

# How to Recognize Damaged Consumables

As the consumable components within the plasma torch naturally wear over time, the quality and accuracy of the finished parts is diminished. Increased edge bevel, bottom dross build-up, and edge distortion are important signs to the operator that a consumable change is needed. In order to remedy these problems, it is not uncommon for the operator to automatically replace the entire set of consumables – especially the electrode, nozzle and shield cap – instead of evaluating each component individually. This results in excessive consumable usage, which negatively impacts the overall cost of operation and increases the cost to produce each finished part.

Since many variables affect the life of torch consumables and since each application is unique and includes different operating conditions, it is difficult to make blanket statements that exactly quantify the number of expected pierces from each component. Instead, it is better to learn what to look for on each consumable and then perform a quick visual inspection when cut quality diminishes. In addition to the electrode, nozzle, and shield cap that garner most of the attention, it is also important to inspect the swirl ring, inner retaining cap and outer retaining cap. Each and every plasma torch component plays a critical role in producing the longest life and highest cut quality possible.

**Here are guidelines for recognizing consumables that have reached their end of life:**

## Outer Retaining Cap

This brass cap holds all the consumables onto the torch head.

It should only be replaced if there is visible damage such as slag build-up, dents or burns (on either opening), or if it is difficult to thread onto the torch head.



**New**



### **Requires Replacement**

What's wrong with this one? The top edge is dented and there is slag build-up on the lip. Both of which could cause the shield cap to not fit properly.

## **Shield Cap**

Although the shield cap is not consumed by the plasma arc, due to its close proximity to the work piece it is susceptible to damage from torch crashes and pierces made too close to the plate.

As its name implies, the shield cap funnels the shielding gas for the purpose of additional nozzle cooling and improved cut edge squareness.

The orifice in the shield cap is crucial to edge cut quality, so it should be replaced when it becomes burnt, bent, or otherwise out of round.

An abrasive hand pad (not sand paper) can be used to remove splatter (slag) that has built-up on the shield cap.

Always inspect O-rings for possible damage such as nicks, cracks and tears. Make sure O-rings are properly lubricated using the manufacturer's recommended lubrication. Refer to the manufacturer's operator manual for lubrication specifications.



**New**



### **Requires Replacement**

What's wrong with this one? While the slag build-up could be removed with an abrasive pad, the orifice is out of round and cannot function effectively.

## **Inner Retaining Cap**

This piece has a copper body with a pressed-on insulator ring for seating into the shield cap.

The purpose of the inner retaining cap is to circulate coolant around the outside of the nozzle, and to distribute gas to the shield cap through tiny holes in the insulator ring.

This piece is not consumed by the plasma arc and can easily last up to 30 or more electrode

replacements.

Replace only if the orifice is burnt, bent, out of round, or if the tiny holes in the copper body or insulator ring are plugged.



**New**



## **Requires Replacement**

What's wrong with this one? The orifice is out of round and the insulator ring is damaged.

# **Nozzle**

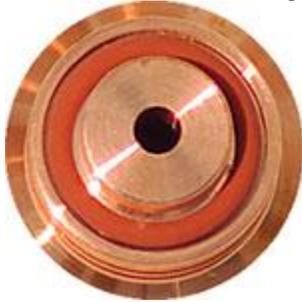
The copper nozzle channels the swirling plasma arc through a small orifice that varies in diameter depending on the amperage of the consumable. When new, this orifice will be perfectly round with a clearly defined sharp edge. This feature is the key to optimal cut quality.

Under normal cutting conditions, expect to use two nozzles for each electrode to maintain the highest cut quality.

The nozzle should be replaced when the orifice begins to wear out of round on either the outer or the inner bore. There may be some light swirl marks on the inside of the nozzle

caused by arc starting, but this is not a cause for replacement.

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**New**



## **Requires Replacement**

What's wrong with this one? The orifice is too out of round to function effectively and the sharp edge of the orifice has been eroded.

# **Swirl Ring**

The swirl ring is machined from a high temperature resistant material such as Vespel® or ceramic, and is, therefore, not consumed by the plasma arc.

It serves as both an insulator between the electrode and nozzle, and a vessel to create the swirling action of the plasma gas needed to create precision cuts.

Care must be taken to ensure the small holes remain free of dirt and debris, and it should be replaced if any cracks or chips are detected.

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**New**



**Requires Replacement**

What's wrong with this one? The small holes are plugged with debris.

## Electrode

The electrode can be made of copper or silver, or a combination of both, and contains a separate emitter rod insert, made of either hafnium or tungsten. The emitter rod offers less resistance to current flow than copper, which prevents the electrode from burning up while the high current arc is generated.

As long as the plasma arc is on, the emitter rod is being consumed. Eventually, it will reach a depth which will allow the arc to jump directly to the end of the electrode. This will result in an immediate blow out which will also destroy the nozzle and shield cap, and could also damage the torch head.



**New**



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## **Safety Zone**

The safety zone for emitter wear depth is approximately 0.040" (1.02mm) for copper electrodes and 0.1" (2.54mm) for silver electrodes.

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