

How to Mig Weld: Welding Tips

A guide for beginners and beyond.....



Obviously it's **safety first** when you're learning to weld. That is common sense, but I say that so you're sure to remember: welding is dangerous. Welders throw sparks; they set things on fire. Make sure anything in the area around you that could possibly ignite is removed. If you are outside, near grass or bushes, wet them with a hose.

Some welding safety tips:

- **Your skin—and your hair—can burn.** Wear a long sleeve shirt, long, non-flammable pants without cuffs and leather welding gloves. - A good eye shield or welding hood must be used.
- **Keep a fire extinguisher** near you when you are welding.
- **Don't Mig weld where water is in contact with you** or your welding surface; you risk electrocution if you do!
- **Use proper ventilation** when you weld. Harmful fumes are generated, and you need ventilation.

Practice welding, then practice more

When you are ready to start, practice welding on scrap metal that is close to the thickness of the metal you are going to repair.

In welding, practice is essential and it will show up in your final effort. You definitely want your technique in place before you weld a live project on valuable metals, a car, or other items.

Welding Systems

A MIG welder has two cables. One is the ground. It looks like an alligator toothed clamp – like car “jumper cables”. This lead must be attached either to the metal you intend to weld, or near the piece you are welding for proper grounding.

The other lead from the MIG welder has the electrode and its handle with the “welder on” and wire feed button. The tip will have a gas outlet if your MIG uses tanks.

When you press the button, wire (and gas, with a MIG with tanks) will be fed from a spool in the machine through the feed line and to the handle you hold in your hand and, as importantly - electricity will flow from that electrode.

A MIG with a tank attachment will force CO₂/Argon into the arc as the weld is created. This gas helps keep the air surrounding the weld uniform, creating a better weld in the process. A gasless mig welder uses a shielded wire electrode. The outer coating of this shielded wire creates its own gas as it burns in much the same way a tank provides a gas source.

Preparing the Surface

Electricity travels most efficiently through clean metal, so preparing the surface to weld is as important as the weld itself. Cut out all the rust and use a wire brush to clean all the surfaces. Use a welding primer if necessary.

First, the procedure is pretty simple - when you press the switch on the handle, you will strike an arc—an electrical contact—between the metal and the electrode. Start the arc by holding the electrode 6mm from the welding surface.

Once the arc is lit, the metal gets molten hot. New metal is fed from the electrode, and a puddle forms on the work pieces. This puddle is molten steel. When you weld, you are joining metals within this puddle. It all boils down to how well you can control that puddle.

Techniques and Welds Types

- It's easier to weld in short runs—generally in about 6mm spots.
- Start by doing one in the middle of the entire length.
- Then, tack each end. Eyeball a spot between the middle spot weld and the end. Do the other direction likewise. This is called stitching. It helps you make a straight weld.
- Do this until you have a line of spots from one end to the other. Don't concentrate too much heat in one spot. Let the entire work piece cool after stitching.

Spot or Tack Welding: To create a tack, hold the electrode in an area for no more than a couple of seconds. Hold tip in one spot about 6mm above the metal. Too long will burn a hole in metal. Proceed to next position for the next tack or spot, on and on. Spot and tack welding can be done on a seam or though holes made in the overlaid stock to be attached.

Creating a Seam or Butt Weld: When you are doing long seams, your hand motion will be in small oval movements. These movements are small circular motions away from you one side on the work piece and toward you on the

other. Remember that you are actually moving a molten puddle of metal along a predetermined path. Think of it a “fanning or pulling a drop of water” – it’s pretty much the same principle. Keep repeating this motion into the joining metals about 6mm from the top of previous circular always working toward your standing position. Never do this type of weld without tacking the entire length with spots any more than 6" apart maximum.

Mig Welding Feed Rate & Voltage

Once the work material and wire type etc has been fixed you have three variables:

- Tip voltage
- Wire feed rate
- Tip movement rate

The three interact and there will be combinations that work -- and those that don't.

The **voltage setting** is the main control for penetration but the other two parameters have some effect. The **feed rate** sets the arc length. Your **movement** controls the smooth transfer on metal to the work piece.

The first two parameters are a compromise because the ideal “settings” will usually vary from part of the weld to another. You can vary your motion to compensate to some extent. Low voltage will mean low penetration and the weld will sit on the job instead of soaking in. Too much voltage will mean penetrating right through and making a hole.

Most MIG welders have little choice of voltage, so try as many as you can. Having fixed the voltage we now adjust the feed rate. The easiest is to drag the gun along some scrap of similar thickness to the work piece and adjust till you get a smooth arc. If you can hear it - you don't even need to watch it.

Start fast and slow it down. When the rate is fast you get a series of pops. The wire hits the job and short-circuits without maintaining an arc. The wire then melts and the process repeats when the new piece hits the metal. It doesn't seem to do any harm.

There will be a range of speeds were you have a steady arc. You will have to experiment a bit

How to weld with flux cored wire

Flux cored is an economical way to weld mild steel if the welder is used only occasionally. Apart from that it's only real advantage over mild steel wire with shielding gas is that it can be used outside in moderate wind conditions.

It is difficult to use while learning MIG welding as the smoke and flux make it difficult to see what's going on. Also the flux doesn't conduct electricity so you have to be careful not to weld over the same piece twice once it's cooled.

Welding without gas

Where ordinary mild steel mig welding wire needs an inert gas shield to prevent it from oxidising when melted, gasless MIG wire has a flux core which forms the shield around the weld to keep oxygen out.

It's the flux that causes all the weld spatter in the photo and the light coloured crust (slag) on top of the weld.



The slag is easy to remove with a wire brush (apart from around the very edge of the weld), and the resulting weld is reasonably neat.

Immediately after the weld is applied a protective coating of slag bubbles up, which means you can't actually see what the weld pool is doing. That's a big downside of gasless welding. In ordinary gas shielded welding you can adjust speed and technique depending on what the weld pool is doing.

My approach was practice on some scrap to get the settings right, then weld consistently and hope for the best.

The arc seems brighter than for mild steel welding and the weld spatters and gives off white smoke.

A flat zigzag torch movement pulling the torch seems to work well with flux cored wire. It prevents the arc dipping back too much into the cooling weld pool (the slag would stop the arc).

The arc is otherwise very stable, but the slag does not conduct so any tack welds would also need to be cleaned up before welding.



The advantage of gasless (other than saving on gas bottle rental) is the ability to weld in windy conditions.

I tried it outside in a gusty wind, and as the photo shows the weld turned out just as good as the one I did inside. Normal gas shielded welding would have struggled in the slightest breeze.

Welder polarity

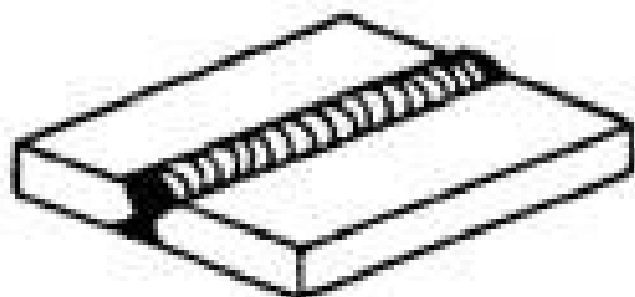
The welder should be set up with a positive earth and negative electrode for gasless welding. This is supposed to put more power into melting the wire.

There are two other types of cored wire that shouldn't be confused with gasless. The first is "dual shield" sometimes used on very thick metal for improved weld toughness. It doesn't have enough gasless flux to shield the

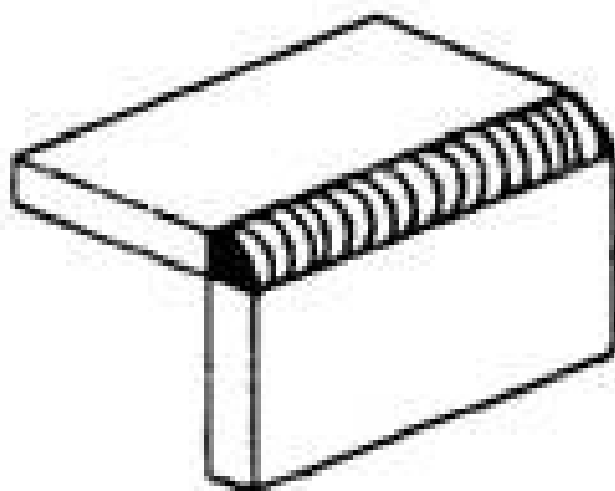
weld so is used with shielding gas. The second odd type is "metal cored" wire which is filled with ground metals that can be tuned to give all sorts of properties, again requiring a gas shield.

Below is an example of a bad MIG weld

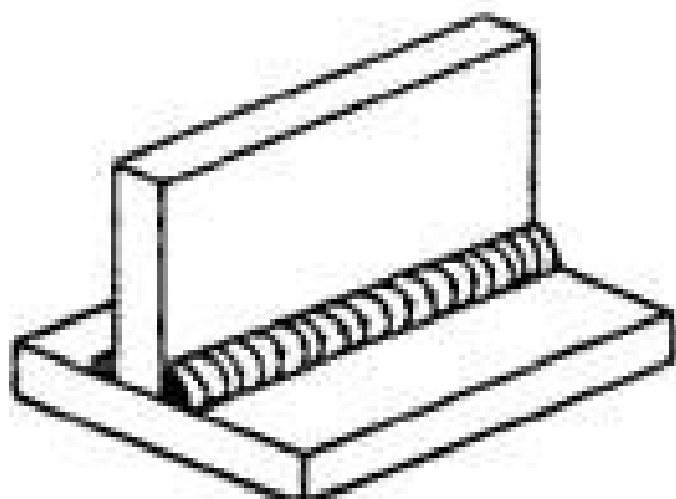




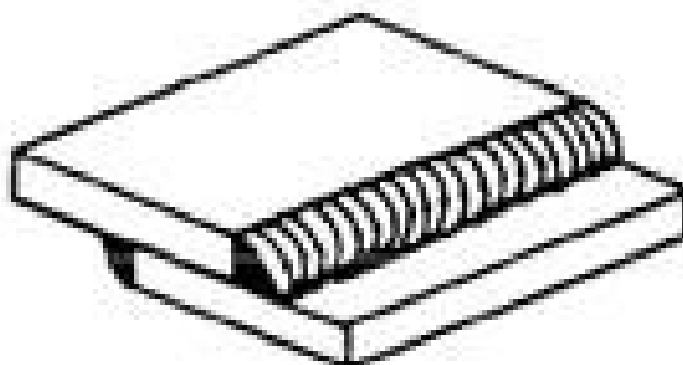
A. BUTT JOINT



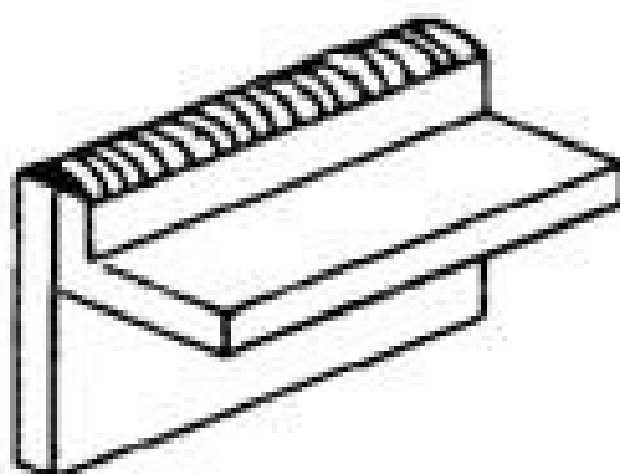
B. CORNER JOINT



C. TEE JOINT



D. LAP JOINT



E. EDGE

Figure 3-6.—Basic weld joints.