MIG VS. FLUX-CORED: WHICH WELDING PROCESS IS RIGHT FOR YOU

Gas Metal-Arc Welding:

GMAW as identified by the American Welding Society, is also popularly known as MIG (Metal Inert Gas) and uses a continuous solid wire electrode for filler metal and an externally supplied gas(typically from a high-pressure cylinder) for shielding. The wire is usually mild steel, typically copper colored because it is electroplated with a thin layer of copper to protect it from rusting, improve electrical conductivity, increase contact tip life and generally improve arc performance. The welder must be setup for DC positive polarity. The shielding gas, which is usually carbon dioxide or mixtures of carbon dioxide and argon, protects the molten metal from reacting with the atmosphere. Shielding gas flows through the gun and cable assembly and out the gun nozzle with the welding wire to shield and protect the molten weld pool. Molten metal is very reactive to oxygen, nitrogen and hydrogen from the atmosphere, if exposed to it. The inert gas usually continues to flow for some time after welding to keep protecting the metal as it cools. A slight breeze can blow the shielding away and cause porosity, therefore welding outdoors is usually avoided unless special windscreens are erected.

However, if done properly, operator appeal and weld appearance are excellent with MIG and it is most welders' favorite process to use. Good technique will yield excellent results. The properly made finished weld has no slag and virtually no spatter. A "push" gun angle is normally used to enhance gas coverage and get the best results. If the material you are welding is dirty, rusty, or painted it must be cleaned by grinding until you see shiny bare metal. MIG welding may be used with all of the major commercial metals, including low carbon steel, low alloy steel, and stainless steel and aluminum with potential for excellent success by a novice.

Aluminum MIG Welding

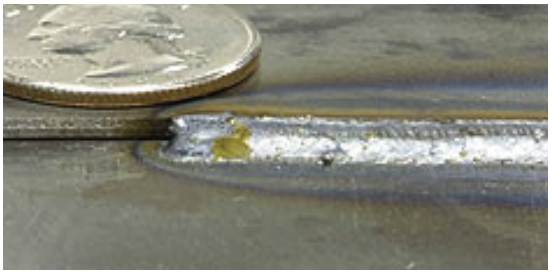
Welding aluminum requires much more than just changing to aluminum wire. Get comfortable welding steel first. Since aluminum is very soft, it requires aluminum drive rolls that have a U-groove and no teeth to bite or cause wire flaking. Cleanliness of the wire and base metal are critical. Wipe the material with acetone on a clean shop rag. Use stainless steel wire brushes that have only been used on aluminum. Drive roll tension and gun length must be minimized. A Teflon, nylon or similar gun liner is needed to minimize friction in feeding the wire and 100% pure Argon gas is required for shielding. Special contact tips are often recommended. Special gun movement techniques are often highly desirable. It is a challenge, but it can be done.

Self-shielded Flux-Cored Arc-Welding process

FCAW per the American Welding Society, or flux-cored for short, is different in that it uses a wire which contains materials in its core that, when burned by the heat of the arc, produce shielding gases and fluxing agents to help produce a sound weld, without need for the external shielding gas. We achieve a sound weld, but in a very different way. We have internal shielding instead of external shielding. The shielding is very positive and can endure a strong breeze. The arc is forceful, but has spatter. When finished, the weld is covered with a slag that usually needs to be removed. A "drag" angle for the gun is specified which improves operator visibility. The settings on the wire feeder welder are slightly more critical for this process. Improper technique will have results that are magnified. This type of welding is primarily performed on mild steel applications outdoors.

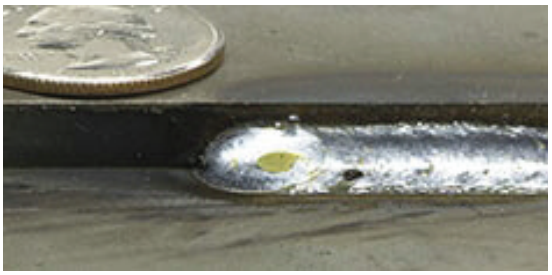
General Usage Rules

MIG
As a rule of thumb, it is recommended to use a compact 115 volt input (or 230 volt) MIG wire feeder welder



indoors on clean new steel that is 24 to 12 gauge thick. 12 gauge is a little less than 1/8" thick. 24 gauge is less than 1/16" thick. The smallest wire (.025") will make it the easiest to weld the thinnest (24 gauge) material. The .030" diameter wire will weld a little faster deposition rate. If you need to weld 1/8" to ¼" thick material with MIG, you will need the higher capacity compact machine which will require 230 volt input. The higher amperage range of this machine can better handle your welding needs in a single pass and you may not have to waste time with second or third passes. The 230 volt machine could also run .035" diameter wire. To MIG weld material more than ¼" thick, you need a higher capacity truly industrial machine. If most of your welding will be performed indoors on clean material that is less than 1/8" thick, a MIG machine that operates on 115 volts is probably your best bet for economic reasons in that a 230 volt input machine will be more expensive.

Flux-Cored



The flux-cored process is only recommended on materials as thin as 20 gauge, a bit thicker than the 24 gauge we said for MIG. In general, this process is best for welding thicker materials with a single pass, especially if you need to weld outdoors such as to repair a tractor out in the field. A 115 volt flux-cored machine using an electrode such as .035" Innershield NR-211-MP will generally allow you to weld steel up to ¼"thick. Note that this is more than double the thickness maximum of 12 gauge with MIG on 115 volts. With the proper electrode on a proper machine, such as .045" Innershield NR-211MP, and a 230 volt input machine, you can weld steel up to 1/2" thick. Note that Innershield® NR-211-MP requires that the machine be setup for DC negative polarity.

Advantages/Disadvantages

While there are advantages and disadvantages to both processes, we will try to outline for you some of the most common.

MIG

Advantages

- The best choice when cosmetic appearance is an issue since it provides lower spatter levels than flux-cored. The arc is soft and less likely to burn through thin material.
- The lower spatter associated with MIG welding also means no slag to chip off and faster cleaning time.
- MIG welding is the easiest type of welding to learn and is more forgiving if the operator is somewhat erratic in holding arc length or providing a steady travel speed. Procedure settings are more forgiving.
- If you are skilled and get specific proper guns, shielding gas, liners, drive rolls, and electrode, MIG can weld a wider range of material including thinner materials and different materials such as stainless, nickel alloys or aluminum.

Disadvantages

- Since a bottle of external shielding gas is required, MIG welding may not be the process of choice if you are looking for something that offers portability and convenience. MIG also requires additional equipment such as a hose, regulator, solenoid (electric valve) in the wire feeder and flowmeter.
- The welder's first job is to prepare the surface by removing paint, rust and any surface contamination.
- MIG has a soft arc which will not properly weld thicker materials (10 gauge would be the maximum thickness that MIG could soundly weld with the 115 volt compact wire feeder welder we are referring to or ¼" with the 230 volt input compact wire feeder welder.) As the thickness of the material (steel) increases, the risk of cold lapping also increases because the heat input needed for good fusion is just not possible with these small machines.

Flux-Cored

Advantages

- The Self-Shielded electrodes are optimal for outdoor procedures since the flux is built into the wire for positive shielding even in windy conditions. An external shielding gas and additional equipment are not needed, so setting up is simpler, faster and easier.
- The flux-cored process is most suited for applications with thicker materials as it is less prone to cold lapping.

Disadvantages

- It is not recommended for very thin materials (less than 20 gauge).
- When flux-cored welding, machine settings need to be precise. A slight change in a knob position can make a big difference in the arc. In addition, the gun position is more critical in that it must be held consistently, and at the proper angle, to create a good weld.
- This process creates spatter and slag that may need to be cleaned for painting or finishing.

It should be noted that the same machine can be used to weld with both MIG and flux-cored processes though a special package is usually needed to change from one application to the other. Drive rolls, shielding gas, gun liners, contact tips and procedure settings need to be addressed when changing processes.

Choosing Wire

Another area that may cause the novice welder some concern is how to choose the best wire. Proper electrode diameter is related to plate thickness and the welder you have. A smaller wire makes it easier to weld thinner plate.

Realize that these small machines are excellent at what they do, but they cannot do everything. Electrodes for production welding, hardfacing to resist wear, and most specialty electrodes will exceed the capacity of these machines. You must be careful to match the output voltage of your machine with the voltage of the electrode and the appropriate wire diameter and wire feed speeds to make sure you have a compatible system.

Tips for All

1) It is very important to get a good, solid work connection. This means you should thoroughly clean or grind the surface of the metal where attaching the work clamp and use a tightly attached work clamp so electricity can easily flow through the workpiece and back to the welder. Paint and rust are insulators. Remove them. This is a very common mistake to overlook.

2) Put the welder on a separate circuit breaker that is properly fused as stated in your Operators Manual. This is not another strand of Christmas lights. You are melting steel at around 5,000 degrees F. You cannot weld with inadequate input power. Don't even try.

3) Good fit-up is a big plus. Weld joints are laps, fillets and butts. Avoid gaps whenever possible to minimize burnthrough problems. This is especially critical on thin sheet metal.

4) Keep the gun cable as straight as possible for smooth wire feeding. Don't sharply bend it.

5) Make sure the contact tip looks good (not elongated or melted) and it is tightened to the diffuser.

6) Cut the wire at an angle to a point before starting to weld for better starts.

7) Use correct electrode stickout and maintain it as well as proper welding procedures.

8) Make sure the drive rolls feed smoothly with proper tension.

9) Relax and try to hold the gun as steady and smooth as possible.

10) Observe and follow all welding safety precautions as specified in your Operators Manual. Pay special attention to the potential for electric shock, arc rays that can burn skin and eyes, fire and explosion, and proper ventilation.