

TIG Welding Setup and Cleanliness Checklist

Tungsten Inert Gas (TIG) welding, also known as Gas Tungsten Arc Welding (GTAW), requires meticulous setup and absolute cleanliness to produce high-quality, contamination-free welds. This comprehensive checklist ensures proper equipment configuration and material preparation.

Why Cleanliness is Critical in TIG Welding

Unlike MIG or stick welding, TIG welding offers no flux to clean contaminants. Any oil, grease, oxide, paint, or moisture will be incorporated directly into the weld pool, causing porosity, cracking, and weld failure. TIG welding demands hospital-grade cleanliness standards.

Equipment Setup Checklist

Power Source Configuration

- Verify correct current type: DC for steel/stainless, AC for aluminum
- Check polarity: DCEN (electrode negative) for most applications
- Set amperage range appropriate for material thickness
- Enable high-frequency start if available (reduces tungsten contamination)
- Configure pulse settings if using pulsed TIG
- Verify foot pedal or fingertip control is connected and functional
- Test current control response before welding

Torch and Consumables Setup

- Select correct tungsten type for application:
 - 2% Thoriated (red): DC steel/stainless (being phased out due to radioactivity)
 - 2% Lanthanated (blue): DC steel/stainless, universal use
 - Pure tungsten (green): AC aluminum
 - 2% Ceriated (orange): DC and AC, low amperage
- Grind tungsten to proper shape:
 - DC welding: Tapered point, 2.5x diameter length, 15-30° included angle
 - AC welding: Balled end (let arc form ball during warm-up)
- Install tungsten with proper stickout (2-3x tungsten diameter)
- Install correct collet and collet body for tungsten size
- Select appropriate cup size (larger for better coverage, smaller for access)
- Install gas lens for improved shielding gas coverage (recommended)
- Check all torch components are tight—no gas leaks

Shielding Gas Setup

- Verify correct gas type: Pure Argon for most applications
- For stainless steel: Consider Argon/Hydrogen or Argon/Helium mix
- Connect regulator/flowmeter to gas cylinder securely
- Open cylinder valve slowly—avoid pressure shock to regulator
- Set flow rate: 15-20 CFH for steel/stainless, 20-25 CFH for aluminum

- Pre-flow setting: 0.5-1 second (establishes shield before arc)
- Post-flow setting: 5-15 seconds (protects hot tungsten and weld)
- Check for leaks at all connections using soapy water
- Verify gas flow by briefly pressing torch trigger away from work

Material Preparation - Critical Cleanliness Standards

Steel and Stainless Steel Preparation

- Remove all mill scale, rust, and oxide using:
 - Wire brush (stainless-only brush for stainless steel)
 - Flap disc or grinding wheel
 - Sandpaper (80-120 grit minimum)
- Degrease surface using:
 - Acetone or denatured alcohol
 - Clean, lint-free cloths
 - Wipe in one direction only
- Clean 2-3 inches beyond weld zone on both sides
- For stainless steel: Use dedicated stainless-only tools to prevent iron contamination
- Final wipe with clean solvent immediately before welding
- Wear clean nitrile gloves—avoid touching cleaned areas with bare hands
- If surface recontaminated (fingerprints, dust), re-clean completely

Aluminum Preparation - Extra Critical

Aluminum forms an oxide layer instantly upon exposure to air. This oxide melts at 3700°F while aluminum melts at 1220°F, creating a barrier to fusion. Aluminum requires the most stringent preparation:

- Remove oxide layer mechanically:
 - Dedicated stainless steel wire brush (aluminum-only)
 - Scrape with sharp carbide scraper
 - Scotch-Brite pad
- Degrease thoroughly with acetone
- Clean minimum 3 inches from weld area
- Weld within 24 hours of cleaning (oxide reforms quickly)
- For critical work: Chemical etch or clean within 30 minutes of welding
- NEVER use steel wire brush on aluminum—embeds iron particles
- Store cleaned aluminum in sealed plastic until welding
- Wear clean gloves at all times—skin oils cause porosity

Filler Metal Preparation

- Verify correct filler alloy matches base metal:
 - ER70S-2 or ER70S-6 for mild steel
 - ER308L for 304 stainless steel
 - ER4043 for 6061 aluminum (general purpose)
 - ER5356 for 5000 series aluminum
- Inspect filler rod for:
 - Surface oxidation or discoloration
 - Oil, grease, or fingerprints
 - Dirt or debris
- Clean filler rod with acetone and clean cloth if questionable
- Handle filler rod only with clean gloves
- Store filler rods in sealed container when not in use
- Keep multiple filler rods ready—avoid contaminating during welding

Work Area and Environment Checklist

- Ensure welding table is clean and grounded
- Position work to avoid awkward positions—comfort improves quality
- Attach ground clamp to clean base metal close to weld area
- Verify adequate ventilation (especially for stainless and aluminum)
- Eliminate drafts that could blow shielding gas away (close doors/windows)
- Remove all flammable materials from area
- Position gas cylinder securely, upright, and accessible
- Arrange filler rods within easy reach
- Place foot pedal or control comfortably for smooth operation
- Verify adequate lighting—shadows obscure weld pool
- Have clean, lint-free rags available for in-process cleaning

Pre-Weld Verification Checklist

- All personal protective equipment donned:
 - TIG welding helmet (shade 10-13)
 - Clean welding gloves (TIG gloves recommended)
 - Long-sleeved cotton or leather jacket
 - Closed-toe shoes or boots
- Test torch trigger—verify gas flow
- Check high-frequency start on scrap piece
- Verify tungsten is not contaminated (no copper, bronze, or black)
- Confirm amperage setting appropriate for material thickness
- Visual inspection—all cleaned areas still pristine
- No moisture on workpiece (wipe if condensation present)
- Work clamp has solid connection to base metal
- Fire extinguisher nearby and accessible

Common Contamination Sources and Prevention

Source	Effect	Prevention
Dirty gloves	Porosity, black spots in weld	Use dedicated TIG gloves, wash regularly
Shop dust/grinding debris	Inclusions, porosity	Clean area thoroughly before welding
Skin oils from fingers	Porosity, uneven penetration	Never touch cleaned areas, wear clean gloves
Wrong wire brush	Iron contamination in stainless/aluminum	Dedicated brushes for each material
Moisture/condensation	Hydrogen porosity	Wipe dry, preheat if needed
Old solvent on rag	Introduces contaminants	Use fresh, clean rags only
Contaminated tungsten	Tungsten inclusions in weld	Regrind tungsten after contamination
Inadequate gas coverage	Oxidation, porosity	Increase flow, eliminate drafts, larger cup

Post-Weld Procedures

- Allow tungsten to cool under post-flow gas shield
- Inspect tungsten for contamination (copper color, black tip)
- Regrind or replace contaminated tungsten immediately
- Clean torch cup and gas lens of any spatter
- Inspect weld for surface defects indicating contamination
- Close gas cylinder valve when finished
- Bleed pressure from regulator/hoses
- Store torch properly to prevent damage to consumables
- Store unused filler rods in sealed, clean container
- Clean and organize work area for next session

Quick-Start Pre-Weld Checklist (Laminate This!)

- Power source set: DC or AC, correct amperage
- Torch: Clean tungsten ground to spec, correct stickout
- Gas: Argon flowing 15-25 CFH, pre/post-flow set
- Material: Cleaned 2-3" beyond weld, degreased, oxide removed
- Filler: Correct alloy, clean, dry, ready
- Safety: Helmet, gloves, jacket, ventilation
- Ground: Clamp on clean metal near weld
- Environment: No drafts, good lighting, organized
- Test: Gas flow verified, arc tested on scrap