15 Lanthanated Tungsten TIG Electrodes (Gold) – Technical Material Specification

1.0 Material Overview & Common Uses

15 Lanthanated Tungsten TIG electrodes (gold band) are a non-radioactive, high-performance tungsten alloy containing 1.3% to 1.7% lanthanum oxide (La2O3) by weight. They are designed for alternating current (AC) and direct current (DC) gas tungsten arc welding (GTAW/TIG) and offer superior arc starting, arc stability, and electrode life compared to pure tungsten or 2% thoriated tungsten electrodes.

- Primary applications include AC welding of aluminum and magnesium alloys, DC welding of carbon steel, stainless steel, nickel alloys, copper alloys, and titanium.
- Commonly used in aerospace fabrication, automotive repair, pipe welding, sheet metal work, and general manufacturing where precise weld control is required.
- Preferred for automated and robotic TIG welding due to consistent arc characteristics and minimal tip erosion.

2.0 Core Technical Properties & Sizing

- Composition: Tungsten (balance) + 1.3%–1.7% Lanthanum Oxide (La2O3).
- Density: 18.5 g/cm³ (nominal).
- Melting Point: 3422 °C (6192 °F) – tungsten base.
- Electrical Conductivity: 30% IACS (approximate).
- Standard Diameters (inches): 1/16 (0.0625), 3/32 (0.09375), 1/8 (0.125), 5/32 (0.15625), 3/16 (0.1875), 1/4 (0.250).
- Diameter Tolerance: ±0.002 inches for diameters up to 1/8 inch; ±0.003 inches for diameters above 1/8 inch.
- Standard Length: 7 inches (177.8 mm) with a tolerance of ±0.125 inches.
- Surface Finish: Ground finish with a maximum surface roughness of 32 microinches Ra.
- Color Code: Gold band at the electrode holder end (per AWS A5.12 classification).
- Hardness: 68–72 HRC (Rockwell C scale).

3.0 Processing, Machinability & Application

15 Lanthanated tungsten electrodes are not machined in the traditional sense but are prepared for welding by grinding the tip to a specific geometry. The electrode is brittle and must be ground with care to avoid chipping or cracking. Proper tip preparation is critical for arc stability and weld quality.

- Grinding: Use a dedicated tungsten grinder or a fine-grit (120–200) diamond wheel. Grind longitudinally (parallel to the electrode axis) to avoid transverse scratches that can cause arc wander.
- Tip Geometry: For DC welding, grind to a pointed cone with a 15–30 degree included angle. For AC welding, a truncated cone (flat tip) with a diameter of 0.010–0.030 inches is recommended.
- Current Range (AC): 1/16 inch diameter: 30–80 A; 3/32 inch: 60–130 A; 1/8 inch: 100–180 A; 5/32 inch: 150–250 A; 3/16 inch: 200–300 A; 1/4 inch: 250–400 A.

- Current Range (DCEN): 1/16 inch: 40–120 A; 3/32 inch: 80–200 A; 1/8 inch: 130–300 A; 5/32 inch: 200–400 A; 3/16 inch: 250–500 A; 1/4 inch: 350–600 A.
- Gas Lens: Use a gas lens collet body for improved shielding gas coverage, especially for aluminum and reactive metals.
- Shielding Gas: 100% argon for most applications; argon-helium mixtures for thicker aluminum sections. Flow rate: 10–20 CFH (cubic feet per hour) depending on cup size.
- Electrode Stickout: Typically 0.25–0.5 inches beyond the gas cup for manual welding; adjust for automated processes.

4.0 Common Defects & Quality Control

- Reject if the electrode has visible cracks, chips, or splits along the length or at the tip under 10x magnification.
- Reject if the diameter is out of tolerance by more than ±0.003 inches for diameters up to 1/8 inch, or ±0.005 inches for larger diameters.
- Reject if the length is less than 6.875 inches or more than 7.125 inches.
- Reject if the surface finish exceeds 32 microinches Ra or has visible grinding marks, pits, or scratches deeper than 0.001 inch.
- Reject if the color band is missing, incorrect, or not clearly visible (must be gold per AWS A5.12).
- Reject if the electrode exhibits excessive wobble or bow (runout greater than 0.005 inches over the 7-inch length).
- Reject if the chemical composition deviates from the specified lanthanum oxide range (1.3%–1.7%) as verified by material test certificate.
- Reject if the electrode is not individually packaged or if the packaging is damaged, exposing the electrode to moisture or contamination.

5.0 Storage, Handling & WHMIS Guidelines

- Store in a dry, climate-controlled environment with relative humidity below 60% and temperature between 10°C and 30°C.
- Keep electrodes in original sealed packaging until use to prevent contamination from oil, grease, or moisture.
- Shelf life: Indefinite when stored properly; however, follow FIFO (First In, First Out) inventory rotation to ensure oldest stock is used first.
- WHMIS Classification: Not classified as a hazardous product under WHMIS 2015 (no GHS pictograms required). However, grinding dust may contain tungsten and lanthanum oxide, which are respiratory irritants.
- Mandatory PPE during grinding: N95 respirator or higher, safety glasses with side shields, and cut-resistant gloves. Use local exhaust ventilation to capture grinding dust.
- Do not ingest or inhale grinding dust. Wash hands thoroughly after handling. Avoid eye contact.
- Dispose of used electrodes and grinding dust in accordance with local environmental regulations. Tungsten is not classified as hazardous waste, but lanthanum oxide may be subject to reporting requirements.
- First aid: If dust enters eyes, flush with water for 15 minutes. If skin irritation occurs, wash with soap and water. Seek medical attention if irritation persists.