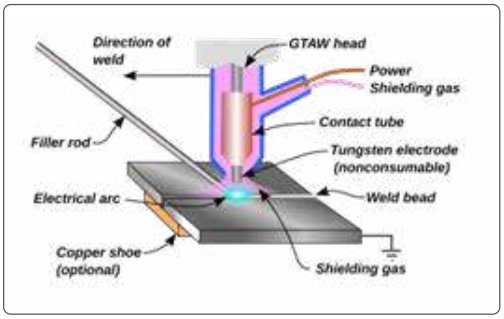
Application Note

Trace Moisture Measurement in Welding - GTAW & TIG

GTAW (Gas Tungsten Arc Welding) & TIG (Tungsten Inert Gas Welding)

TIG welding, also known as Tungsten Inert Gas welding, is performed using a torch equipped with a permanent, non-consumable tungsten electrode to establish the welding arc.

The filler material is introduced separately and manually into the weld pool, rather than through the torch itself. This method provides welders with a high degree of control, enabling skilled operators to produce welds that are both stronger and of higher quality compared to other welding techniques. As a result, TIG welding is especially favoured for joining thin sections of stainless steel, aluminium, titanium and other specialised alloys, making it a standard process in the aerospace industry.



Certain hydride-forming metals, such as titanium, vanadium, zirconium, tantalum and niobium, are susceptible to embrittlement and fracture if hydrogen is introduced and diffuses into the metal. Titanium becomes highly reactive at elevated temperatures and can readily combine with oxygen, nitrogen, hydrogen and carbon. The absorption of these elements into the metal's structure can embrittle the weld, potentially rendering the component unusable.

To prevent such contamination, the weld pool must be shielded from atmospheric gases, especially oxygen and water vapour. Commonly, argon or helium or mixtures thereof, are used as shielding gases, sometimes with small additions of other gases to tailor the weld properties. These shielding gases must be extremely dry, with low moisture content, to avoid introducing hydrogen or other contaminants into the weld.

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In the aerospace sector, companies typically adhere to strict quality assurance standards, often under NADCAP (National Aerospace and Defense Contractors Accreditation Program) accreditation. These standards specify maximum allowable moisture levels at the torch head, typically between -60 °C and -40 °C dewpoint and require regular testing to ensure compliance.

TIG welding is generally employed for low volume, specialised applications. Each welding station is usually supplied with shielding gas from a nearby cylinder. While the gas in the cylinder is extremely dry, often better than -70 °C dewpoint, it can absorb moisture from regulators and piping en route to the torch.

To monitor moisture content at the torch head, a portable dewpoint hygrometer, such as the SADPmini2, can be used. A shroud or nozzle is fitted to the welding torch; if a No. 5 size is available, the 6 mm outer diameter tube supplied with the SADPmini2 can be inserted for a gas tight fit. For larger nozzles, insulating tape can be used to achieve a seal. Some users fabricate an adaptor to attach directly to the torch head in place of the shroud. A short length (10 - 20 mm) of PTFE tubing is recommended to minimise equilibration time.

The gas cylinder's pressure regulator typically includes an integral flow meter and the flow rate should be set to match normal welding conditions, usually around 10 to 12 litres per minute.

Suitable Products

Portable Hygrometers

Online Hygrometers

Online Hygrometers

Trace Moisture Analysers

If you would like more details of trace moisture measurement in welding gases, please contact: +44 (0) 1274 733100 or contact@amsystems.co.uk

alpha moisture systems