READING A WELDING PROCEDURE SPECIFICATION

Read the Procedure in Run Order

The root, fill and cap can have different limits. Match the job to the approved WPS before touching the controls.

Field / Example	What the Welder Needs	What Goes Wrong
01 · Control	WPS number, revision, drawing and joint ID.	An earlier revision can carry different gas, range or sequence.
02 · Joint	The actual grades, thicknesses and joint sketch. A 6mm plate does not establish coverage on its own.	Wrong root gap or backing changes access and penetration.
03 · Process	135 is MAG with solid wire. 141 is TIG with solid filler. Match the process and run order.	A root process swap changes technique and can fall outside qualification.
04 · Consumable	Classification, diameter, polarity, shielding and backing gases.	Similar grade labels can hide different chemistry, gas or hydrogen requirements.
05 · Operating range	Use actual measured current, voltage and travel speed if the job specifies them.	Panel presets may differ from arc values or approved limits.
06 · Thermal control	Preheat before starting. Interpass before subsequent runs. PWHT after welding when the procedure calls for it.	Wrong thermal cycle can affect toughness, hardness and distortion.

Where These Fields Come From

ISO 15609-1:2019 specifies arc welding WPS content. ISO 4063:2023 gives process numbers. The application standard or contract defines how the procedure is qualified.

ISO 15609-1:2019 · WPS content

TWI · Welding procedure

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Arc Energy and Heat Input

Calculate energy per unit of weld length from current, arc voltage and actual travel speed. Use the method required by the job.

Process	Thermal Factor k	EN 1011-1:2009 Example
SAW · single wire	1.0	Submerged arc.
MMA · MAG · flux-core	0.8	Use the coefficient only with the compatible calculation method.
TIG · plasma	0.6	For pulsed waveforms, check whether the procedure requires instrumented energy measurement.

Formula and Units

Arc energy = U × I × 60 / (1000 × v). Heat input = k × arc energy. U is arc voltage in V, I is current in A and v is travel in mm/min. Result in kJ/mm.

Worked MAG Example

This example uses a 20V 1G setup on 9.6mm plate. For a calculation exercise only, use 180A and a measured 300mm/min. Arc energy = 0.720kJ/mm. At k = 0.8, heat input = 0.576kJ/mm. Current and travel are exercise inputs.

Worked TIG Example

At 12V, 90A and 120mm/min, arc energy = 0.540kJ/mm and heat input = 0.324kJ/mm at k = 0.6. These are arithmetic inputs, not an issued TIG procedure.

Why the Range Matters

Low input can increase cooling rate and HAZ hardness in susceptible steel. High input can coarsen the HAZ, reduce toughness or soften some steels. Duplex work needs the specified balance of heat input, interpass and chemistry.

TWI · EN 1011-1 factors and energy

TWI · Measuring arc parameters

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Preheat, Interpass and Test Evidence

Preheat and interpass limits can serve different purposes. The same temperature may be a minimum in one row and a maximum in another.

Decision	What to Read
Preheat selection	For ferritic steels consider composition or carbon equivalent, combined thickness, diffusible hydrogen, heat input and restraint. EN 1011-2 gives assessment methods.
Temperature measurement	ISO 13916:2025 clause 4.1: when heating is concentrated on the groove and t ≤ 50mm, use A = 4t, capped at 50mm, from the groove edge. At t > 50mm the required temperature extends at least 75mm from the preparation unless agreed otherwise.
Interpass and PWHT	Check interpass just before the next run. PWHT follows its own specified cycle, including heating, hold and cooling.
WPQR / PQR	Records test variables and test results. ISO 15614-1:2017 qualification ranges depend on the process, test level, product and variables. Read the actual record before extending coverage.
Welder qualification	ISO 9606-1:2012 clauses 9.2 and 9.3 distinguish six-month confirmation from revalidation. Options include retest every 3 years or a 2-year test-based route. A continuing route has additional conditions.

Worked Temperature Check

On a 6mm example with heat concentrated at the groove, A = 24mm. Use the specified instrument. When heating from the measurement side is unavoidable, allow temperature to equalise before measuring.

A Document Check

If a six-month confirmation is missing, refer the certificate for review before assigning production work.

Why Quality Records Matter

The applicable ISO 3834 quality system and EN 1090 execution requirements can call for controlled procedures and traceability. Keep the issued WPS, WPQR, welder record, material certificates and inspection plan available.

ISO 13916:2025 · Clause 4.1
ISO 15614-1:2017 · Procedure tests
TWI · How preheat is applied
TWI · Six-month confirmation and routes

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READING A WELDING PROCEDURE SPECIFICATION

Two Job Packs and a Stop Rule

These are teaching cases for reading a WPS. The job pack must supply its own approved procedure and ranges.

Field	6mm S355 MAG Plate · Exercise	Stainless Pipe TIG · Exercise
Joint and process	Single-V plate butt. Read the 135 process and inspect the joint sketch.	Pipe butt, 141 with filler. Confirm OD, wall and position on the certificate.
Filler and gas	Example classification ER70S-6. Read the full ISO classification and approved gas combination.	Check whether parent is 304L or 316L, then compare filler and purge entries.
Run settings	See 0.576kJ/mm MAG exercise on page 2.	See 0.324kJ/mm TIG exercise on page 2. Verify the root run, purge and separate fill entries.
Evidence to attach	Job drawing, WPS revision, WPQR and welder qualification range.	Add backing gas ID, O_2 reading if specified, and root inspection record.

Stop, Compare, Refer

Stop if material, process, diameter, thickness, gas or position differs. Record the discrepancy. Welding coordination checks whether existing qualification covers it, then issues a controlled instruction or arranges a new qualification.

Common Mistake

Treating a procedure with a single sample value as a range. A change inside an issued range is different from changing the specified process, consumable or joint detail.

For equipment or consumable selection against a WPS, send the issued revision and the process, filler and gas rows. Call 023 8033 9443 or email sales@rhdaveywelding.co.uk.

Jasic TIG Range Guide
Parweld XTM
Parweld XTT
Parweld Filler Wires
Weld Star TIG
Kjellberg MMA Electrodes

ISO 15609-1:2019 · WPS content
ISO 15614-1:2017 · Test qualification

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