

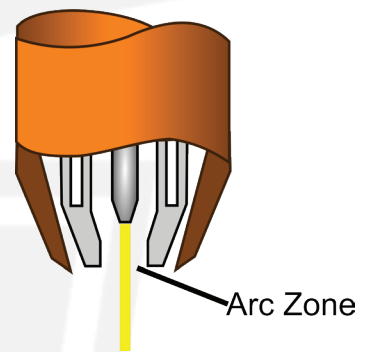
## Introduction

Plasma Arc Welding (PAW) is a welding process utilizing plasma, a gas which has been heated to a high temperature and ionized. The plasma becomes electrically conductive, transferring an electric arc to the work piece through a small orifice. This ensures a high concentration of heat to a small area. The shielding gas enters the arc-zone and channels the plasma to the work piece.

Because of the advanced level of arc control and accuracy, PAW is particularly well-suited for use in precision welding applications. The resultant weld is extremely high-quality due to the high concentration of heat delivered through the plasma torch and due to the use of shielding gas which protects the molten weld puddle against oxidation.

The welding arc transfer is gentle, consistent and accurate, allowing for welding of thin sheets, fine wire and miniature components.

Plasma arc welding is a precise process and the narrow columnar arc accepts fewer tolerances than the wider arc of the GTAW process. Even the slightest adjustments, or process variations can cause problems such as premature torch failure and difficulty starting.



## Premature Torch Failure

### Problem

One common problem is premature torch failure. For high-production work, this can be frustrating, not to mention expensive, if you have to stop production to replace a damaged torch. While first instinct may be to blame the torch manufacturer, this may not be the case.

### Arc-Zone.com Recommended Solution

When setting up your torch, do not modify any of the replacement parts. These are highly engineered components and should not be tinkered with.

One of the most common causes of torch failure is o-ring damage. This can be caused by assembling dry, un-lubricated liners into the torch, or by not replacing cracked or worn o-rings around the shield cup, torch body, backcap etc. This is an easy replacement and the first thing you should check.

Check gas pressure and flow rate. Use a high-quality flowmeter and be sure to set the pressure and flow rate to the recommended setting for your equipment and application.

Whether you're using OEM parts or aftermarket parts, use only high-quality replacement parts from a verified supplier. Variations in manufacturing processes from several manufacturers can cause tolerance stack-up problems that will lead to inconsistent welding performance.

Use high-quality precision ground tungsten electrodes from a trusted pre-ground tungsten electrode supplier like Arc-Zone.com. This will ensure that correct electrode tip geometry and ground finish is maintained. If you are grinding or re-grinding your tungsten in-house use a high quality tungsten grinder and follow the manufacturers grind specifications closely.

Deep electrode setback can cause inconsistent arc starting and torch failure. Follow the manufacturer's settings guide for electrode setback and tip orifice size.

Confirm the transfer-arc mode is selected on the power supply.

Check the electrical integrity of the work lead cable, cable connection to the clamp and work piece.

Be sure to maintain the proper tip to work piece standoff. You can take the guess work out of this process by using an arc voltage sensing control.

## Difficulty Startin

### Problem

Another common problem is that the torch is hard to start. In an optimal set up, the pilot arc is initiated between the torch electrode and nozzle tip. The arc is then transferred to the weld piece, delivering intense heat to a small area by forcing the gas and arc through a small orifice in the nozzle/tip. If the transfer is not initiated, there are several factors that need to be examined.

### Arc-Zone.com Recommended Solution

Start problems are often caused by inconsistent gas flow rates. Be sure to use a high-quality gas flowmeter. Gas flow problems may also be caused by the plasma arc nozzle/tip orifice. Make sure you are using the right size orifice for your welding application.

A leaking o-ring or backcap can also cause problems in starting. Look for blueing on the tip of the tungsten, indicating outside air is leaking into the torch. This will also be apparent in the weld itself, which will have a grayish tint and may fail an x-ray inspection. Additionally, verify that the power supplies pilot board and pilot arc resistor are operating properly.

## Conclusion

Although the plasma arc welding process requires precision and consistency in set up and maintenance as well as the use of high-quality parts from companies like Arc-Zone.com, the stable, concentrated arc delivered at lower amperage results in a high-quality weld suited for bio-medical, pharmaceutical, food processing, dairy, brewery, power generation, aircraft, aerospace, automotive and many other applications.

# About ARC-ZONE.com

## Jim Watson

Jim is CEO and founder of Arc-Zone.com. He is a master fabricator with years of hands-on experience in his own shop and also as a winning motorcycle racer, car builder, and chief mechanic for a top motorsports team. He also has extensive experience in manufacturing, technical sales, and product development. Before launching Arc-Zone.com, he held leadership positions in some of the most respected companies in the welding industry.

## Arc-Zone.com

Under Jim's direction, Arc-Zone.com has led the industry in product innovation and online sales and service, becoming the world's leading supplier of high-quality, high-performance welding and metal working tools and accessories.

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