

# Making the Cut: Plasma Cutting for Home Repair and Hobby

## Plasma Cutting For Home Repair And Hobby

Many home repair and renovation projects, as well as hobbies, involve cutting metal materials. These projects may include:

Auto body repair; metal art sculpting; repairing small equipment like lawn mowers and snow blowers; cutting metal studs for garages and home additions; cutting gutters, down spouts, chain link fencing and clothes line poles; cutting copper tubing for plumbing projects; making metal lawn ornaments and holiday decorations; building and repairing homemade outdoor grills.

Often, home hobbyists use metal cutting shears, band saws and oxyfuel cutting torches for metal cutting. However, with new technological advances, air plasma cutting has become an affordable way to cut metal.

Air plasma cutting is a process where an electrical arc passes through a small, constricting nozzle. When a gas, usually air, is introduced, it combines with the electrical current to create a high temperature plasma arc (plasma is a state of matter, unlike solid, liquid or gas). When placed in contact with an electrically conductive material, like copper and stainless steel, the arc passes through the metal, melting a thin area. The force of the arc pushes the molten metal through the workpiece and severs the material. Although the technology behind plasma cutting may seem complicated, the process itself is very easy to learn and perform.

## Plasma Cutting - A Cut Above

Plasma cutting provides advantages over other cutting methods. It is quicker and easier than metal cutting shears and band saws. Compared to plasma cutting, shears cannot make radius cuts as tight, and saws are more expensive because they require frequent saw blade replacement, especially when cutting thicker metals.

Compared to oxyfuel torch cutting, the plasma cutting process cuts cleaner and faster, has a narrower cut width and has a smaller heat-affected zone, which prevents the surrounding area from warping or damaging paint. In addition, plasma cutting can be used on any type of electricity-conducting metal (the oxyfuel process cannot cut stainless steel or aluminum). Plasma cutting is also a less expensive and more convenient method of metal cutting because clean, dry air is used for most plasma cutting applications.

The plasma cutting process can be used to cut any material that is a good electrical conductor. It can be successfully performed on a variety of material sizes as well &ndash; from thin gauge aluminum to stainless and carbon steel up to several inches, depending upon the power of the cutting machine.

## Setting-Up A Plasma Cutter

To set-up, simply hook-up the plasma cutting unit to a compressed air source &ndash; available in bottles or from a small air compressor. Most plasma cutting units have their own regulator to maintain the proper flow of air for the system.

To set the amperage, or heat, of the cutting unit to the proper level, make a few practice cuts with the amperage set high. You can then adjust the amperage down according to your travel speed. Traveling at the right speed and using the right amount of heat will produce a very clean cut with little or no distortion to the metal.

## Operating A Plasma Arc For Cutting

Begin cutting by placing the torch as close as possible to the edge of the base metal. Press the trigger to initiate the preflow air; the pilot arc will then light, followed by the cutting arc. Once the cutting arc starts, move the torch slowly across the metal, maintaining a distance of 1/16" to 1/8" from the workpiece. All Miller Electric plasma cutters have a drag shield, which lets the operator drag the torch across the workpiece while the torch tip stays the appropriate distance from the metal. Adjust your speed so that the cutting sparks emerge from the bottom of the metal. You should be able to see the bottom of the workpiece and the arc should be directed straight down. If the sparks are not visible at the bottom of the plate, you have not penetrated the metal. This may be caused by several factors: the work clamp is not properly grounded to the workpiece; your travel speed is too fast; you have insufficient amperage; or the plasma stream is directed at an inappropriate angle.

When nearing the end of a cut, angle the torch slightly towards the outside edge of the workpiece and pause briefly to completely finish the cut. The post flow air will continue for a short period of time after the trigger is released to cool the torch and consumable parts, however cutting can be resumed immediately.

## Operating A Plasma Arc For Piercing

Piercing, or creating a hole, can be performed by placing the torch at a 40-degree angle to the workpiece. Press the trigger. When the cutting arc is initiated, bring the torch tip to a 90-degree angle and the arc will pierce the base metal. A good rule to follow is that you can pierce up to 1/2 of the maximum cutting thickness provided by the machine.

## What To Look For In A Plasma Cutter

**Output Power.** The output power needed in a plasma cutting machine depends primarily on the thickness and type of material to be cut. The metal thickness will also determine the size of the nozzle opening, as well as the type and amount

of gas or air required.

Determine the type of metal you are planning to cut and then check the cutting capacity of the machine you wish to purchase. Miller uses three standards: rated, quality and sever cuts. A rated cut is the thickness of mild metal that an operator can manually cut at a rate of 10 inches per minute (IPM). A quality cut is rated at a slower speed but on thicker metal. A sever cut is the maximum thickness a plasma cutter can handle. The travel speed is slower and the cut may require clean up.

For example, the Spectrum 375 and Spectrum® X-TREME 375 both have a cut rating of 3/8-in. At 6 IPM, the Spectrum 375 X-TREME can cut 1/2-in. mild steel. At a slower speed, both can sever up to 1/2-in.

This type of machine works well for most fabrication, maintenance and automotive repair, as well as home workshop or hobbyist applications. A more powerful machine may be necessary for operators planning to cut thicker materials.

**Cutting Speed and Capacity.** Determine the type and thickness of metal you are cutting and your desired cutting speed. Then compare your needs to the cutting capacity and cutting speed of the machine you are considering.

The above chart shows a typical relationship between cutting speed and material thickness. See each model's individual specifications for its cutting speed chart.

**Consumables.** Besides compressed air or nitrogen, there can be as few as two consumables needed for plasma cutting. These are the torch tip and electrode. If either the tip or the electrode become worn or damaged, the quality of the cut will be affected. The consumables will wear with each cut, but factors like moisture in the air supply, cutting excessively thick materials or poor operator technique will increase the deterioration of the consumables. You will want to have consumables available when you need them, so the ability to order and receive them in a timely fashion is important. Best practice is to replace the tip and the electrode together for optimal quality cuts. It is especially convenient if the cutting machine has a storage compartment for these consumables.

**Weight and Size.** Weight and size may be extremely important factors to consider when purchasing a plasma cutter if there is a need for portability. While the Spectrum 375 weighs 55 lbs. the Spectrum 375 X-TREME provides the ultimate in portability, weighing only 18 lbs., allowing the user to carry it comfortably by its shoulder strap.

## Proper Safety Procedures

As with all industrial products, read the owner's manual for proper safety procedures.

Safety procedures must be closely followed in any application of the plasma cutting machine. Be aware of potential hazards involved with the process including high voltages and temperatures, fumes, ultraviolet radiation and molten metal. Proper welding clothing should be worn, as well as welding helmets with dark lenses or appropriate dark safety glasses, as specified by the manufacturer.

Before cutting, inspect the drag shield, tip and electrode and do not operate the unit without the tip or electrode in place. Hitting the torch on a hard surface to remove spatter can damage the torch and stop proper operation. In addition, avoid constant starting and restarting of the plasma arc to lengthen consumable life.