

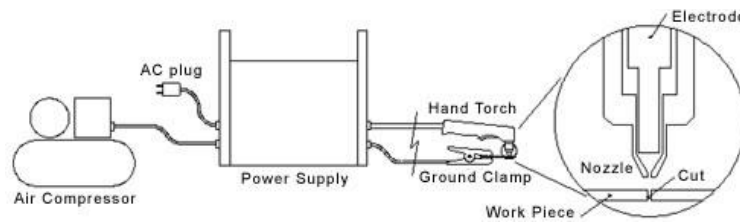
# PLASMA CUTTING

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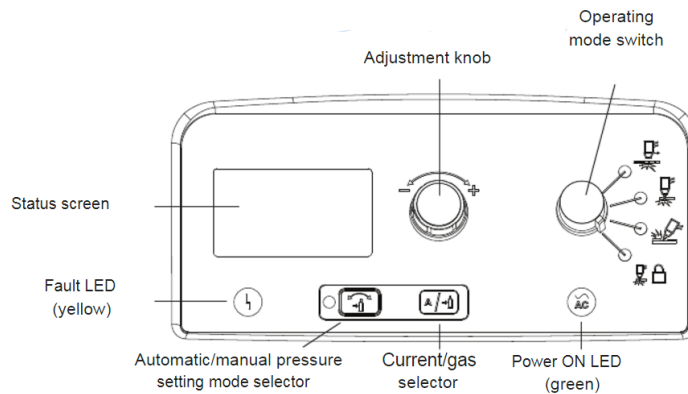
Plasma cutting was developed in the 1960s as an alternative to oxy-acetylene torch cutting. While the results are similar, a plasma cutter offers a more productive and cleaner cutting operation. Plasma cutting is ideally suited to fast material removal in sheet and plate metals. Here at Generator, we use a Hypertherm Powermax 65 plasma cutter in two configurations; manual and CNC machine operation modes. This class will introduce the safety, basic concepts, and execution of both cutting operations.

## Parts of the Plasma Cutter

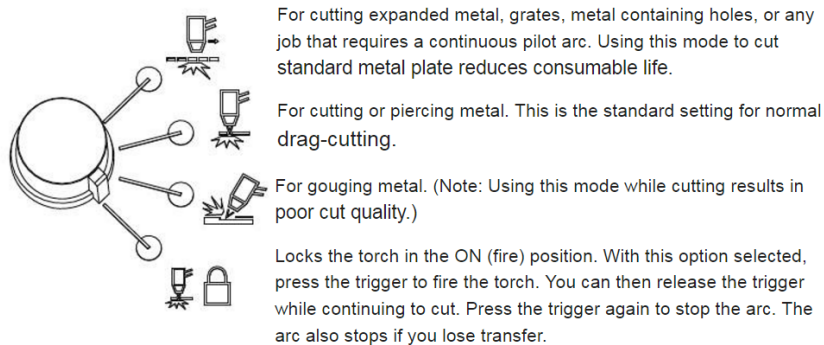
Basic Overview of a plasma cutting system:



Control Panel:



Operating Modes:



## Plasma Cutting Safety

The CNC plasma cutter is the **most dangerous piece of equipment at Generator**. In addition to typical **arc welding hazards** (UV rays, high temperatures, fire hazard, fume inhalation), the Plasma table introduces a **water filled drop table hazards** (electrocution, scalding) and **CNC hazards** (pinch hazard, runaway machine). Best safety practice is to reduce risk of accidents as much as possible. To do this, we make sure everybody using the machine is properly trained, we keep the machine and facility in good running order, and we provide appropriate Personal Protective Equipment (PPE) for operators.

### Mandatory PPE for Plasma Cutter Use:

1. Cutting Goggles (or Welding Hood) Shade 5 MINIMUM.
2. Leather Gloves (MIG Gloves)
3. Long sleeved pants and shirt made from cotton or wool. Operators wearing synthetic clothes must cover with jacket, arm guards, etc.

### Material Selection:

Just as with using the MIG/TIG/Oxyfuel welders, some materials will create dangerous fumes. These materials can only be cut with extreme care by professionals. Here at Generator, galvanized materials are not allowed on the Plasma cutter due to risk of zinc-oxide poisoning. **No Galvanized Metals!!!** The best materials to cut on the plasma table are uncoated aluminum and steel. Other conductive materials such as copper may be cut. Consult the shop lead and existing literature online before cutting other metals.

### Shop Environment Safety:

DO NOT plasma cut if water is on the ground near the table.

DO NOT plasma cut until main metal shop ventilation is turned on.

DO NOT operate the plasma cutter if the welding station is in use.

## Parts of the Plasma Torch:

The Machine Torch and Hand Torch contain the following consumables. Some consumables may have slightly different appearance based on usage. A fine-cut torch will have a narrower shield and nozzle. Consult the Operators Manual to determine appropriate wear intervals.



## Plasma Cutting Procedure:

### Understanding duty-cycle limitations

The duty cycle is the amount of time, in minutes, that a plasma arc can remain on within a 10-minute period when operating at an ambient temperature of 104° F (40° C).

With a Powermax65:

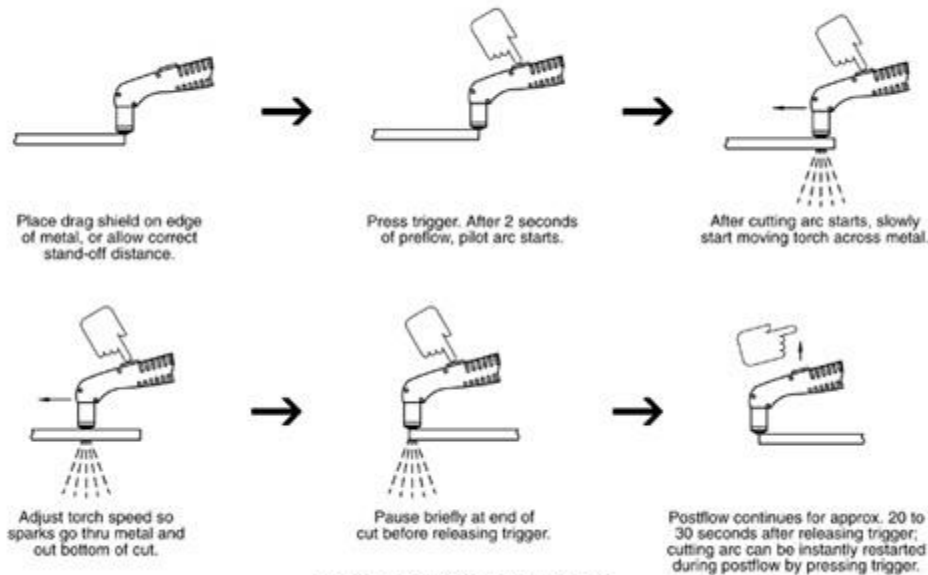
- At 65 A, the arc can remain on for 5 minutes out of 10 minutes without causing the unit to overheat (50% duty cycle).
- At 59 A, the arc can remain on for 6 minutes out of 10 (60%)
- At 46 A, the arc can remain on for 10 minutes out of 10 (100%).

With a Powermax85:

- At 85 A, the arc can remain on for 6 minutes out of 10 minutes without causing the unit to overheat (60% duty cycle).
- At 74 A, the arc can remain on for 8 minutes out of 10 (80%)
- At 66 A, the arc can remain on for 10 minutes out of 10 (100%).

If the duty cycle is exceeded, the power supply overheats, the temperature fault icon appears in the status screen, the arc shuts off, and the cooling fan continues to run. You can not resume cutting until the temperature fault icon disappears and the fault LED goes off.

## EXAMPLE of Cutting Operation



Plasma Cutting Sequence

### Safety

- PPE for Plasma Cutting
- NO GALVANIZED METALS
- Pre-operation safety checks
  - Puddles
  - Flammable materials

### Turn on the CNC Plasma cutter

- Drain air compressor
- Turn on air compressor @ 120psi
- Turn on main power switch
- Turn on plasma power supply
- Turn on PC
- Turn on motor controller

### Process CNC job from DXF to GCODE

- Import DXF to sheetcam
- Adjust start/end points
- Create duplicates/ nesting
- Adjust tool

### Run CNC job

- Arm E-Stop
- Import CNC job file
- Set XYZ zeroes
- Enable Torch Height Control
- Test cut (dry run)
- Shields down, enable torch
- Final cut

### Turn off the CNC Plasma cutter

- Move torch to rear half of table
- Turn off power supply
- Unplug, put away

### Maintenance and Troubleshooting

- Plasma Cutter Manual
- ArcLight Manual
- Inspect Torch Consumables
- Water Table Maintenance