

Welding Gas Selection Guide

Shielding Gas Reference for All Processes

Proper shielding gas selection is critical for weld quality, penetration, bead appearance, and overall performance. This guide covers the most common shielding gases for MIG, TIG, and flux-core welding, along with their specific applications and characteristics.

MIG (GMAW) Welding Shielding Gases

Gas Mix	Composition	Best For	Characteristics	Typical Flow
C25	75% Ar / 25% CO ₂	Mild steel (most common)	Good penetration, some spatter	15-25 CFH
C15	85% Ar / 15% CO ₂	Mild steel (spray transfer)	Less spatter, cleaner welds	15-25 CFH
C10	90% Ar / 10% CO ₂	Stainless, mild steel	Minimal spatter, excellent arc	18-25 CFH
C5	95% Ar / 5% CO ₂	Thin stainless steel	Very low spatter, good control	18-25 CFH
100% CO ₂	Pure CO ₂	Budget mild steel welding	Deep penetration, high spatter	20-30 CFH
100% Argon	Pure Ar	Aluminum, magnesium	Stable arc, no oxidation	20-30 CFH
Tri-Mix	90% He/7.5% Ar/2.5% CO ₂	Stainless steel	Hot arc, excellent flow	22-30 CFH
Ar/He Mix	75% Ar / 25% He	Thick aluminum	Hotter arc, better penetration	25-35 CFH

TIG (GTAW) Welding Shielding Gases

Gas Type	Composition	Material Application	Characteristics	Flow Rate
Pure Argon	100% Ar	Steel, SS, titanium, copper	Stable arc, good cleaning action	10-20 CFH
Pure Helium	100% He	Thick aluminum, copper	Very hot arc, deep penetration	20-35 CFH
Ar/He 75/25	75% Ar / 25% He	Thick aluminum, stainless	Balanced heat and stability	15-25 CFH
Ar/He 50/50	50% Ar / 50% He	Automated thick aluminum	High heat input, faster travel	18-30 CFH
Ar/He 98/2	98% Ar / 2% He	Austenitic stainless	Cleaner welds, faster speeds	12-20 CFH
Pure Ar + Backup	100% Ar + purge	Stainless pipe welding	Protects both sides of weld	10-15 + purge

Material-Specific Gas Recommendations

Base Metal	MIG/GMAW Process	TIG/GTAW Process	Notes
Mild Steel	C25 (75/25 Ar/CO ₂)	100% Argon	C25 is industry standard for MIG
Stainless Steel	Tri-Mix or C10	100% Argon or Ar/He	Avoid CO ₂ on thin SS

2025 Best Welding Helmet Reference Guide

Aluminum	100% Argon	100% Argon or Ar/He	Never use CO ₂ with aluminum
Silicon Bronze	100% Argon	100% Argon	Argon prevents oxidation
Copper	Ar/He mix	Ar/He mix (75/25)	Helium adds needed heat
Magnesium	100% Argon	100% Argon	Special fire precautions required
Cast Iron	C25 or 100% Ar	100% Argon	Preheat typically required
Nickel Alloys	100% Argon or Ar/He	100% Argon	Expensive materials, use Ar

Shielding Gas Properties and Effects

Gas	Arc Stability	Penetration	Bead Appearance	Spatter Level	Cost
100% Argon	Excellent	Moderate	Clean, shiny	Very Low	Moderate
100% CO ₂	Fair	Deep	Rougher	High	Low
75/25 Ar/CO ₂	Good	Good	Clean	Moderate	Low-Moderate
90/10 Ar/CO ₂	Excellent	Moderate	Very Clean	Low	Moderate
100% Helium	Fair	Very Deep	Hot/fluid	Low	High
Ar/He Mix	Good	Deep	Clean, hot	Low	High
Ar/H ₂ Mix	Excellent	Deep	Bright, clean	Very Low	Moderate

Gas Flow Rate Guidelines

General Flow Rate Principles:

MIG Welding:

- Indoor, no drafts: 15-20 CFH
- Normal shop conditions: 20-25 CFH
- Outdoor or breezy: 25-35 CFH
- Aluminum (always higher): 25-35 CFH

TIG Welding:

- Small cups (#4-#6): 10-15 CFH
- Medium cups (#7-#10): 15-20 CFH
- Large cups (#12+): 20-30 CFH
- Trailing shield: Additional 10-15 CFH

Warning Signs of Incorrect Flow:

- Too Low: Porosity, oxidation, poor arc stability
- Too High: Turbulent flow, air entrainment, porosity, wasted gas

Gas Cylinder Safety and Storage

- Always secure cylinders in upright position with chain or strap
- Store cylinders in well-ventilated area away from heat sources
- Keep protective caps on when not in use
- Never use oil or grease on regulators or fittings
- Check for leaks using soapy water solution, never with a flame
- Open cylinder valves slowly and stand to the side
- Close cylinder valve when finished welding
- Use correct regulator for each gas type
- Inspect hoses regularly for cracks, burns, or damage
- Keep full and empty cylinders separated and labeled

Quick Selection Guide

Most Common Choices:

- General MIG welding on mild steel → C25 (75% Ar / 25% CO $\blacksquare$)
- MIG welding aluminum → 100% Argon
- MIG welding stainless → Tri-Mix or C10
- TIG welding steel or stainless → 100% Argon
- TIG welding aluminum → 100% Argon (or Ar/He for thick)
- Budget MIG on thick steel → 100% CO $\blacksquare$

DISCLAIMER: This information is provided for educational purposes only. Always follow manufacturer guidelines, local codes, and safety regulations. Welding involves significant hazards including burns, electric shock, fumes, and fire. Proper training, certification, and safety equipment are essential before attempting any welding operations.

For more welding resources, visit: <https://bestweldinghelmet.net>