

Safe Operation of an Xcel-Arc / Unimig CNC Plasma Cutting Table

Standard Operating Procedure (SOP)

1. Purpose

To prevent electric shock, burns, arc eye, toxic fume inhalation, fire, and mechanical injury when operating a CNC plasma cutting table for automated cutting of mild steel, stainless steel, or aluminium.

2. Scope

Applies to all Xcel-Arc and Unimig CNC plasma tables in the workplace, including integrated plasma power sources (e.g., RAZOR CUT 45/80/120 or Unimig equivalents), CNC controllers (e.g., Unimig Arc Path software), torch height control (THC), and water/downdraft tables. Covers setup, operation, and shutdown.

3. Responsibilities

Operator: Must be trained, authorised, and never bypass safety interlocks or guards.

Supervisor/PCBU: Ensure annual machine certification, fume extraction compliance, and only authorised persons operate the table. Maintain records of training and inspections.

4. Major Hazards

- Electric shock from high-voltage plasma arc (up to 400 V DC)
- UV/IR radiation causing arc eye or burns
- Toxic fumes (e.g., chromium VI from stainless, hexavalent chromium from coatings)
- Fire from sparks/hot slag
- Mechanical pinch/crushing from gantry/torch movement
- Noise (>95 dB(A)) and flying debris

5. Mandatory Personal Protective Equipment (PPE)

- Auto-darkening welding helmet or goggles (shade 8–12 per AS/NZS 1338.1)
- Flame-resistant FR-rated jacket/sleeves and trousers
- Dry leather welding gloves (no holes)
- Class 5 hearing protection (ear muffs)
- P2 or powered air-purifying respirator (PAPR) with HEPA filter when cutting stainless, galvanised, or coated metals
- Steel-cap safety boots
- Close-fitting clothing – no synthetics, loose sleeves, or jewellery

6. Training & Authorisation

Only persons who have:

- Completed documented CNC plasma training
- Been assessed competent on this specific Xcel-Arc/Unimig model (including software and THC)
- Current authorisation recorded in the training register

may operate unsupervised. Annual refresher required.

7. Pre-Operation Checks

- Power supply isolated; leads, earth clamp, and torch cable undamaged (no exposed conductors)
- Plasma consumables (electrode, nozzle, shield cap) correct for amperage/material and not worn (>50% erosion = replace)
- Air/compressed air supply dry, filtered, and set to 550–650 kPa (per manufacturer chart)
- Water table appropriately filled
- CNC software (e.g., Unimig Arc Path or Xcel-Arc compatible) loaded with correct cut parameters (pre-configured database verified)
- THC calibrated (pierce height 3–5 mm, cut height 1.5–3 mm); limit switches and interlocks functional
- Gantry/table clear of debris; water table filled if applicable (pH 7–9 to prevent hydrogen buildup)
- Fire extinguisher (9 kg ABE dry chemical) and spill kit within 5 m; area clear of flammables (8 m radius)
- Emergency stop buttons (minimum three: controller, gantry, power source) tested

8. Safe Operating Procedure

Set-Up

- Isolate power and air; lock out/tag out (LOTO) during consumable/torch changes.
- Load G-code or use CAD/CAM software (e.g., Cut2D Pro) to generate paths; verify dry-run without arc.
- Secure workpiece on table (clamps or magnets); ensure earth clamp contact within 1 m of cut line.
- Select parameters from database (e.g., amperage 30–120 A, speed 500–3000 mm/min per thickness).
- Position torch perpendicular; test THC touch-sense on scrap.

Operation

Never enter the table enclosure while powered or arc active.

- Put on all PPE – helmet down before starting.

- Clear area of bystanders; close enclosure doors (interlocked).
- Start fume extraction/downdraft first, then plasma power source and CNC controller.
- Initiate cycle from controller (e.g., touchscreen on Unimig); monitor THC arc voltage (100–150 V typical).
- Stand outside enclosure; observe via viewing window – never override THC or interlocks.
- For stainless/galvanised: use PAPR and confirm LEV airflow.
- Pause cycle immediately if abnormal noise, smoke, or arc instability occurs.

9. Shut-Down & Cleaning

- End cycle; allow post-flow (10–30 s) to finish.
- Turn off plasma source, CNC, and extraction; isolate power/air.
- Remove slag/hot pieces with tongs (wear heat-resistant gloves); cool before handling.
- Vacuum or wet-wipe dross (never dry sweep); empty water table sludge weekly (wear PPE).
- Inspect consumables and log usage.

10. Absolutely Prohibited Actions (Zero Tolerance)

- Operating without enclosure doors closed or interlocks bypassed
- Cutting coated/painted metals without coating removal and PAPR
- Touching torch during arc or laying it on wet/grounded surfaces
- Entering table during operation or with power on
- Using damaged leads, consumables, or uncalibrated THC
- Cutting magnesium or explosive-coated materials without risk assessment
- Operating without LEV (fume levels must < Workplace Exposure Standard, e.g., 0.05 mg/m³ for Cr(VI))

11. Emergency Procedures

- Arc/shock: Release trigger, hit nearest emergency stop; isolate power before touching victim.
- Fire: Use extinguisher on small fires; evacuate and call 111 for large ones.
- Fume exposure: Move to fresh air, administer oxygen if trained; seek medical help.
- Arc eye: Rinse with sterile saline; consult doctor.
- Report all incidents to supervisor; investigate root cause.

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