Tungsten Type	Ceramic Cup Size	TIG Filler Wire Diameter	Polarity	Gas	Gas Flow	Pre-Gas	Start Amp	Up-Slope	Peak Amp	Base Amp	Down-Slope	Finish Amp	Post Gas	Pulse Hz	% Pulse
1mm	1.6mm	Lanthanated / Ceriated	6	1.6mm	Torch Negative	Pure Argon	8L/min	1.0s	30A	1.0s	35A	18A	1.0s	30A	2.0s	0.9	50%
2mm	1.6mm	Lanthanated / Ceriated	8	1.6mm	Torch Negative	Pure Argon	8L/min	1.0s	45A	1.0s	60A	22A	1.0s	45A	2.0s	1.2	50%
3mm	2.4mm	Lanthanated / Ceriated	10	2.4mm	Torch Negative	Pure Argon	8L/min	1.0s	60A	1.0s	70A	30A	1.0s	60A	2.0s	0.9	50%

This setup information is intended to act as a guide only. Individual may vary depending on technique, skill and material. Please refer to your machine's operating manual for further instructions.

HYPERTIG™ STAINLESS STEEL TIG WIRE

FILLET/LAP WELD - STANDARD

Material Thickness	Tungsten Diameter	Tungsten Type	Ceramic Cup Size	TIG Filler Wire Diameter	Polarity	Gas	Gas Flow	Pre-Gas	Start Amp	Up-Slope	Peak Amp	Down-Slope	Finish Amp	Post Gas
1mm	1.6mm	Lanthanated / Ceriated	8	1.6mm	Torch Negative	Pure Argon	8L/min	1.0s	50A	1.0s	63A	1.0s	50A	2.0s
2mm	1.6mm	Lanthanated / Ceriated	8	1.6mm	Torch Negative	Pure Argon	8L/min	1.0s	60A	1.0s	75A	1.0s	60A	2.0s
3mm	2.4mm	Lanthanated / Ceriated	8	2.4mm	Torch Negative	Pure Argon	8L/min	1.0s	60A	1.0s	75A	1.0s	60A	2.0s
5mm	3.2mm	Lanthanated / Ceriated	10	3.2mm	Torch Negative	Pure Argon	8L/min	1.0s	90A	1.0s	120A	1.0s	90A	2.0s
6mm	3.2mm	Lanthanated / Ceriated	10	3.2mm	Torch Negative	Pure Argon	8L/min	1.0s	95A	1.0s	135A	1.0s	95A	2.0s
8mm	3.2mm	Lanthanated / Ceriated	10	3.2mm	Torch Negative	Pure Argon	8L/min	1.0s	105A	1.0s	145A	1.0s	105A	2.0s

FILLET/LAP WELD - PULSE

Material Thickness	Tungsten Diameter	Tungsten Type	Ceramic Cup Size	TIG Filler Wire Diameter	Polarity	Gas	Gas Flow	Pre-Gas	Start Amp	Up-Slope	Peak Amp	Base Amp	Down-Slope	Finish Amp	Post Gas	Pulse Hz	% Pulse
1mm	1.6mm	Lanthanated / Ceriated	6	1.6mm	Torch Negative	Pure Argon	8L/min	1.0s	30A	1.0s	50A	18A	1.0s	30A	2.0s	0.9	50%
2mm	1.6mm	Lanthanated / Ceriated	8	1.6mm	Torch Negative	Pure Argon	8L/min	1.0s	45A	1.0s	70A	22A	1.0s	45A	2.0s	1.2	50%
3mm	2.4mm	Lanthanated / Ceriated	10	2.4mm	Torch Negative	Pure Argon	8L/min	1.0s	60A	1.0s	82A	30A	1.0s	60A	2.0s	0.9	50%

This setup information is intended to act as a guide only. Individual may vary depending on technique, skill and material. Please refer to your machine's operating manual for further instructions.

HYPERTIG™ ALUMINIUM TIG WIRE

BUTT WELD - STANDARD

Material Thickness	Tungsten Diameter	Tungsten Type	Ceramic Cup Size	TIG Filler Wire Diameter	Polarity	Gas	Gas Flow	Pre-Gas	Start Amp	Up-Slope	Peak Amp	Down-Slope	Finish Amp	Post Gas	AC Balance	AC Hz
1mm	1.6mm	Zirconiated / Lanthanated	6	1.6mm	Torch Negative	Pure Argon	8L/min	1.0s	20A	1.0s	25A	1.0s	20A	2.0s	0	110
2mm	1.6mm	Zirconiated / Lanthanated	6	1.6mm	Torch Negative	Pure Argon	8L/min	1.0s	30A	1.0s	45A	1.0s	30A	2.0s	0	110
3mm	2.4mm	Zirconiated / Lanthanated	8	2.4mm	Torch Negative	Pure Argon	8L/min	1.0s	40A	1.0s	75A	1.0s	40A	2.0s	0	110
4mm	2.4mm	Zirconiated / Lanthanated	8	2.4mm	Torch Negative	Pure Argon	8L/min	1.0s	50A	1.0s	85A	1.0s	50A	2.0s	0	90
5mm	2.4mm	Zirconiated / Lanthanated	8	2.4mm	Torch Negative	Pure Argon	8L/min	1.0s	65A	1.0s	110A	1.0s	65A	2.0s	0	90
6mm	3.2mm	Zirconiated / Lanthanated	10	3.2mm	Torch Negative	Pure Argon	8L/min	1.0s	100A	1.0s	125A	1.0s	100A	2.0s	0	90

BUTT WELD - PULSE

Material Thickness	Tungsten Diameter	Tungsten Type	Ceramic Cup Size	TIG Filler Wire Diameter	Polarity	Gas	Gas Flow	Pre-Gas	Start Amp	Up-Slope	Peak Amp	Base Amp	Down-Slope	Finish Amp	Post Gas	AC Balance	AC Hz	Pulse Hz	% Pulse
1mm	1.6mm	Zirconiated / Lanthanated	6	1.6mm	Torch Negative	Pure Argon	8L/min	1.0s	30A	1.0s	50A	33A	1.0s	30A	2.0s	0	90	1.2	50%
2mm	1.6mm	Zirconiated / Lanthanated	6	1.6mm	Torch Negative	Pure Argon	8L/min	1.0s	45A	1.0s	65A	40A	1.0s	45A	2.0s	0	90	1.2	50%
3mm	2.4mm	Zirconiated / Lanthanated	8	2.4mm	Torch Negative	Pure Argon	8L/min	1.0s	60A	1.0s	80A	65A	1.0s	60A	2.0s	0	90	1.2	50%

This setup information is intended to act as a guide only. Individual may vary depending on technique, skill and material. Please refer to your machine's operating manual for further instructions.

HYPERTIG™ ALUMINIUM TIG WIRE

FILLET/LAP WELD - STANDARD

Material Thickness	Tungsten Diameter	Tungsten Type	Ceramic Cup Size	TIG Filler Wire Diameter	Polarity	Gas	Gas Flow	Pre-Gas	Start Amp	Up-Slope	Peak Amp	Down-Slope	Finish Amp	Post Gas	AC Balance	AC Hz
1mm	1.6mm	Zirconiated / Lanthanated	6	1.6mm	Torch Negative	Pure Argon	8L/min	1.0s	20A	1.0s	27A	1.0s	20A	2.0s	0	120
2mm	1.6mm	Zirconiated / Lanthanated	6	1.6mm	Torch Negative	Pure Argon	8L/min	1.0s	30A	1.0s	50A	1.0s	30A	2.0s	0	120
3mm	2.4mm	Zirconiated / Lanthanated	8	2.4mm	Torch Negative	Pure Argon	8L/min	1.0s	40A	1.0s	80A	1.0s	40A	2.0s	0	120
4mm	2.4mm	Zirconiated / Lanthanated	8	2.4mm	Torch Negative	Pure Argon	8L/min	1.0s	50A	1.0s	95A	1.0s	50A	2.0s	0	110
5mm	2.4mm	Zirconiated / Lanthanated	8	2.4mm	Torch Negative	Pure Argon	8L/min	1.0s	65A	1.0s	115A	1.0s	65A	2.0s	0	110
6mm	3.2mm	Zirconiated / Lanthanated	10	3.2mm	Torch Negative	Pure Argon	8L/min	1.0s	100A	1.0s	135A	1.0s	100A	2.0s	0	110

FILLET/LAP WELD - PULSE

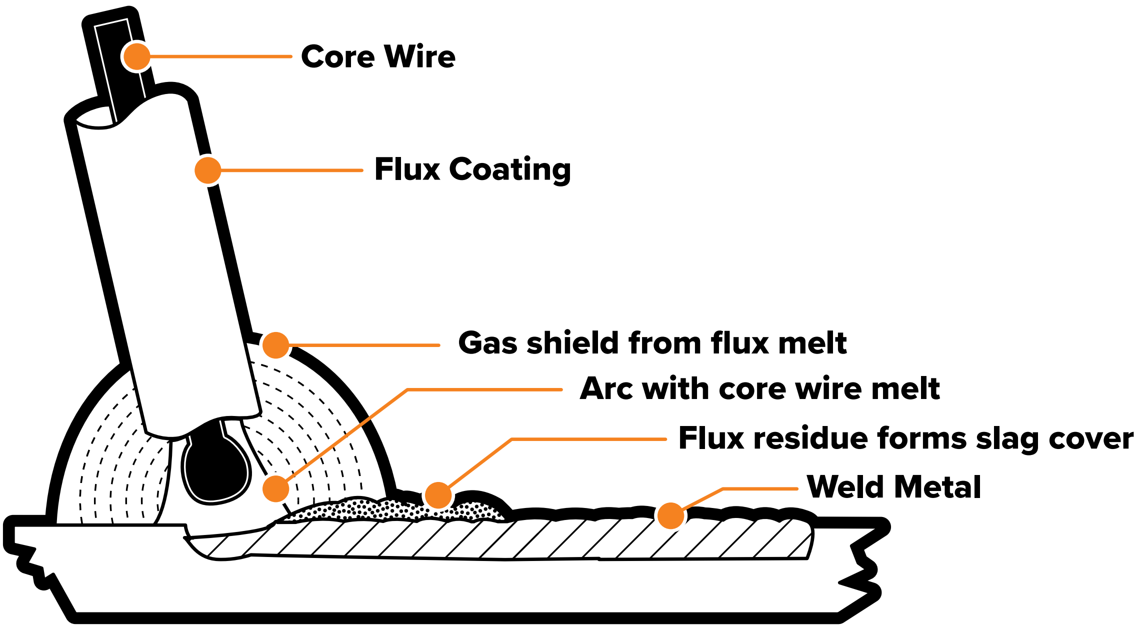
Material Thickness	Tungsten Diameter	Tungsten Type	Ceramic Cup Size	TIG Filler Wire Diameter	Polarity	Gas	Gas Flow	Pre-Gas	Start Amp	Up-Slope	Peak Amp	Base Amp	Down-Slope	Finish Amp	Post Gas	AC Balance	AC Hz	Pulse Hz	% Pulse
1mm	1.6mm	Zirconiated / Lanthanated	6	1.6mm	Torch Negative	Pure Argon	8L/min	1.0s	30A	1.0s	60A	35A	1.0s	30A	2.0s	0	85	1.2	50%
2mm	1.6mm	Zirconiated / Lanthanated	6	1.6mm	Torch Negative	Pure Argon	8L/min	1.0s	45A	1.0s	75A	45A	1.0s	45A	2.0s	0	85	1.2	50%
3mm	2.4mm	Zirconiated / Lanthanated	8	2.4mm	Torch Negative	Pure Argon	8L/min	1.0s	60A	1.0s	100A	70A	1.0s	60A	2.0s	0	90	1.2	50%

This setup information is intended to act as a guide only. Individual may vary depending on technique, skill and material. Please refer to your machine's operating manual for further instructions.

Stick welding is one of the oldest types of welding and is still widely used today on various applications, such as construction and earth moving equipment, thanks to its simple technique. While it may not be as easy as MIG welding for a beginner, it's definitely not as hard as TIG welding. Stick welding is a good middle ground and is perfect for those who don't want the hassle of a gas tank or want to weld thicker pieces of metal.

WHAT IS STICK WELDING?

Manual Metal Arc (MMA) or 'Stick' welding is the process in which a power source is used to create an electric arc between a flux covered electrode and the workpiece. Strike the electrode against the metal to ignite it and then melt the electrode into the joint to create the weld. The flux covering acts as a protective layer for your weld, so there is no protective gas needed for this process. This protective coating on the electrode leaves behind a topcoat on your weld known as 'slag', which needs to be removed to achieve a clean weld.



MACHINE SETUP

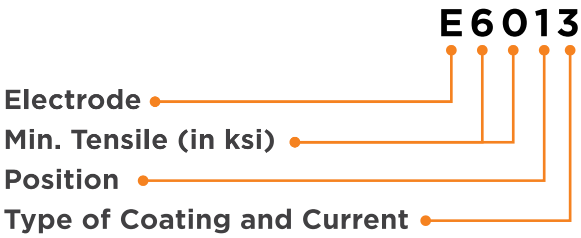
1. Stick Electrodes
2. Electrode Holder
3. Polarity
4. Settings

Almost all UNIMIG machines are suitable for stick welding, as the torch attaches into the panel mount, which both MIG and TIG machines are equipped with. There are a few dedicated stick welders, and the setup of these is very straightforward.

1. STICK ELECTRODES

Stick welding electrodes come in a range of classifications and sizes for every kind of weld. The first thing you need to do is match your electrode to your parent metal, and then you need to pick a size that's relevant for the thickness you want to weld.

Each electrode has the classification stamped on the end, which goes into the electrode holder. Carbon steel electrodes are stamped with a 4-digit code. For example: E6013



- The "E" indicates electrode
- The first 2 digits refer to the tensile strength (how much weight it can withstand after welding) of the electrode
- The 3rd digit indicates the position (see below) that the electrode can be used in
- The 4th digit indicates the flux coating and the current to be used

The "E" remains constant on every type of electrode because they're all electrodes.

The first two numbers do not vary much as the weld needs to be stronger than the metal welded, so most electrodes have a tensile strength of 60,000ksi or 70,000ksi, which covers pretty much everything.

There are only three variations of the third number: 1 (all positions), 2 (flat & horizontal) and 3 (flat only). Most electrodes are coded with '1' as they can do every position.

The fourth number is the type of flux coating on the electrode. This is the most varying part of every electrode, as there are 9 types of coating, the flux coating will determine how the weld puddle reacts.

The most common stick electrode classifications are E6010, E6011, E6013, E7016, E7018 & E7024. Out of these, if you're just starting your welding journey, the best choice for carbon steel would be:

- **E6013:** this electrode is general purpose; it can be used on most applications from furniture to fencing, all positional, with easy striking and slag removal.
- **E7016/E7018**: these are low hydrogen, sometimes referred to as hydrogen controlled. They're all positional (except vertical down), the 16 is ideal for a high-quality weld, and the 18 contains iron powder as well, giving it a higher deposit rate (a fatter weld).

On top of your standard carbon steel electrodes, you can also get hard facing and cast-iron sticks.

- **Hard Facing:** these are used for things that cop some severe abuse, like the teeth on earth moving equipment. Having a harder metal means it won't wear out as fast. One of the more common hard facing electrodes is the 531. The difference between these classifications is the hardness you require.
- **Cast Iron:** cast-iron is made as one solid piece by pouring molten iron mixtures into moulds. Cast iron rods are used to weld pieces back together once they break as they're made up of the right chemical compound. Some common classifications on these are Ni 98 (or 402Ni) and Ni 55 (or 416NiFe).

If you're looking for stainless steel electrodes, these are stamped with the metal's grade; **308L, 309L, 312L & 316L** are the most common.

You can get dissimilar metal electrodes (stainless 309L & 312L are some examples); these are designed for welding together stainless steel and carbon steel or steels of unknown nature.

SINGLE VS TWIN COAT

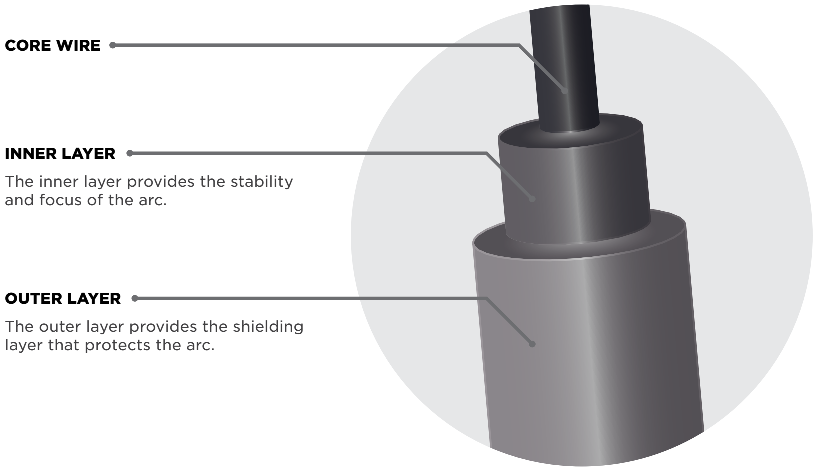
Most stick electrodes are single coated, which means that all the ingredients needed to make it both conductive and protective are included in the same outer layer that coats the inner core. However, you can purchase twin coated electrodes. What is a twin coated electrode though? It's exactly what it sounds like: it has two layers.

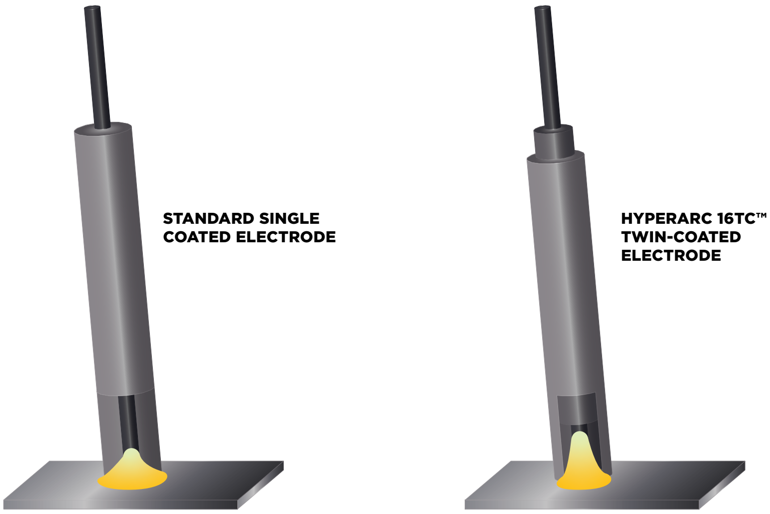
The inner layer contains the ingredients that ionise and make it conductive, which provides a stable, concentrated arc around the wire. The second layer contains the shielding and slag forming components. It is non-conductive, which also helps to concentrate the arc and make it easier to direct.

There are quite a few benefits with a twin coated electrode, and they're generally more popular with the operators, but only E7016s are available with twin coating.

UNIMIG sells a range of general purpose, low hydrogen, stainless steel, hard facing and cast-iron electrodes, including our brand new **HYPERARC 16TC Low Hydrogen Electrode**.

If you're looking to weld aluminium, don't even bother with stick welding. Instead, check out our guides on MIG and TIG welding, as they're much better welding options for an aluminium project.





- Less concentrated arc.
- Less arc force.
- Less stability at lower currents.

✓ Superior arc stability.
✓ Easy strike and restrike.
✓ Greater stability at lower currents.

2. ELECTRODE HOLDER

There are two types of torch that you can purchase to place your electrode in for the weld: the square/twist lock holder and tongs.

ELECTRODE HOLDER VS TONGS

The most significant difference between these two 'torches' is how they look. The twist lock holder has a square opening which clamps your electrode into place once the head is twisted clockwise. The tongs look exactly like tongs, with grooves along the insides for the angle you want your electrode. (If none of the groove positions fit the angle you're looking for, you can just bend the electrode where it attaches for the perfect angle.)

The reality is these two types of electrode holders do the same thing: clamp your electrode in place. In America, the tongs are the most popular, and in Australia, the twist lock holder is more popular. That's why most of the stick welders by UNIMIG come with a twist lock electrode holder when you purchase them.

3. POLARITY

Stick welding can be done in both positive and negative polarities, but unfortunately, there is no hard and fast rule on setting the torch up. The required polarity is listed on the front of the box of electrodes, so make sure to keep the front label and read it so you can set your machine up correctly.

- If the electrodes ask for an AC/DC+, you'll need to attach your earth clamp into the **Negative (–)** panel mount and the torch into the **Positive (+)** panel mount.
- If the electrodes ask for an AC/DC–, you'll need to attach your torch into the **Negative (–)** panel mount and the earth clamp into the **Positive (+)** panel mount.

When working in DC, some electrodes might ask for a DCEP (Direct Current Electrode Positive) or a DCEN (Direct Current Electrode Negative). The last letter is the most important and refers to the polarity required. Most electrodes will need a positive polarity.

4. SETTINGS & AMPERAGE

The settings on a machine made specifically for stick welding are the easiest to figure out. All you have to do is pick your amps, and you're ready to go. However, if you're using a MIG or TIG machine, you'll need to select 'MMA/stick' mode on the machine. The control may be a scroll through option or a switch on the front of the machine, depending on what you have.

For example, if you're using the **VIPER 185 MIG/TIG/Stick Welder** machine, there's a switch on the right-hand side labelled MMA/TIG/MIG. You would need to place it into the MMA mode and then use the far-left knob (labelled 'A' and with an image of a stick gun) to adjust the amps for your electrode.

The number of amps you need will depend on how thick your electrode is (and, therefore, how thick your parent metal is). UNIMIG has a useful starting guide with amperage ranges for a few types of electrodes and their thicknesses, found in the next chapter. For example, if the metal you're looking to weld is a 4mm mild steel downhand butt weld, you'll need a 2.6mm **HYPERARC General Purpose 6013** electrode, and you'd set your amps somewhere between 60-65. If you're unsure of where in that range to start, try the middle first and adjust if need be.

While welding, there are a few indications that your amperage is set incorrectly. If your amps are too high, the arc will be fierce, with too much penetration and spatter spraying everywhere. If your amps are too low, you'll have a very soft arc, there'll be barely any fusion between the metals, and your electrode will likely stick more.

KEYABLE VRD

VRD stands for Voltage Reduction Device. The keyable switch means that this setting can be turned on or off to suit your application. You may also be required to have it turned on by your site foreman, and a keyable switch allows this while also letting you turn it off if you've got difficult to start electrodes.

METAL PREPARATION

Unlike MIG and TIG welding, there is no need to prepare your metal. Because of the flux coating on each electrode, stick welds are tough enough to go over rust and other things that would usually cause contamination without any problems.

STORAGE

Some electrodes need to stay dry to keep the weld moisture and contaminant free. To achieve this, some manufacturers vacuum-seal their electrodes so that they'll remain moisture-free until they reach the customer. UNIMIG's **HYPERARC 16TC Electrodes** come in a vacuum-sealed package, so they'll be ready for use as soon as you open the packet.

If you don't have somewhere dry and sealed to store these, or they become filled with a bit of moisture, you can re-bake the electrodes in an electrode oven to dry them out.

The only electrodes that you do need to worry about re-baking are the low hydrogen ones (E7016 & E7018), as they must remain moisture-free. It doesn't matter too much if the others aren't baked, as it won't affect the weld.

Please do not try to bake your electrodes in a kitchen oven. It doesn't work. Your oven can't get enough concentrated heated into the electrode, so all you'll be doing is wasting your time and potentially covering your electrode in leftover food bits (gross).

STARTING YOUR WELD

You've got your electrode and machine ready to go; now you're ready to weld.

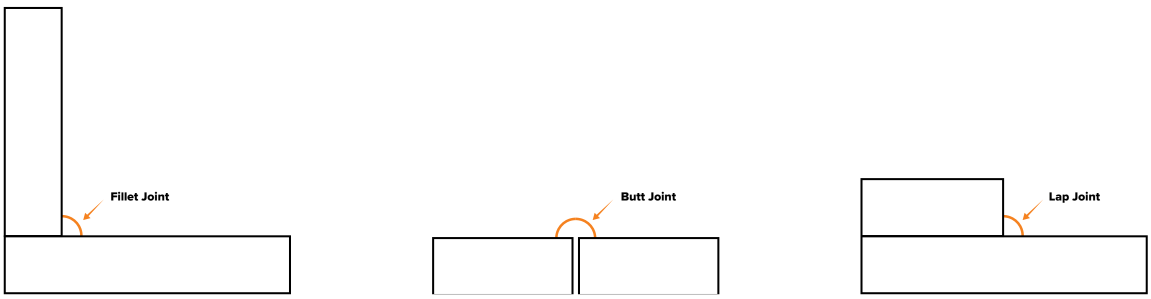
There are three main factors to consider when doing a weld:

1. Work angle
2. Travel angle & distance
3. Travel speed

This is true regardless of whether you are TIG, MIG or stick welding. Stick welding is slightly different from MIG and TIG, though, as your stick torch starts a lot further away from the join than the others.

1. WORK ANGLE

Your work angle is your torch in relation to the angle of the joint. There are a few different joint types, and several positions these joints can be found.

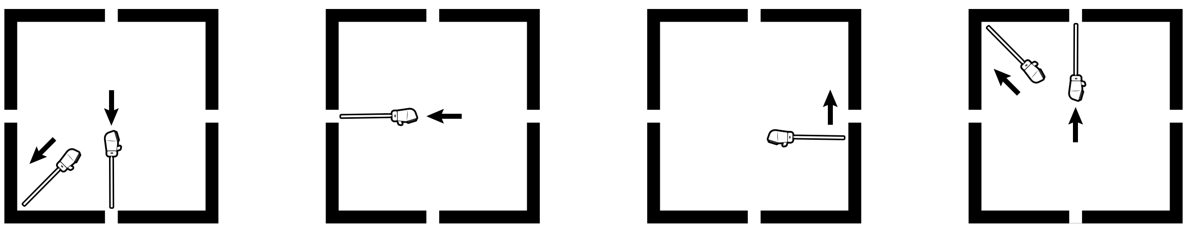


T-joint / Fillet Joint	Butt Joint	Lap Joint
90° joint angle	180° joint angle	90° joint angle
45° work angle	90° work angle	60°/70° work angle

(These angles do not include your travel angle, which we'll talk about next.)

POSITIONS

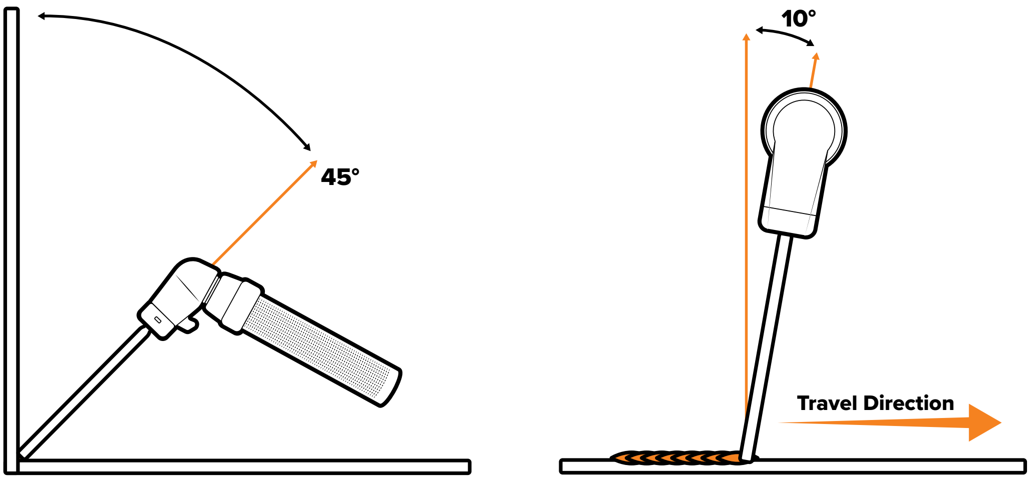
Flat (butt & fillet) **Horizontal** **Vertical** **Overhead (butt & fillet)**



The main thing that your weld's position will affect is whether or not you'll be fighting against gravity as you go. You'll usually need to increase your travel speed and lower your amps to keep the molten metal from dripping if you're in an overhead, vertical or horizontal position. Keeping your arc tight will also help. While you're learning, flat positions are best.

2. TRAVEL ANGLE & DISTANCE

When stick welding, you only want to drag (pull) your weld. If you use a push angle, you risk having slag trapped in the weld pool and contaminating the weld. To drag your weld, place your stick into the joint (if you're welding a fillet, then your stick should be at roughly 45°) then tilt your stick slightly sideways by 10° to 15°. Your torch should hover over where you're going to be welding, rather than hovering over where you've already welded.



As you weld, keep your arc length short. A good rule of thumb is that your arc length shouldn't be longer than your electrode diameter. If you're using a 2.6mm electrode, your arc length shouldn't be longer than 3mm. However, you don't want to be so close that your electrode is touching the metal, as it will stick. If you pull away too far, your arc will become unstable, you'll produce more spatter, which will fly everywhere, and it'll become hard to keep the arc lit.

3. TRAVEL SPEED

Like all welding, your travel speed needs to be consistent. The slower you travel, the fatter your weld will be (and you could go straight through if your parent metal is on the thin side). The faster you travel, the less penetrative your weld will be.

MAKING THE WELD

Before you start a stick weld, it's a good idea to do some dry runs to make sure that you can move with the rod as it melts and gets shorter. You can do this over the edge of a table; just imagine your weld is disappearing into a weld pool, and move along the table's edge, slowly dropping your electrode down below it as you go. Practising this is a good idea as you don't want to make your arc too long. A long arc will affect your weld's quality, and the arc will fail if it gets too far away.

It's also a good idea to practice your arc ignition on some scrap metal. You want to scratch your electrode like you're lighting a match and then pull up, but you don't want to pull away too fast or too far. The ignition can be tricky, especially if you have a difficult electrode type, as there's also the problem of it sticking to the metal if you don't pull away fast enough. If your electrode does get stuck, just use a fast twisting motion to dislodge the electrode from the parent metal and try again.

Place your workpiece in front of you in a way that when you begin welding, your hands can move freely and steadily. Remember that you want to be able to move downwards with the electrode.

Check that your earth clamp has been attached to a metal surface, such as a (clean) metal workbench, because if your earth clamp isn't grounded, your machine won't start.

If you're making a fillet join, you can use a magnetic welding clamp to hold your two pieces of metal together.

Start with your tacks. Remember to flip your welding helmet down before you ignite your arc. Tacks are used to fuse the metals together at the edges, so you don't have to hold them together while you're trying to weld.

To make a tack with your stick weld, strike the electrode to ignite it and then run a tiny weld, only a few millimetres long, then pull away. You almost don't want to move the electrode, as the tack doesn't need to be very big. You should be able to break it off in case it's lined up wrong. Repeat this process on both edges so that your workpiece stays lined up how you want it.

The first step in making a stick weld is igniting the arc. Scratch your electrode along your metal, quickly but not too softly (some force is needed) and pull it up and away as you scratch (but not too far). Now that your arc is ignited, you can begin to drag it along the weld, maintaining a steady pace for the best results. If you accidentally pull away, or you don't move down with the melting electrode, you can reignite it in the same way that you started it in the first place. If you're using a low hydrogen electrode and having trouble with reigniting it, you might find that the wire has burnt up slightly into the flux, leaving an empty tube of flux at the tip of your rod. Just give this a quick file to remove the excess flux, and you'll be back up and running.

If you have the right amperage and technique, your weld should be about twice your electrode's width (a 2.6mm electrode will produce a 5mm weld). If you finish the weld and you've still got half an electrode remaining, don't throw it out! The ability to reignite an electrode means that nothing needs to be wasted, but once you're down to about 5cm left, you're better off starting a new one and getting rid of the stub.

Once you've finished your weld, there's one last step before you can examine how well you did. The slag removal. The protective layer that forms over your weld to minimise contamination needs to be taken off to complete the process.

You can remove the slag with a chipping hammer for the best results, and a wire brush to finish it off doesn't hurt either. If you intend to go over the weld again and make multiple passes, this wire brush is essential in order to remove all contaminants from the weld. The type of electrode you use will also impact how easy or hard it is to remove the slag from on top of the weld.

Quick Tip: even if you're faced with challenging slag, don't beat at it. You're likely to make it airborne and spray it across the room, creating a bigger mess. Instead, use the pointed end of your hammer to drag along the top and chip at the sides with the flat end, alternating with the wire brush as well to remove it.

Once you've removed the slag, you're done, and you can inspect your weld. Don't be disheartened if you're first stick weld doesn't look great. Getting the technique right and keeping a steady pace as you drag while the electrode melts away under you is hard. The first few attempts will most likely be wobbly; your arc will stop and start; you'll probably have fat parts and thin parts. All of that is fine! Just keep practising (you can use your half electrodes for practice), and you'll be a master in no time.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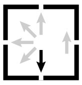
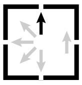
HYPERARC 16TC™ LOW HYDROGEN ELECTRODES

BUTT WELD DOWNHAND



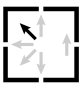
Material Thickness	Electrode Diameter		
	2.6mm	**3.2mm**	**4.0mm**
3mm	55 - 70A		
4mm	55 - 70A		
5mm	60 - 75A		
6mm	60 - 75A	70 - 90A	
7mm	65 - 80A	75 - 95A	
8mm	65 - 90A	90 - 105A	100 - 115A
9mm		100 - 115A	105 - 115A
10mm		110 - 120A	110 - 125A
11mm		110 - 120A	110 - 130A
12mm		115 - 130A	115 - 150A

BUTT WELD OVERHEAD



Material Thickness	Electrode Diameter		
	2.6mm	**3.2mm**	**4.0mm**
3mm	50 - 60A		
4mm	50 - 60A		
5mm	55 - 70A		
6mm	60 - 70A	70 - 80A	
7mm	65 - 75A	75 - 85A	
8mm	65 - 75A	90 - 100A	100 - 110A
9mm		90 - 105A	100 - 110A
10mm		105 - 110A	105 - 115A
11mm		110 - 115A	105 - 115A
12mm		110 - 115A	110 - 120A

FILLET OVERHEAD



Material Thickness	Electrode Diameter		
	2.6mm	**3.2mm**	**4.0mm**
3mm	50 - 65A		
4mm	50 - 65A		
5mm	50 - 70A	70 - 85A	
6mm	60 - 75A	70 - 90A	
7mm	65 - 75A	75 - 95A	
8mm	65 - 80A	90 - 100A	100 - 115A
9mm		90 - 100A	100 - 120A
10mm		100 - 115A	105 - 120A
11mm		100 - 115A	110 - 120A
12mm		100 - 120A	115 - 140A

This setup information is intended to act as a guide only. Individual may vary depending on technique, skill and material. Please refer to your machine's operating manual for further instructions.

HYPERARC 16TC™ LOW HYDROGEN ELECTRODES

FILLET DOWNHAND

	Electrode Diameter		
Material Thickness	2.6mm	3.2mm	4.0mm
3mm	60 - 70A		
4mm	60 - 70A		
5mm	60 - 75A	70 - 90A	
6mm	65 - 75A	75 - 90A	
7mm	65 - 75A	80 - 90A	
8mm	70 - 80A	95 - 110A	100 - 120A
9mm		100 - 115A	105 - 120A
10mm		100 - 120A	110 - 130A
11mm		110 - 120A	110 - 135A
12mm		110 - 125A	115 - 160A

HORIZONTAL WELD

	Electrode Diameter		
Material Thickness	2.6mm	3.2mm	4.0mm
3mm	55 - 70A		
4mm	55 - 70A		
5mm	60 - 75A		
6mm	60 - 75A	70 - 90A	
7mm	65 - 80A	75 - 95A	
8mm	65 - 90A	90 - 105A	100 - 115A
9mm		100 - 115A	105 - 115A
10mm		110 - 120A	110 - 125A
11mm		110 - 120A	110 - 130A
12mm		115 - 130A	115 - 150A

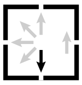
VERTICAL UP

	Electrode Diameter		
Material Thickness	2.6mm	3.2mm	4.0mm
3mm	50 - 55A		
4mm	50 - 55A		
5mm	55 - 60A	75 - 80A	
6mm	55 - 60A	75 - 80A	
7mm	60 - 70A	80 - 90A	
8mm	70 - 75A	80 - 90A	95 - 110A
9mm		90 - 100A	95 - 110A
10mm		90 - 100A	100 - 115A
11mm		100 - 120A	100 - 115A
12mm		100 - 120A	105 - 130A

This setup information is intended to act as a guide only. Individual may vary depending on technique, skill and material. Please refer to your machine's operating manual for further instructions.

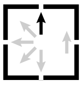
HYPERARC™ 7018 LOW HYDROGEN ELECTRODES

BUTT WELD DOWNHAND



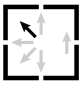
Material Thickness	Electrode Diameter		
	2.6mm	3.2mm	4.0mm
3mm	65 - 70A		
4mm	65 - 70A		
5mm	70 - 75A		
6mm	70 - 75A	100 - 110A	
7mm	75 - 85A	100 - 110A	
8mm	85 - 90A	115 - 120A	115 - 120A
9mm		115 - 120A	115 - 120A
10mm		115 - 125A	115 - 125A
11mm		115 - 125A	115 - 130A
12mm		115 - 135A	115 - 140A

BUTT WELD OVERHEAD



Material Thickness	Electrode Diameter		
	2.6mm	3.2mm	4.0mm
3mm	60 - 70A		
4mm	60 - 70A		
5mm	60 - 75A		
6mm	60 - 75A	95 - 100A	
7mm	65 - 80A	95 - 100A	
8mm	65 - 80A	95 - 110A	115 - 120A
9mm		95 - 110A	115 - 120A
10mm		100 - 120A	115 - 120A
11mm		100 - 120A	115 - 125A
12mm		105 - 125A	115 - 140A

FILLET OVERHEAD



Material Thickness	Electrode Diameter		
	2.6mm	3.2mm	4.0mm
3mm	65 - 75A		
4mm	65 - 75A		
5mm	65 - 75A		
6mm	75 - 85A	90 - 100A	
7mm	75 - 85A	90 - 100A	
8mm	75 - 90A	90 - 105A	105 - 120A
9mm		105 - 120A	105 - 120A
10mm		105 - 125A	115 - 130A
11mm		105 - 125A	115 - 130A
12mm		105 - 130A	115 - 135A

This setup information is intended to act as a guide only. Individual may vary depending on technique, skill and material. Please refer to your machine's operating manual for further instructions.

HYPERARC™ 7018 LOW HYDROGEN ELECTRODES

FILLET DOWNHAND

Material Thickness	Electrode Diameter 2.6mm	Electrode Diameter 3.2mm	Electrode Diameter 4.0mm
3mm	70 - 80A		
4mm	70 - 80A		
5mm	70 - 85A		
6mm	70 - 85A	90 - 100A	
7mm	75 - 100A	90 - 105A	
8mm	75 - 100A	95 - 110A	120 - 125A
9mm		105 - 120A	120 - 125A
10mm		105 - 125A	110 - 130A
11mm		105 - 125A	110 - 130A
12mm		110 - 135A	110 - 140A

HORIZONTAL WELD

Material Thickness	Electrode Diameter 2.6mm	Electrode Diameter 3.2mm	Electrode Diameter 4.0mm
3mm	65 - 70A		
4mm	65 - 70A		
5mm	70 - 75A		
6mm	70 - 75A	80 - 85A	
7mm	75 - 85A	85 - 90A	
8mm	75 - 90A	100 - 115A	115 - 125A
9mm		100 - 115A	115 - 125A
10mm		110 - 120A	120 - 130A
11mm		110 - 125A	120 - 130A
12mm		110 - 135A	125 - 150A

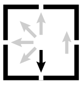
VERTICAL UP

Material Thickness	Electrode Diameter 2.6mm	Electrode Diameter 3.2mm	Electrode Diameter 4.0mm
3mm	65 - 70A		
4mm	65 - 70A		
5mm	70 - 75A		
6mm	70 - 75A	80 - 90A	
7mm	70 - 85A	80 - 95A	
8mm	70 - 85A	95 - 105A	100 - 110A
9mm		95 - 105A	100 - 115A
10mm		100 - 110A	110 - 120A
11mm		100 - 110A	110 - 120A
12mm		105 - 115A	110 - 130A

This setup information is intended to act as a guide only. Individual may vary depending on technique, skill and material. Please refer to your machine's operating manual for further instructions.

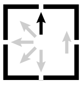
HYPERARC™ STAINLESS STEEL ELECTRODES

BUTT WELD DOWNHAND



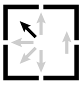
Material Thickness	Electrode Diameter 2.6mm	Electrode Diameter 3.2mm
3mm	60 - 65A	
4mm	60 - 65A	
5mm	60 - 70A	
6mm	60 - 70A	70 - 80A
7mm	60 - 75A	70 - 80A
8mm	70 - 80A	75 - 95A
9mm		75 - 95A
10mm		95 - 110A
11mm		95 - 110A
12mm		110 - 115A

BUTT WELD OVERHEAD



Material Thickness	Electrode Diameter 2.6mm	Electrode Diameter 3.2mm
3mm	55 - 60A	
4mm	55 - 60A	
5mm	55 - 60A	
6mm	60 - 65A	100 - 110A
7mm	60 - 65A	100 - 110A
8mm	65 - 70A	100 - 115A
9mm		100 - 115A
10mm		100 - 115A
11mm		105 - 120A
12mm		105 - 120A

FILLET OVERHEAD

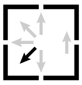


Material Thickness	Electrode Diameter 2.6mm	Electrode Diameter 3.2mm
3mm	60 - 70A	
4mm	60 - 70A	
5mm	65 - 75A	
6mm	65 - 75A	75 - 80A
7mm	70 - 75A	75 - 80A
8mm	70 - 80A	80 - 90A
9mm		80 - 90A
10mm		90 - 100A
11mm		90 - 100A
12mm		110 - 115A

This setup information is intended to act as a guide only. Individual may vary depending on technique, skill and material. Please refer to your machine's operating manual for further instructions.

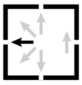
HYPERARC™ STAINLESS STEEL ELECTRODES

FILLET DOWNHAND



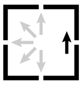
		Electrode Diameter	
		2.6mm	**3.2mm**
Material Thickness	**3mm**	65 - 70A	
	4mm	65 - 70A	
	5mm	65 - 80A	
	6mm	65 - 80A	75 - 85A
	7mm	70 - 80A	75 - 85A
	8mm	70 - 85A	90 - 100A
	9mm		90 - 100A
	10mm		100 - 115A
	11mm		100 - 115A
	12mm		110 - 120A

HORIZONTAL WELD



		Electrode Diameter	
		2.6mm	**3.2mm**
Material Thickness	**3mm**	60 - 65A	
	4mm	60 - 65A	
	5mm	60 - 70A	
	6mm	60 - 75A	70 - 80A
	7mm	65 - 75A	70 - 80A
	8mm	65 - 75A	75 - 95A
	9mm		75 - 95A
	10mm		95 - 110A
	11mm		95 - 110A
	12mm		110 - 115A

VERTICAL UP

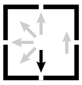


		Electrode Diameter	
		2.6mm	**3.2mm**
Material Thickness	**3mm**	55 - 60A	
	4mm	55 - 60A	
	5mm	55 - 60A	
	6mm	60 - 65A	80 - 90A
	7mm	60 - 65A	80 - 90A
	8mm	65 - 70A	90 - 100A
	9mm		90 - 100A
	10mm		95 - 105A
	11mm		95 - 105A
	12mm		105 - 115A

This setup information is intended to act as a guide only. Individual may vary depending on technique, skill and material. Please refer to your machine's operating manual for further instructions.

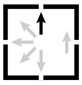
HYPERARC™ 6013 GP ELECTRODES

BUTT WELD DOWNHAND



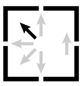
Material Thickness	Electrode Diameter 2.6mm	3.2mm	4.0mm
3mm	65 - 75A		
4mm	65 - 75A		
5mm	70 - 80A		
6mm	70 - 80A	100 - 110A	
7mm	75 - 85A	100 - 110A	
8mm	80 - 90A	110 - 120A	125 - 135A
9mm		110 - 120A	125 - 135A
10mm		120 - 130A	125 - 135A
11mm		120 - 130A	130 - 140A
12mm		120 - 135A	130 - 140A

BUTT WELD OVERHEAD



Material Thickness	Electrode Diameter 2.6mm	3.2mm	4.0mm
3mm	60 - 70A		
4mm	60 - 70A		
5mm	70 - 80A		
6mm	70 - 80A	100 - 110A	
7mm	75 - 85A	100 - 110A	
8mm	75 - 85A	100 - 115A	120 - 130A
9mm		100 - 115A	120 - 130A
10mm		110 - 120A	125 - 135A
11mm		110 - 120A	125 - 135A
12mm		110 - 125A	130 - 140A

FILLET OVERHEAD



Material Thickness	Electrode Diameter 2.6mm	3.2mm	4.0mm
3mm	70 - 80A		
4mm	70 - 80A		
5mm	70 - 80A		
6mm	75 - 85A	100 - 110A	
7mm	75 - 85A	100 - 110A	
8mm	80 - 90A	110 - 120A	125 - 135A
9mm		110 - 120A	125 - 135A
10mm		115 - 125A	130 - 140A
11mm		115 - 125A	130 - 140A
12mm		120 - 130A	130 - 145A

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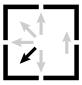
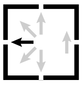
HYPERARC™ 6013 GP ELECTRODES

FILLET DOWNHAND



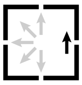
Material Thickness	Electrode Diameter		
	2.6mm	3.2mm	4.0mm
3mm	80 - 90A		
4mm	80 - 90A		
5mm	85 - 95A		
6mm	85 - 95A	105 - 120A	
7mm	85 - 100A	105 - 120A	
8mm	90 - 100A	110 - 125A	130 - 140A
9mm		110 - 125A	130 - 140A
10mm		110 - 130A	135 - 150A
11mm		110 - 130A	135 - 150A
12mm		110 - 135A	135 - 155A

HORIZONTAL WELD



Material Thickness	Electrode Diameter		
	2.6mm	3.2mm	4.0mm
3mm	70 - 80A		
4mm	70 - 80A		
5mm	70 - 80A		
6mm	75 - 85A	100 - 110A	
7mm	75 - 85A	100 - 110A	
8mm	80 - 90A	110 - 120A	125 - 135A
9mm		110 - 120A	125 - 135A
10mm		120 - 130A	125 - 135A
11mm		120 - 130A	130 - 140A
12mm		120 - 135A	135 - 150A

VERTICAL UP



Material Thickness	Electrode Diameter		
	2.6mm	3.2mm	4.0mm
3mm	65 - 75A		
4mm	65 - 75A		
5mm	70 - 80A		
6mm	70 - 80A	110 - 115A	
7mm	75 - 85A	110 - 115A	
8mm	75 - 85A	110 - 120A	120 - 130A
9mm		110 - 120A	120 - 130A
10mm		110 - 125A	125 - 135A
11mm		110 - 125A	125 - 135A
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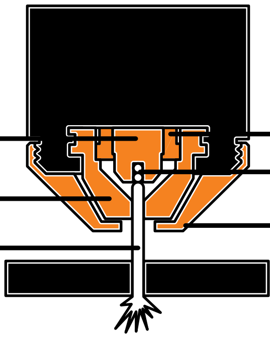
If you've ever seen Star Wars, then you'll know what a light sabre is, and (even if you don't admit it) you've probably wanted to have a go of a real one. What's the closest you're ever going to get to waving around a super destructive beam of light? Plasma cutting. Except you absolutely shouldn't wave it around, and they're not quite 'destructive', but they will shoot out a beam of light that cuts through things, which is just as cool.

WHAT IS PLASMA CUTTING?

Plasma is a super-heated column of gas (and the fourth state of matter). It's formed when compressed air or compressed gases (like nitrogen or argon) make contact with the electrode (which is inside the torch) and ionise to create plasma.

Plasma cutting (plasma arc cutting), therefore, is a melting process that uses plasma and an outside power source to create an electric arc between the electrode and the metal being cut to melt and eject it from the cut.



Plasma can cut through anything electrically conductive; steel, stainless steel and aluminium are all fair game. In comparison, oxy cutting will only work on metals that contain iron, as it works through chemical reactions, such as oxidisation (it's like a sped-up version of rusting) instead.

MACHINE SETUP

1. Air/Gas
2. Torch & Consumables
3. Settings

1. AIR/GAS

Unlike welding machines, every Australian market plasma cutter you can buy is made to work on compressed air only, including UNIMIG machines. The good news is that an air compressor attaches to the back of a plasma cutter in the same way a gas tank connects to the back of a welder. The bad news is that UNIMIG doesn't supply air compressors, so you'll have to purchase one separately from your local hardware store. The need for an air compressor means they're not very portable because you need to be connected to the compressor and a power supply. When purchasing a compressor, make sure to get one that can deliver 70–120psi and has an airflow/intake volume rating that is greater than your plasma cutters. You don't want to run out of air before you've finished your cut.

If you're looking for more portability, some machines come with built-in air compressors, like the **RAZOR CUT 40 AIR Plasma Cutter**. These machines will still need a power supply, however.

An air dryer or filter is essential for keeping contaminants like moisture and dust particles out of the machine's air lines. Moisture in the pipes will come out in your torch and cause your consumables to burn up faster, resulting in bad cuts, which is something you'd like to avoid. Depending on which model machine you have, your air dryer/filter can be found inside the machine or at the back of the machine.

3 TYPES OF FILTER

- Basic
- Roll
- In-line

Basic: most plasma cutters will come with a basic air filter. These will work fine, especially if you're only doing small cuts on hobby projects, but additional, higher quality air filters are still recommended. If you choose to upgrade your air filter, the original basic filter will remain attached to your machine, and the new filter is attached as an extra unit. Basic air filters are self-draining, with a small hose that sticks out the bottom for the captured moisture to drip out. Some UNIMIG machines have this basic air filter installed inside the machine, but these come with a drainage hole drilled in the bottom to work in the same way.

Roll: these filters look similar to a toilet roll, which is where they get the nickname 'toilet roll filters,' and consist of a cylindrical cartridge. The roll works well, but it's not self-draining, which means they need to be changed every so often depending on the frequency of use.

In-line: these sound cool, but in reality, they're not that good. Made from specially treated plastic, it works by closing up when moisture touches it to block the water from getting through. The problem? Airflow is one of the most important things when running a successful plasma cut, and these filters block the moisture as well as the airflow when they close.

Both roll and in-line filters are mostly needed in high humidity environments.

2. TORCH & CONSUMABLES

Plasma cutting is done in DCEN (Direct Current Electrode Negative). Getting the polarity correct on your plasma cutter is a lot easier than any form of welding because the plasma torches have a different shaped plug. There's no guesswork involved with this one; you literally can't connect your earth clamp or torch into the wrong hole. UNIMIG's **VIPER CUT 30 Plasma Cutter** (for your home DIY projects) comes with the torch already connected, making this set up even easier.

Quick Tip: don't clamp your earth to the bit of metal that will be cut off, as you could then become the path of least resistance, which is not a good time. Make sure to attach your earth clamp to either a (clean) metal workbench or the part of the metal that will not fall away once it's cut.

Because plasma cutting machines come with a specific plug for the torch and only the **Positive (+)** polarity panel mount, you can't use them for anything else, unlike welding machines, which are generally mix and match (to a degree).

CONSUMABLES

The attachments on your torch will make a significant difference to the type of cutting you can do with your machine.

Types of Shields

- Contact cutting
- Gouging
- Stand off cutting

Different guns will allow for more or less varieties of shields to be attached. For example, the UNIMIG **SC30 Plasma Torch**, which comes with the **VIPER CUT 30**, can only do stand off cutting. In comparison, the **SC80 Plasma Torch** can do all three.

Contact cutting: contact cutting is what it sounds like; you place the tip of the gun against the metal you want to cut, and off you go. UNIMIG torches come with a contact cutting shield cap so that the cutting tip doesn't touch the metal (as this can wear your tip out), but some machines don't, in which case the tip itself will be pushed along the metal.

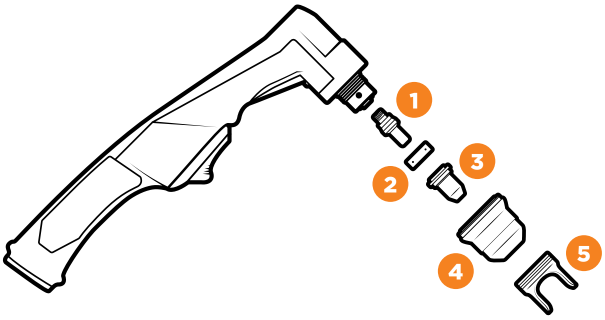
Gouging: gouging is used when you want to remove metal from a piece without actually cutting through it. It's generally used to remove defective welds so that you can redo them.

Stand off cutting: stand off cutting is similar to contact cutting, except you are forced to leave a space between the torch and metal, as the shields come with little legs or small wheels known as 'stand off guides'. This process gives your consumables extra life as they remain at a distance from the sparks.

In general, regardless of the type of cutting you want to do and the shield you attach for it, there are several consumables inside the gun which remain the same, though they may look slightly different.

STANDARD CONSUMABLES

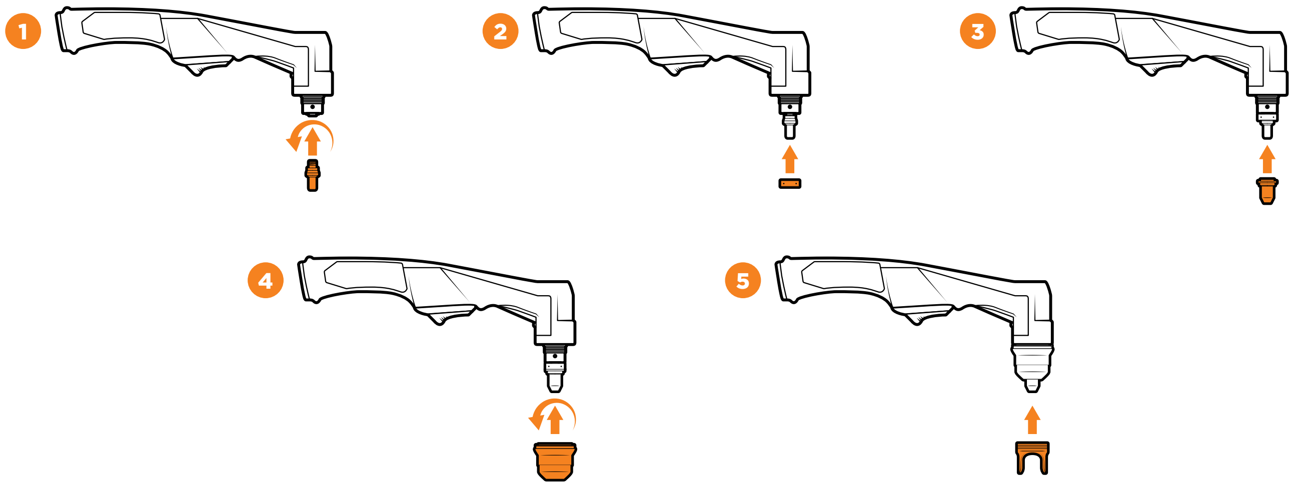
1. Electrode
2. Swirl ring (gas distributor)
3. Cutting tip
4. Shield cap body (retaining cap)
5. Shield cap



Putting the consumables together to get your torch up and running isn't too hard, and most machines will come with a guide either on the machine or in their User Manual. UNIMIG torches usually come already set up, but if you need to swap parts or replace them, you'll need to take apart and reassemble the torch.

CONSUMABLES ASSEMBLY

1. Screw your electrode in
2. Place your swirl ring (gas distributor) on the torch head
3. Place your cutting tip over the electrode
4. Screw your shield cap body (retaining cap) in; this should go over the other parts and hold everything in place inside the torch
5. (If you have one) screw your shield cap onto the end of the shield cap body



The higher-end torches will also need a cooling tube. The tube sits inside the torch head, and the electrode is screwed on like normal over it.

If you haven't assembled the torch correctly, you'll know about it straight away, as it won't turn on. Most of these consumables will sit in place, so don't try and twist or force things in; you'll just end up breaking parts.

The most important thing about the consumables is that you have the right ones for the type of cutting you want to do, and they'll withstand the amps you'll be using. These can all be changed and replaced as the need arises.

The small opening of your cutting tip shouldn't touch the material you are cutting unless the torch is designed for the tip to make contact. A damaged contact tip will lower the quality of your cut. The cutting tip should also be able to withstand the number of amps output by the machine; otherwise, it will burn up. In both of these cases, you'll need to replace your cutting tip.

You need to replace the electrode in your gun once there is around a 1mm pit in the centre of the piece.

It's recommended to swap out your electrode and your cutting tip at the same time.

3. SETTINGS

AMPERAGE

Unlike welding, the amps you set your machine to will not affect your cut all that much, so long as you adjust your travel speed to compensate. You can set your machine to its max amps and cut every thickness of metal, but if your machine goes up to 80A and you're cutting 2mm steel, you're going to have to fly across the cut to avoid warping or completely melting the metal. You'll also need to make sure you've got consumables in your torch that can handle the amps you're putting out. If you have a machine set to 80A with consumables only capable of handling 60A max, you're going to burn through them. Some machines come with amperage guides which you can use as a starting point. For example, UNIMIG's **VIPER CUT 30 Plasma Cutter** comes with a recommended settings guide in the User Manual.

VIPER CUT 30 - MILD STEEL PARAMETERS (75 PSI)

Material Thickness (mm)	Amps	Travel Speed (mm/min)
2-3mm	24A	360 mm/min
5-6mm	27A	340 mm/min
8-10mm	30A	240 mm/min
12mm	30A	200 mm/min

VIPER CUT 30 - STAINLESS STEEL/ALUMINIUM PARAMETERS (75 PSI)

Material Thickness (mm)	Amps	Travel Speed (mm/min)
2-3mm	25A	360 mm/min
5mm	27A	300 mm/min
6mm	30A	300 mm/min

AIR PRESSURE

In general, the air pressure regulator can be found on the back of the machine above the air filter. The regulator will have a hose that runs in on one side and out on the other, with a twistable valve on top. This valve is how you change the air pressure, which you can see on the pressure gauge. Most UNIMIG machines come pre-set at a pressure level that will work well regardless of the amperage, and the regulator is inside the machine. A good starting pressure regardless of the machine is 75psi. The amps and air pressure do work together, so if you're cranking your amps as high as they can go, you'll want to up your air pressure as well. You don't want one overpowering the other, as it'll give you a poor-quality cut.

2T VS 4T

2T (two touch) means you will need to hold the button down while you cut. In 4T (four touch) mode you will only need to click the button to ignite the arc, and it will stay ignited until you click it again to turn it off. This setting works the same way that a welder's 2T/4T setting works, but there's no foot pedal option.

AIR TEST

The air test light looks like a gas bottle, and this will check that your air is flowing through the torch at the correct pressure.

PERFORATED METAL

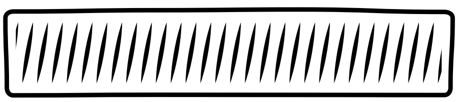
This setting will have an image of a plasma cutter over a dotted line, and this setting will allow you to cut over mesh and other perforated metals. The torch arc will automatically cut out on standard settings if it can't find metal to complete the electric circuit, so switching to this mode will keep your arc steady for a smooth cut. Otherwise, you'll have to keep pulling the trigger to start the arc over and over.

CLEAN CUT VS SEVERANCE CUT

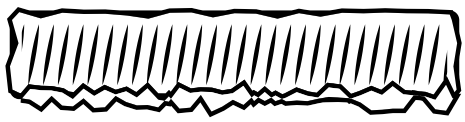
You can get two types of cut with your plasma cutter: a clean cut or a severance.

Clean cut: precisely what it says, a smooth, clean cut on the metal.

Severance: a cut all the way through, but it won't be smooth, and if you plan on working on it after, you'll need to clean it up.



CLEAN CUT



SEVERANCE

Every plasma machine will have a maximum clean cut thickness and a maximum severance. These indicate how thick the metal can be if you want a good quality cut and how thick the metal can be if all you need is to get through it. The severance thickness will always be more than the clean cut thickness.

The metal thicknesses will vary depending on how many amps you can use (your machine model will determine your max amps) and what kind of metal you're using. Aluminium is softer and stainless steel is harder than steel, and they both have higher viscosity (a fluid's resistance to flow). Their max thicknesses are usually smaller than steel's max thickness because of their viscosity.

For example, if you were using a **RAZOR CUT 80 Plasma Cutter**, your thickness would look like this:

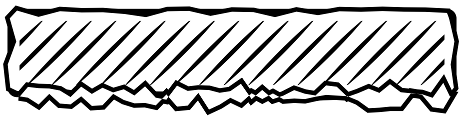
	Mild Steel	Stainless Steel	Aluminium
Cut Thickness	30mm	16mm	16m
Severence Thickness	35mm	20mm	20mm

The max cut and severance thickness your machine can do should be included in the product information, so make sure you get one that will go through the metal you're planning to cut.

TRAVEL SPEED

Your travel speed will depend on how thick the material is that you are cutting. The sparks should be coming out straight down on the other side of the plate when travelling at the correct speed. If you're cutting too fast, the sparks will spray at a very steep angle in the opposite direction than you're cutting. Some sparks might even fly out from the top. If they're flying out of the top, it means your plasma arc isn't cutting all the way through, and the sparks are bouncing off that part that is still joined together.

If they are coming out straight down, but you're getting stuck in grooves, you're cutting too slow. Cutting too slow results in a wider kerf (the material lost due to the cutting process) and dross (excess metal from the cut that hardens on the bottom of the piece and needs to be cleaned off). Cutting too slow also makes the cut much harsher; it won't be as smooth as it could be.

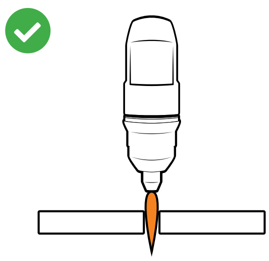


TOO FAST

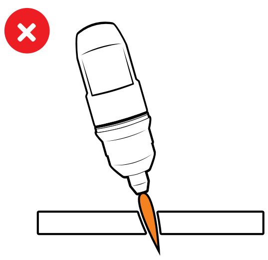
CUTTING YOUR METAL

Before you cut, make sure to mark out where you want to cut, whether it's a straight line or a shape; freehand cutting will always be worse than a guided cut.

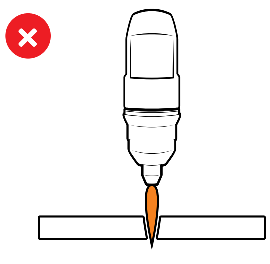
To do the actual cut is relatively easy. Once your machine and torch are all ready to go, place the tip of your torch flush with the metal where you're cutting, pull the trigger and away you go.



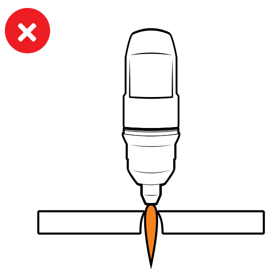
Correct torch height and square to the material. Minimum bevel & equal bevel Longest consumable life.



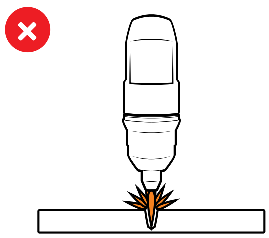
Torch angled to the material. Unequal bevel, one side may be excessively bevelled.



Torch height too high. Excessive bevel, plasma stream may not cut all the way through the material.



Torch height too low. Reverse bevel. The tip may contact the work and short out or damage the tip.



If sparks are spraying up from the workpiece, you are moving the torch too fast, or you don't have enough amps set.

For extra accuracy on your cuts, add a piece of sheet metal to push the torch up against to keep your lines straight (if you want straight lines). You can also measure from the shield's outer edge to the centre of the cutting tip opening and add that width between the line you wish to cut and the sheet metal you're leaning against. This will mean that your cut will be dead on, rather than slightly to the side of where you drew it. You can get circle cutting attachment kits for some plasma torches to help you make perfect circles.

If you are starting in the middle of a plate and piercing straight through, it's a good idea to angle the cutter at roughly a 45° angle so that the metal doesn't jump back at the shield and clog it up. Once you've pulled the trigger and the plasma has pierced all the way through the metal, you can angle back up to 90° and begin cutting. If you're just starting from an outer edge, you can just start at 90°.

If you're gouging instead of cutting, the process is almost the same. You'll still run your torch along in a line, but rather than hold it straight up and down, keep it at a roughly 45° angle from the metal (as if you're pushing a MIG torch), as this helps avoid going through the piece.

Even if you have the right travel speed, which corresponds with the amps and air pressure, plasma cutting will leave a bit of dross (leftover metal) on the bottom. This can be removed with a chipping hammer; it's generally not too thick, so it's easy to clean up.

CNC TABLES

CNC stands for Computer Numerical Control and what that means is a computer does all the hard work for you.

A CNC table, therefore, is a table that comes with a computer that does the cutting for you. These tables come with all the equipment needed (an X-axis and a Y-axis) that you can mount a router (the torch) to. These tables are usually used in auto repair, machine fabrication and construction (to name a few) to make precision cuts which are impossible to get with a hand-held tool.

You do need to program what you want into a CNC computer, and there are specific programs (one that interprets M-codes & G-codes) that need to be used for the computer to understand what kind of cuts you're inputting. Some of the software you can use include AutoDesk Fusion 360 CAD/CAM Software.

These CNC tables usually work by connecting the plasma torch to an arm that can run back and forth (Y-axis) and left to right (X-axis) over the table. A specific CNC plasma torch attaches to this arm and makes the cuts that have been programmed in. This torch is pretty similar to a hand-held torch and also comes with changeable consumables for contact or stand off cutting. Instead of a handle with a trigger, the main difference is that it has a long, straight plastic tube that the consumables attach to. These CNC plasma cutting torches are available at UNIMIG, and some UNIMIG machines come with a CNC connection, so you can hook them up to any model of plasma cutting table.


JASIC
TIG-MMA 200P


UNIMIG
RazorWeld
AC/DC PULSE

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