

NEWSLETTER

JULY 2026

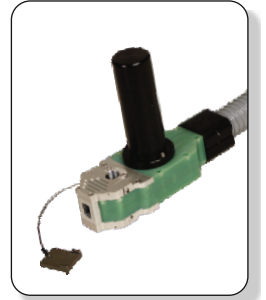
ISSUE 02



UNIVERSAL
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All about

ORBITAL WELDING



UNDERSTANDING ORBITAL WELDING CHALLENGES IN MONSOON

BURSTING THE MYTHS: BLACK SPOTS AT THE END OF WELD

1. THE OBSERVATION



Black spots are frequently observed at the end of the downslope, particularly during monsoon due to high humidity.

2. THE MYTHS BURSTED (CORE QUESTIONS)



- Is it a defect? **(No)**
- Why only in Monsoon? **(High Moisture)**
- Will the joint fail Radiographic Testing (RT)? **(No)**

3. UNMASKING THE CULPRIT: MOISTURE IS THE SOURCE OF OXYGEN

Humidity (Moisture) breaks down under the welding arc, releasing **FREE OXYGEN**.

This Oxygen reacts with Silicon and Manganese to form superficial **SILICON OXIDE & MANGANESE OXIDE** slag.



4. RT & PENETRATION RESULTS



- Joint **WILL NOT FAIL** in RT!
- These are **surface slags/surface indentations**, **NOT** volumetric defects.

KEY TAKEAWAYS

Surface slag is not a defect. Weld integrity is good. Focus on moisture control.

Editorial notes

This issue focuses on orbital welding application in semiconductor industries, some developments related to orbital GTAW carried out at Universal Orbital Systems Pvt Ltd. This issue will also discuss about the core motivation behind developments.

The objective of starting this newsletter is to provide insights about latest developments at Universal Orbital Systems Pvt Ltd. At Universal Orbital, innovation and development goes hand in hand to cater to customer and industrial requirements. Through this newsletter, we aim to reach to the readers, share our orbital welding knowledge.

We are very grateful about the response we have got for our first edition. We believe such connect with our clientele will aid in exchanging technological discussions on welding and present our work in the field of orbital welding.

The newsletter policy is now changed to per monthly basis. The activities, developments at Universal Orbital Systems will now be featured every month. We hope to share and exchange the orbital welding knowledge through this drive.

Author

Ms Rucha Kanade

Msc Welding Engineering

Technical Director at Universal Orbital Systems Pvt Ltd



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Orbital Welding in Semiconductor Industries

Semiconductor industries have very intricate design of pipelines for transfer of fluids useful in the production of the integrated circuits. The production of such integrated circuits requires clean room and high precision welding process for the pipelines. The recommended joining process for tubes is Orbital GTAW.

Universal Orbital Systems Pvt Ltd has developed a UHP (ultra-high purity) orbital welding heads series specifically for semiconductor industries. These orbital welding heads are designed considering the complexity of tubes and pipelines used in the semiconductor industries. The UHP orbital weld head series is designed in compliance with SEMI F78

Along with welding head series, the latest power source called as Orbitron 8000 is suitable for the purpose of welding. The power source is a smart lab instrument that has potential to incorporate AI. The power source is also designed and manufactured indigenously in compliance with SEMI F78 standard.

One of the important novel features of this power source is the advance shielding gas control.

The power source is also compatible with Auto Gas Purge control unit

- This is a novel advancement of Universal Orbital Systems Pvt Ltd for the optimization of purge gas flow and improving the weld quality of the joints as per required in the industry. Gas flow control is required in 5G position of the tube to ensure uniform penetration throughout the tube.
- The next feature is the facility to adjust the current parameter during real time welding process. This feature can be utilized in such a way that the orbital welder can modify the current as per the position of the tungsten electrode along the tube to acquire the desired penetration and fusion.
- We also provide an Auto Purge-Gas Control Unit for accurate purging gas control to achieve weld joints that fit the SEMI F78 standard. In 5G position, due to the effect of gravity at 6'o and 12'o clock position achieving uniform penetration can be challenging. A purge control unit that adjusts the purging



gas pressure at these positions can improve the weld quality and increase the production rates as well. The purge gas pressure has to be regulated to achieve equal penetration thus avoiding concavity in the pipe ID. We can set the gas pressure (unit: mm of water) sector-wise just like how welding current and speed is set.



Universal Orbital Systems is keen to work with semiconductor industries due to the complexity of the intricate pipelines. We provide constant support from our R&D for required customization in the orbital welding head. We are keen to provide quality and ease of welding.

Some of micro fittings welded by Universal Orbital Systems' micro head series MH12, MH-16X, MH-25X:



July month developments

A SS-310 sample was received for WPS. We worked on setting the parameters and understand the welding issues associated with the material SS-310. Generally, SS-310 is challenging to weld. This is due to the high thermal expansion coefficient and low thermal conductivity. Due to this, solidification cracking is observed in the weld metal. In order to provide a solution we conducted welding trials on a standard tube of $\varnothing 38.1\text{mm}$, thickness 1.6mm.

Initially welding with Argon gas (99.9995% pure) caused cracking in the weld metal. The crack was clearly visible in with naked eye. DP test was conducted on the joint and the weld joint had failed the test.

Understanding the metal's thermal properties, it was concluded that the heat input required should be minimum to avoid cracking.

Shielding gas Argon 95% and Hydrogen 5% was used as a mixture shielding gas to conduct the welding. There was no crack observed in the weld joint and the joint passed DP test. The current required was much lower in comparison with pure Argon shielding gas. The heat input was reduced by 100 J/mm when compared to joint that was welded with pure Argon gas (99.9995% pure).

However there was welding discoloration observed around the weld joint. In order to mitigate this copper backing was provided to remove the heat instantaneously and avoid cracking of weld joint.

Motivation behind developments in orbital welding



With the purpose of sharing and exchanging knowledge in the welding fraternity, the developments are planned and executed at Universal Orbital. Orbital Welding is a continuously evolving technology. We believe we can also contribute in the advancements of Orbital Welding. Universal Orbital is a research and execution oriented company that believes in simplifying the technology for practical usage and holistic knowledge approach.

Development of orbital welding equipment at Universal Orbital is fueled by the core purpose of welding automation of all kinds of designs of pipelines in various industries. The developments include WPS set-up for exotic materials like SS-310, Titanium and Inconel etc. The development includes detailed study of welding parameters and achieving the required standard welding joint by mitigating material restrictions that causes welding defects. The development also includes designing various weld head, fixtures and collets to weld intricate pipelines while considering the production rates of the joints. The development extends to training that includes how to weld such joints with proper welding sequences.

Developing a welding solution which is collinear with the industrial advancements has always been the driving force at Universal Orbital Systems while considering a practical industrial approach. We are always open to conduct welding trials on complex pipelines and exotic materials to provide a practical, industrial solution

We aim in providing indigenous orbital welding solutions to not just industries but also public sector companies and provide our small contribution to the mission of "ATMANIRBHAR BHARAT"



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G.S. PARKHE AWARD



CII AWARD



MSME AWARD

S.No.29/8,29/9, Near Shree Control Chowk,Beside Anant Industrial Estate Phase-3,
Narhe Dhayari Road,Pune,Maharashtra- 411041

T:+918793089870 M: +918080288688 / +919022602946

Email: sales@universalorbital.com / www.universalorbital.com