SHIELDING GAS SELECTION

Read the Cylinder Label

ISO 14175 group codes describe gas chemistry. Read the nominal mixture as well as the code.

ISO 14175 Group	Example Composition by Volume	Typical Use
I1	100% Ar	TIG on common alloys, MIG on aluminium and backing gas when suitable.
I3	Ar + He. A 75/25 blend is one example.	MIG/TIG on selected aluminium and other non-ferrous work. Helium raises arc voltage at a given arc length.
M12	98% Ar / 2% CO_2 example	Stainless MAG with compatible solid wire. Small active addition supports wetting.
M13	98% Ar / 2% O_2 example	Stainless MAG with compatible wires and transfer modes. Check oxidation and service.
M20	92% Ar / 8% CO_2 example	Steel MAG. Argon-rich blends support stable spray when the wire and current suit it.
M21	82% Ar / 18% CO_2 example	Steel MAG. Higher CO_2 can change fusion profile and increase spatter compared with lower-CO_2 blends.
M22	Argon with >3% to 10% O_2. 92% Ar / 8% O_2 is one example.	For compatible steel MAG applications. M22 is an Ar/O_2 group.
C1	100% CO_2	Steel MAG on appropriate wires and transfer modes. Higher spatter in many setups.

Avoid a Gas Substitution

Aluminium MIG uses inert shielding. An active steel mixture can cause oxidation and unstable weld quality. On stainless use a wire-approved stainless mix. Gas chemistry can change oxidation, carbon pickup and corrosion performance.

ISO 14175:2008 · Table 2

AWS · Gas and weld chemistry

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What the Mix Tolerance Means

ISO 14175:2008 clause 6 and Table 3 specify manufacturing tolerances for mixture components. Use the nominal mix specified for the weld.

Nominal Component	Allowable Variation	Calculated Example
Above 5%	±10% of the nominal value	8% CO_2 gives 7.2–8.8%.
Above 5%	±10% of the nominal value	18% CO_2 gives 16.2–19.8%.
From 1% to 5%	±0.5 percentage points	2% CO_2 gives 1.5–2.5%.
Below 1%	Table 3 gives no tolerance	Use the supplier's declared limits and the contract requirements.

Buying Check

Order by classification and nominal composition. On delivery compare the label and any certificate with the purchase specification. A permitted blend tolerance does not authorise switching to a different nominal mix.

Why Similar Mixes Behave Differently

Compare transfer, spatter and bead profile using the same wire, joint and permitted settings. The 92/8 and 82/18 examples belong to different ISO groups even though both are argon and CO_2.

ISO 14175:2008 · Clause 6 and Table 3

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Transfer Modes and Settings

Transfer changes with gas, wire and current. A machine programme for one wire and gas can behave differently on another.

Transfer	What Happens	Verified Setup Comparison
Short-circuit	Wire repeatedly bridges the pool. Useful for many thin and positional joints.	Example: 0.89mm ER70S-6, 75/25 Ar/CO_2, 9.6mm plate, 1G: 8.9m/min at 20V, DC+.
Globular	Large drops form. Often more spatter and a less controllable pool.	CO_2-rich shielding and operating region influence globular transfer.
Spray	Fine droplets cross the arc without shorting. Fluid pool favours flat and suitable horizontal work.	Same machine, 1.1mm ER70S-6, 90/10 Ar/CO_2, 9.6mm plate, 1G: 9.4m/min at 26.5V, DC+.
Pulse	Peak current detaches droplets. Lower average current helps control the pool.	Same machine, 1.1mm ER70S-6, 90/10, 9.6mm 3G up: 3.3m/min at 0.95 trim on that programme.

Worked Flow Comparison

The short-circuit example calls for 12–16.5L/min. The spray example calls for 12–19L/min. The figures are equipment examples for one machine, not interchangeable starting settings for every set.

Ask R H Davey for advice on shielding gas selection · 023 8033 9443

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TIG Flow, Cups and Coverage

Set the flow with gas moving through the torch. A static regulator pressure reading does not give delivery at the cup.

Gas Lens · Diffuser and Flow Direction



Cup and Tungsten	Stainless Argon Flow	Aluminium Argon Flow
#4–#6 · 0.25mm	2–4L/min	2–4L/min
#5–#6 · 1.6mm	4–6L/min	3–5L/min
#6–#8 · 2.4mm	5–7L/min	6–8L/min
#8–#10 · 4.0mm	6–8L/min	10–12L/min

Use the Table Within Its Scope

The figures are nozzle and tungsten examples with argon. Cup numbers refer to bore in sixteenths of an inch. A #8 cup is nominally 12.7mm.

Why Use a Gas Lens

A diffuser straightens the gas stream and can improve coverage where access needs more electrode extension. A wider nozzle can cover a broader area. Too little flow loses shielding. Too much can entrain air.

When Helium Helps

A helium blend can increase arc power and improve travel or fusion on thicker, heat-conductive material. Compare a qualified trial for the actual alloy and joint. Argon generally gives easier arc starting.

CK · Gas lens and TIG shielding

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SHIELDING GAS SELECTION

Back Purging and Safe Gas Delivery

Protect the hot root with a controlled atmosphere. Measure the purge separately from the air people breathe.

Purged Section · Inlet, Vent and Sample



Check	Practical Action
Dam, vent and sample	Isolate the smallest practical volume. Keep a vent open. Take the oxygen sample at the representative outlet or near the root as the procedure defines.
Worked purge volume	A 100mm internal diameter over 300mm between dams contains about 2.36L. At 5L/min, one ideal volume takes about 28 seconds. Mixing and leaks make the real purge longer. Start on the measured O_2 result.
Oxygen and heat tint	TWI duplex research tested 20–20,000ppm O_2. These are study conditions. Compare silver or straw versus blue/purple and black oxide with the job's reference. Colour is not an oxygen reading or an acceptance criterion by itself.
Backing gas	Argon is a common stainless backing gas. Duplex can use a qualified Ar/N_2 mixture. Titanium requires protection of the root and hot metal, including trailing protection where necessary.
Practical faults	Shield the area from draughts. Check flow at the torch and test leaks with approved fluid. Identify gas from the label. A residual-pressure valve keeps gas in the cylinder to prevent contamination. Follow the supplier's return instructions.
Asphyxiation and cylinders	Secure cylinders, protect valves and use the correct regulator. Inert gas displaces oxygen in pits, pipe and enclosures. Follow the confined-space assessment, monitoring and rescue plan. Never use oxygen to improve breathing air.

Keep the Purge Through the Hot Stage

TWI cites specifications that maintain purge through the root and hot pass, sometimes longer, or until the root region is below about 250°C. Avoid overpressure as the root closes.

For regulator or gas setup help, give the cylinder label, process, wire, torch and required delivery range. Call 023 8033 9443 or email sales@rhdaveywelding.co.uk.

Weldgas Regulators
Jasic TIG Range Guide
Parweld XTT
CP7 CP47 Gas Safety
Parweld XTM

HSE · Asphyxiation hazards
TWI · Duplex purge research
TWI · Root heat tint
BCGA CP44 · Cylinder handling

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