

2% Ceriated Tungsten TIG Electrodes (Grey) – Technical Material Specification

1.0 Material Overview & Common Uses

2% ceriated tungsten electrodes (AWS classification EWCe-2) are non-consumable tungsten-based welding electrodes alloyed with approximately 2% cerium oxide (CeO_2). They are identified by a grey colour band at the tip. Ceriated tungsten offers excellent arc stability at low amperages, easy arc starting, and reduced electrode erosion compared to pure tungsten, making it ideal for AC and DC TIG welding of carbon steel, stainless steel, nickel alloys, titanium, and copper alloys. It is particularly suited for thin-gauge materials and orbital welding applications where precise arc control is required.

2.0 Core Technical Properties & Sizing

- Chemical composition: 97.30% tungsten min, 1.80–2.20% cerium oxide, balance trace impurities (Fe, Mo, Al, Si, C, O, N) per AWS A5.12/A5.12M.
- Density: 19.2 g/cm³ (nominal).
- Melting point: 3422 °C (6192 °F) – tungsten matrix; cerium oxide does not lower melting point significantly.
- Electrical conductivity: ~30% IACS (relative to copper).
- Thermal conductivity: 173 W/m·K at 20 °C.
- Standard diameters: 1/16 in (1.6 mm), 3/32 in (2.4 mm), 1/8 in (3.2 mm), 5/32 in (4.0 mm), 3/16 in (4.8 mm).
- Diameter tolerance: ± 0.002 in (± 0.05 mm) for diameters up to 1/8 in; ± 0.003 in (± 0.08 mm) for larger diameters.
- Standard lengths: 7 in (175 mm) or 6 in (150 mm); length tolerance: ± 0.125 in (± 3.2 mm).
- Surface finish: Smooth, free of cracks, pits, and surface contamination; maximum surface roughness $R_a \leq 0.8$ μm .
- Straightness: Maximum bow of 0.010 in per 6 in length (0.25 mm per 150 mm).
- Hardness: 70–85 HRC (Rockwell C) as-drawn; tip grinding may reduce surface hardness locally.

3.0 Processing, Machinability & Application

2% ceriated tungsten electrodes are ground to a point or truncated cone shape for optimal arc initiation and stability. Grinding must be performed longitudinally (parallel to the electrode axis) to avoid transverse grinding marks that can cause arc wandering. Use a dedicated tungsten grinder or a fine-grit diamond wheel (120–220 grit) with coolant to prevent overheating and micro-cracking. Do not use the same grinding wheel for steel or other metals to avoid contamination.

- Recommended tip angle: 20–30° included angle for DC welding; 30–45° for AC welding.
- Grinding speed: 3000–6000 RPM; avoid excessive pressure to prevent thermal shock.
- Current range (DCEN, 2% ceriated): 1/16 in (1.6 mm) – 70–150 A; 3/32 in (2.4 mm) – 150–250 A; 1/8 in (3.2 mm) – 250–400 A.
- Gas lens recommended for shielding gas coverage; use 100% argon or argon/helium blends.
- Not recommended for use with pure helium shielding gas due to reduced arc stability.
- Electrode stick-out: 0.25–0.50 in (6–12 mm) typical; adjust based on joint geometry.

- Avoid touching the electrode to the weld puddle; contamination will require re-grinding.

4.0 Common Defects & Quality Control

- Reject if any longitudinal or transverse cracks are visible under 5x magnification.
- Reject if surface pits, voids, or inclusions exceed 0.005 in (0.13 mm) in depth or diameter.
- Reject if colour band is missing, smudged, or incorrect (must be grey per AWS A5.12).
- Reject if diameter is out of tolerance by more than ± 0.003 in (± 0.08 mm).
- Reject if straightness exceeds 0.015 in per 6 in (0.38 mm per 150 mm).
- Reject if electrode exhibits visible oxidation, rust, or discoloration (blue/purple tint) indicating overheating during manufacturing.
- Reject if chemical composition deviates from AWS EWCE-2 limits (cerium oxide outside 1.8–2.2%).
- Acceptance sampling per ANSI/ASQ Z1.4 (AQL 1.0 for critical defects, AQL 2.5 for minor defects).

5.0 Storage, Handling & WHMIS Guidelines

% ceriated tungsten electrodes are stable under normal storage conditions but must be kept dry and free from oil, grease, and moisture to prevent weld contamination. Cerium oxide is not classified as a hazardous substance under WHMIS 2015, but grinding dust contains tungsten and cerium compounds that may be harmful if inhaled. Follow all applicable workplace safety regulations.

- Store in original sealed packaging in a clean, dry environment at 15–30 °C and <60% relative humidity.
- Shelf life: Indefinite when stored properly; no degradation of metallurgical properties.
- FIFO (First In, First Out) rotation recommended to ensure consistent batch traceability.
- WHMIS 2015 classification: Not classified as a hazardous product under GHS (no hazard pictograms required for solid electrode).
- Grinding dust: Contains tungsten and cerium oxide; use local exhaust ventilation (LEV) and wear NIOSH-approved N95 respirator during grinding.
- PPE during handling: Safety glasses with side shields, cut-resistant gloves (ANSI A2 or higher), and long sleeves.
- Do not ingest; wash hands thoroughly after handling.
- Dispose of grinding waste in accordance with local environmental regulations for metal dust.

Regulatory Disclaimer: This document is a generic technical material specification provided for educational purposes. The end-user assumes all liability for reviewing, adapting, and validating all tolerances, properties, and safety protocols against specific OEM data sheets and local regulations before deployment.