HYPERTHERM®
A Hypertherm Associates Brand

Transform metal removal with plasma gouging's precision, quality, and speed



Plasma, the smarter, safer replacement of CAG

Common industry challenges when removing unwanted metal and welds

Removing gates or excess metal from castings, welds, and hard-facing can be a complicated process with varied results in finish quality and time required. Various gouging methods using different equipment and technologies pose unique challenges in terms of the learning curve, techniques, automation capabilities, post-processing, and, of course, safe operation. As a result, many companies are converting to plasma arc gouging as their preferred method to address these challenges and others related to their business, such as productivity gains and the shortage of skilled labor. Operator safety and comfort are important drivers for the conversion to plasma.

Common gouging methods

PAG (Plasma Arc Gouging) uses a plasma torch to generate a high-temperature plasma arc that melts the metal, which is then removed by a high-velocity gas stream.

CAG (Carbon Arc Gouging) uses a carbon electrode and a high-velocity air jet to melt the metal and blow it away.

Oxyfuel gouging uses a combination of oxygen and fuel gas to produce a flame that melts the metal, which is then blown away by the oxygen stream.

Grinders and cutoff wheels are manual, with less specialized gouging methods that are still used for their accessibility and versatility.

Plasma Arc Gouging increases productivity and reduces labor costs

PAG is significantly faster than CAG methods, resulting in higher productivity and lower labor costs. The torch is angled and uses specially designed consumables to produce a wide arc that melts and removes material, creating a groove, rather than cutting through the metal.

PAG benefits:

- Work on any conductive metal – ferrous or non-ferrous
- Gain faster operating speeds and spend less time on grinding rework
- Reduce noise and debris levels to meet regulatory and safety requirements
- Improve safety over carbon arc methods
- Reduce operator training time with a shorter learning curve for operation

Gouging Use-Case

A company serving the mining industry that fabricates large iron ore tumblers converted from handheld CAG to semi-automated PAG. The plasma torch was mounted on a manipulator with an oscillator to produce a consistent gouge profile around the circumference of the tumbler, which was rotated at the required speed, enabling simultaneous gouging and welding. This allowed for a significant reduction in fabrication time.

Key results include:

- Lower, long-term operating costs due to long consumable life and lower labor hours
- Greater productivity gains from faster gouging speeds and fewer secondary operations
- Improved safety from less noise, fumes, molten splatter, and grinding

Plasma vs. carbon gouging at-a-glance

Features	Plasma Arc Gouging	Carbon Arc Gouging
Noise and fumes	Lower	Higher
Mechanical precision	Higher	Lower
Contamination risk	Lower	Higher
Material compatibility	Wide	Wide
Automation	Easily automated	Very challenging
Secondary operations	Minimal	Extensive

Typical gouging applications

Plasma Arc Gouging is a fast, precise way to remove metal and a game-changer in a variety of repair and fabrication tasks. Here's how PAG helps in some of the most common applications:

- Back gouging with plasma ensures full weld penetration by removing material from the backside of a joint. Back gouging with plasma provides structural integrity, works great on thick materials, and is cleaner and faster than traditional grinding.
- PAG excels at weld removal on cracked or defective welds to prep for clean, substantial rework. Plasma delivers smooth, precise gouging for easy re-welding, less heat distortion than other methods, and better repair quality and inspection readiness.
- Gate, runner, and sprue removal on cast parts is something PAG excels at. It quickly removes excess metal from cast parts without damaging the surface. Plasma gouging enables clean, controlled removal, is faster than grinding or machining, and protects part integrity for better finish and performance.
- Hard-face removal with PAG strips away tough, wear-resistant coatings. Plasma gouging handles hard alloys with ease, reduces tool wear compared to mechanical methods, and speeds up re-hard-facing prep time.

Motion platforms



Handheld

Many gouging applications are performed by operators using handheld plasma torches, some of which are designed explicitly for gouging. Gouging with plasma has a short learning curve, as many operators can master the techniques quickly and become proficient in various metal-removal methods.



Carriages and track

For those needing to make long gouges on flat or cylindrical surfaces, track-based, motorized tractors (carriages) are a standard method of producing consistent gouges using a machine-style plasma torch. Many of these tractors are designed to produce different gouge profiles using weaving techniques programmed into the controller.



Column and boom manipulators

When a large metal structure needs to be gouged, such as a pressure vessel or cylinder, manipulators are a practical solution, as they control the motion of the plasma torch and the metal structure using turning rolls. A CNC will often have gouging process parameters for different plasma models in the software, making operation setup easy and highly repeatable.

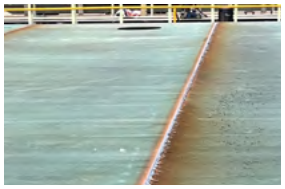


Table gantry

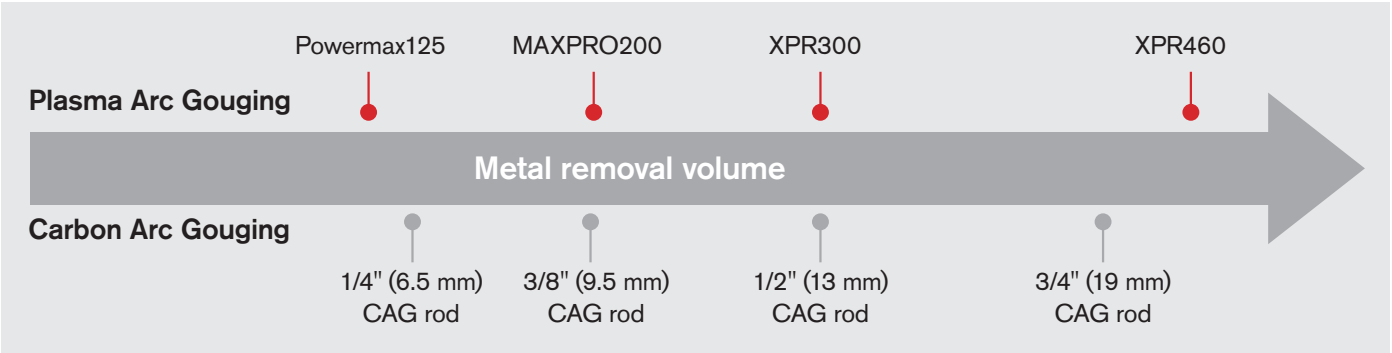
Besides plasma cutting on an XY table, plasma gouging can also be performed with the plasma torch mounted onto a bevel head. When long, straight gouges are required, such as back-gouging for weld prep, this method can be used.

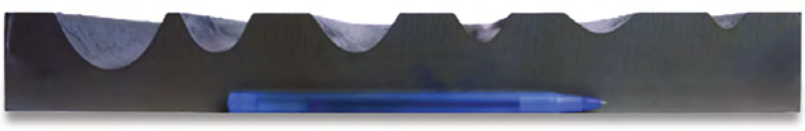


Robotic

A growing trend is to use cobots and industrial robots for high-mix, low-volume gouging applications. These offer many advantages for achieving repeatable results and overcoming the shortage of skilled operators. Not only are cobots very effective for gouging, but they are also easy to teach and can be moved to where the work needs to be performed, such as in a confined space or mounted vertically.

Metal removal comparison







Single pass and weave gouges using the XPR460®, XPR300®, and XPR170®.

Hypertherm solutions for gouging

Hypertherm plasma-gouging solutions are widely adopted by companies across a vast array of industries, from energy and mining to automotive and construction. The gouging processes are available on the Powermax® line, the MAXPRO200®, and, recently, the XPR® series.

> **With specialized gouging consumables, application-specific torches, and the most powerful arc available, Hypertherm solutions are optimized to ensure the best possible gouging and metal-removal outcomes.**

Model	Typical gouge profile	Metal removal rate	Gas options	Torch options	Duty cycle	Max amperage
Powermax45 SYNC	3,2 mm D x 6,8 mm W (0.12" D x 0.26" W)	3,4 kg (7.5 lbs.) per hour	Air, Nitrogen, or F5	Handheld, machine, and robotic	50%	45
Powermax65 SYNC	2,9 mm D x 6,4 mm W (0.11" D x 0.25" W)	4,0 kg (8.8 lbs.) per hour	Air, Nitrogen, or F5	Handheld, machine, and robotic	50%	65
Powermax85 SYNC	3,5 mm D x 6,6 mm W (0.14" D x 0.26" W)	8,2 kg (18.2 lbs.) per hour	Air, Nitrogen, or F5	Handheld, machine, and robotic	60%	85
Powermax105 SYNC	6,6 mm D x 6,0 mm W (0.26" D x 0.24" W)	8,6 kg (19.1 lbs.) per hour	Air, Nitrogen, or F5	Handheld, machine, and robotic	80%	105
Powermax125	7,9 mm D x 9,9 mm W (0.31" D x 0.39" W)	12,52 kg (27.6 lbs.) per hour	Air, Nitrogen, or F5	Handheld, machine, and robotic	100%	125
MAXPRO200	7,6 mm D x 9,9 mm W (0.30" D x 0.39" W)	19.9 kg (44 lbs.) per hour	Air/Air, O2/Air	Handheld, machine, and robotic	100%	200
XPR170	9,9 mm D x 17,2 mm W (0.39" D x 0.68" W)	20.4 kg (45 lbs.) per hour	O2/Air, H2-mix/N2, N2/N2	Machine and robotic	100%	170
XPR300	8,1 mm D x 16 mm W (0.32" D x 0.63" W)	34.4 kg (76 lbs.) per hour	O2/Air, H2-mix/N2, N2/N2	Machine and robotic	100%	300
XPR460	11,1 mm D x 23,8 mm W (0.44" D x 0.94" W)	73.9 kg (163 lbs.) per hour	O2/Air, H2-mix/N2, N2/N2	Machine and robotic	100%	460

Hypertherm plasma: trusted more than any other brand

Manufacturers worldwide trust Hypertherm® plasma cutting and gouging solutions more than any other brand. Our products are rated as the industry's most reliable and consistently outperform the competition in cut quality, productivity, and cost-efficiency. They are designed, tested, and manufactured to the highest standards to ensure they perform as expected for many years, often decades. It's the best equipment investment you can make.

Learn more about the benefits of plasma gouging

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