



BY  
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# ORBITAL WELDING ESSENTIALS

Your Guide to Orbital Welding

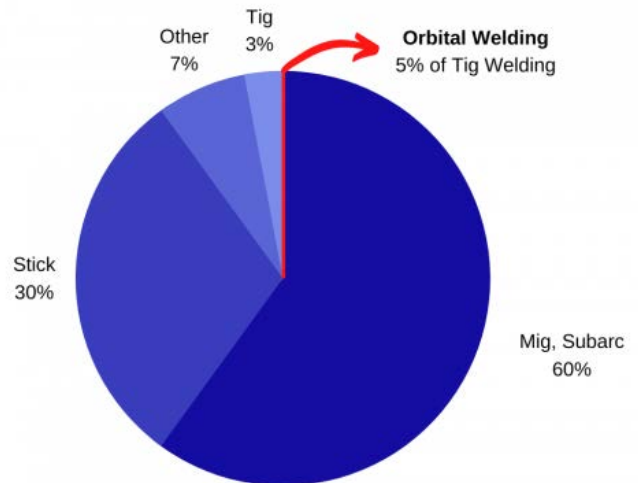


# ORBITAL WELDING ESSENTIALS

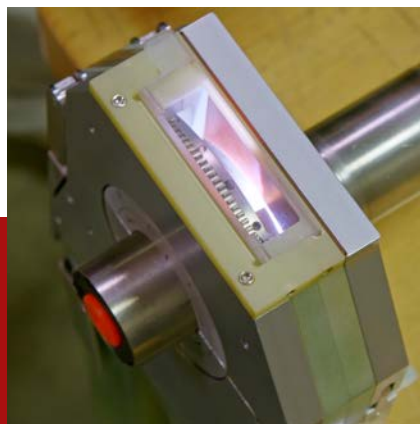
## WHAT IS ORBITAL WELDING?

Orbital welding is the automatic or mechanized welding of tubes or pipe in-place with an electrode rotating (or orbiting) 360 degrees around the workpiece. Orbital welding can be conducted on tube or pipe with the addition of filler material or as a fusion process.

In the 1950s, orbital welding was developed by the aerospace industry to replace compression fittings and manual welds. This type of welding falls under TIG (Tungsten Inert Gas) welding. As you can see in the chart here, TIG constitutes for only 3% of welding worldwide. Then, only about 5% of TIG welding is comprised of orbital TIG welding.



**Though orbital welding represents only a small percentage of applications, its creation has been vital to the ever-growing standards and success of many industries.**



# BENEFITS OF ORBITAL WELDING

Manual welding can be unreliable, and workloads can often become greater than even the most skilled welders can handle. With an orbital welding system, uniform welds can be created quickly with a minimized risk of human error.

The orbital welding process is designed to produce welds that meet ASME BPE acceptance criteria. Consistent bead size and full penetration create smooth surfaces that prevent microbiological growth and possible contamination of the product. This is especially beneficial in critical applications such as in the pharmaceutical or food & beverage industries.

## **BENEFITS:**

- Increased Speed and Process Efficiency
- Weld Quality - Accuracy & Consistency
- Weld Repeatability
- Weld Cleanliness
- Versatility for Unique Applications (piece unable to be rotated, has poor visibility, or is in a hard to reach place)
- Weld Documentation and History



## **PREVENTS:**

- Poor Penetration
- Lack of Fusion
- Poor Purging Techniques





# WHEN TO USE ORBITAL WELDING

## APPLICATIONS:

- Sanitary Tubing
  - Tube to Tube
  - Tube to Fitting
  - Fitting to Fitting
- Pipe
  - Pipe to Pipe
  - Pipe to Fitting
- Exotic Alloy Application
- Tube to Tube Sheet
- Overlay Applications

**Any tube or pipe with material running through it has the potential of being welded with an orbital welder**

## INDUSTRIES:

- Semiconductor
- Biotechnology
- Pharmaceutical
- Cosmetic
- Food & Dairy Processing
- Breweries & Wineries
- Electronics
- Chemical
- Aerospace
- Nuclear Piping



# ORBITAL WELDING EQUIPMENT



**An orbital welding system is composed of three pieces:**

**the power supply, water cooler, and the weld head.**

## POWER SUPPLY

The power supply is where weld programming is conducted. It communicates weld speed, amperage, purging time and more to the weld head. The power supply also documents welds, stores programs for future use and features a printer for documentation purposes after each weld.

## WATER COOLER

The water cooler interconnects to the weld head and holds cooling fluid. We recommend a low conductivity coolant. Utilizing a pump, the water cooler flows the coolant through the weld head coolant lines and into the weld head. This allows the weld head to run at 100% duty cycle.

## WELD HEAD

Weld heads connect to the power supply and water cooler through a series of cable connections. There are two options when it comes to weld heads: **enclosed heads** and **open weld heads**.



# ORBITAL WELD HEADS

## ENCLOSED WELD HEAD

Enclosed weld heads are often referred to as closed or fusion weld heads. They are closed, as the name suggests, creating an inert atmosphere chamber that surrounds the weld joint. This encapsulated environment helps to create fusion welds with a decreased risk for blemishes or other imperfections.

No welding helmet is needed while conducting a weld. Internally, the weld head rotor holds the tungsten electrode in place as it orbits around the tube or pipe, creating a fusion weld. This type of weld head is typically used for orbital tube welding but can be used on thin-walled pipe.

Suggested Size Limits of Autogenous Welding Enclosed Weld Heads:

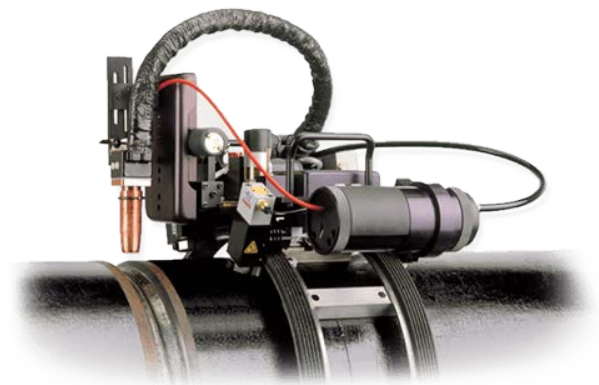
- Diameters up to 6" pipe (6.625") (schedule 5 pipe) - limited by fixed tungsten length
- Wall thickness up to 0.154" (2" schedule 40 possible)



Enclosed Weld Head

## OPEN WELD HEAD

These weld heads are most often utilized for pipe welding applications where filler wire is required, and multiple passes are required to complete the weld. There are two styles of weld head offered in the open face design for pipe welding. The clamping style head uses a vise clamping system to mount to the workpiece. The low profile or guide ring style uses a tracking system that mounts to the workpiece and attaches to the track.



Open Weld Heads

# HOW TO ORBITAL WELD

1

## CUT

Before aligning tube or pipe ends, they first need to be cut. Orbital saws are commonly used on sanitary tubing and small thin-walled pipe. For larger applications, use a clamshell or band saw.

2

## FACE OR BEVEL

After cutting, use a tube facing tool to get rid of burrs and other imperfections. If adding wire on a heavy walled application, you'll need to prepare the tube or pipe with a bevel.

3

## CLEAN

This step is important, especially in sanitary welding stainless steel. Cleaning the tube or pipe gets rid of potential contaminants and puts you in the best position for a successful weld.

4

## TUNGSTEN

To strike an arc, you'll need an electrode. In this case, it will be ceriated tungsten. Place the appropriate tungsten piece within the weld head in the tungsten holder.

5

## ALIGN

The fit-up is extremely important when it comes to the penetration of the weld. Align the joint of the two pieces with the tungsten.

6

## PURGE

After aligning, purge oxygen from the inside of the tube or pipe, using argon or mixed shielding gas. This prevents sugaring on the backside of your weld and helps keep the weld from becoming concave.

7

## PROGRAM

Power supplies have manual and auto program options. Input the prompted information, such as weld head, material, OD size, and wall thickness to generate a program.

8

## WELD

With all these steps completed, you're ready to strike an arc. Complete the weld and make adjustments as needed.

# ORBITAL ACCESSORIES

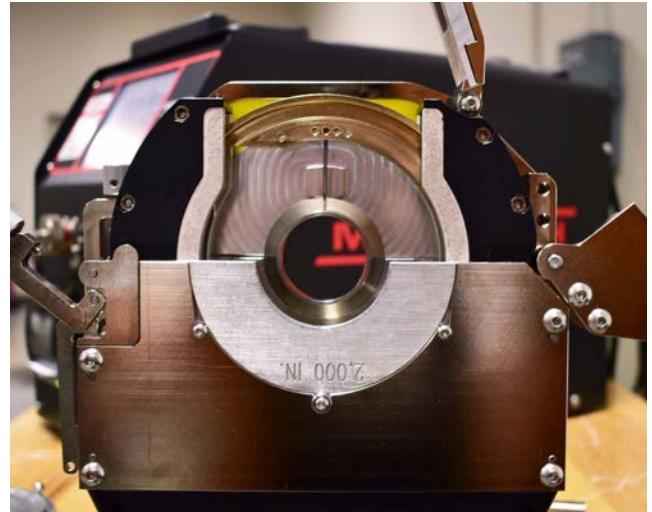
## TUNGSTEN ELECTRODES

The most necessary accessory in orbital welding is a consumable – ceriated tungsten. Tungsten is needed to start an arc for the weld. The size and length depend on your application – OD sizes and wall thickness are a few of the factors to consider.

The number of welds per piece of tungsten depends on the quality of the tungsten as well as the material and OD of the workpiece.

Other essential orbital welding supplies include:

- Cleaning Supplies
- Inert Gas & Dual Regulator
- Weld Head Bench Mount
- Oxygen Analyzer
- Printer Paper

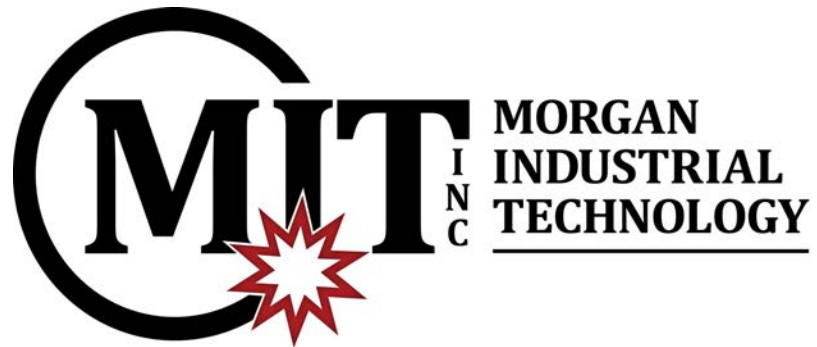


## DON'T FORGET THE PURGE

The presence of oxygen during your weld can cause discoloration and can lead to eventual corrosion and contaminants. To avoid this, use purge plugs to diffuse your gas mixture while expelling the remaining oxygen.



**ORBITAL WELDING | CUTTING | BEVELING | RENTAL | SERVICE**



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