FIT-UP AND TACK WELDING

Set the Groove and Root Geometry

Use the joint detail to set the angle, root gap and land. The table gives selected one-sided preparation examples for steel.

Section Across the Prepared Groove



Joint Example	ISO 9692-1:2013 Table 1	Process and Scope
Broad-root-face V	Row 1.5: 5–40mm thickness, about 60° included, 1–4mm gap, 2–4mm land.	111, 13 and 141 as listed.
Single bevel	Row 1.9.1: >3–10mm, bevel angle 35–60°, gap 2 to <4mm, land 1–2mm.	111, 13 and 141 as listed. Angle refers to the bevel, not a symmetric V.
Single U	Row 1.8: >12mm, β 8–12°, gap ≤4mm, land ≤3mm.	111, 13 and 141 as listed. Read the radius and geometry on the approved detail.
Steep-flanked V	Row 1.4: >16mm, β >5° to 20°, gap 5–15mm.	111 and 13 as listed, with backing strip.

When the Preparation Changes

Square edges save machining on joints that can reach the required root. Double-V uses access from both sides. Single-J can reduce weld volume on thicker stock but takes machining. On a fillet, measure the contact gap along the seam.

Common Mistake

Holding a 60° template against one bevel face and treating the reading as the included angle. For a symmetrical 60° groove, each bevel is 30° from the square edge.

ISO 9692-1:2013 · Table 1

TWI · Root access and preparation

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Square, J, Double-V and Fillet Details

These are selected ISO 9692-1:2013 examples. Process listings do not establish coverage across the entire thickness range.

Detail	Standard Row and Dimensions	Use and Process
Square butt	Table 1, 1.2.1: t ≤4mm. For process 13, gap approximately t.	The same row has different entries for other processes. Keep the exact column and backing detail.
Single J	Table 1, 1.11: t >16mm, β 10–20°, gap 2–4mm, land 1–2mm.	111, 13 and 141. One curved edge leaves its mating member square.
Broad-root double V	Table 2, 2.4: t >10mm, gap 1–4mm, land 2–6mm.	About 60° for 111 and 141, or 40–60° for process 13. Access to both sides.
One-sided fillet	Table 3, 3.1.1: both members >2mm, joint angle 70–100°, gap ≤2mm.	Processes 3, 111, 13 and 141 as listed. This is preparation geometry.

Worked Fit-Up Check

For the 3.1.1 example, a measured 2.3mm gap is 0.3mm above the reference maximum. Refit before tacking if the issued detail adopts that limit. Compare the drawing separately for any tighter tolerance.

ISO 9692-1:2013 · Tables 1, 2 and 3

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Measure Gap, Offset and Angle

Measure at several stations. Compare the part against the intended joint detail before treating it as a weld imperfection.

Plate Offset · Measure the Step



What to Measure	Method	Worked Reference
Root gap	Use feelers or a taper gauge. Do not drive a wedge into a loose fit-up.	For an illustrative target of 2.0 ± 0.5mm, a 2.7mm reading is 0.2mm over the upper limit.
Linear mismatch	Bridge the joint with a straightedge or offset gauge. Use an internal hi-low gauge on accessible pipe.	ISO 5817 item 3.1: on 8mm longitudinal plate, limits are 0.8mm B, 1.2mm C, 2.0mm D.
Tube mismatch	Measure at several clock positions. Use the smaller wall for t.	ISO 5817 item 3.1, 5072: 0.5t capped at 2mm B, 3mm C and 4mm D for the listed circumferential geometry.
Angular mismatch	Use a bevel gauge or digital inclinometer referenced to the specified faces.	A 2mm rise over a 100mm datum is about 1.15°. Compare with the job's permitted angle.

Two Different Acceptance Questions

ISO 13920:2023 sets general tolerances when the drawing invokes a class. ISO 5817:2023 Table 1 covers weld imperfections, including particular misalignment cases. Neither replaces a tighter fit-up tolerance on the WPS.

ISO 5817:2023 · Table 1 item 3.1

ISO 13920:2023 · General tolerances

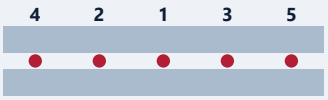
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FIT-UP AND TACK WELDING

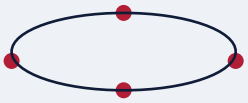
Tack Without Losing Fit-Up

Plan which tacks stay and which come out. Recheck the joint after each stage that can move it.

Plate · Centre-Out Example



Pipe · Four Clock Positions



Assembly	Sequence Example	What to Measure
Straight plate seam	Start from the centre and alternate outwards where the assembly allows. Sequence 1–5 shown below.	Recheck gap after each pair. Balanced or back-step welding may help, depending on restraint.
Rectangular frame	Tack opposite corners, then the remaining pair. Measure again before committing the seams.	A 300 × 400mm nominal rectangle has a 500mm diagonal. Compare both diagonals and the specified tolerance.
Pipe	For a four-tack teaching example, place at 12 and 6 o'clock, then 3 and 9 o'clock.	Measure around the circumference. Set size and spacing from the actual pipe procedure.

Retained Tacks

Use qualified welders and the production tack requirements. Apply preheat and approved filler as the job requires. Clean and feather ends when needed so the following run can fuse them. Remove cracked tacks under the authorised procedure.

Temporary Tacks and Handling

A removable bridge tack belongs in the work plan. Inspect the area after removal. Use independent support or an approved handling plan when turning or lifting.

TWI · Tack weld quality

TWI · Tack sequence and distortion

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Distortion and the Final Check

Use a trial on representative work to set any allowance. Recheck the assembly after releasing restraint.

Frame · Tack Opposite Corners



Pipe · Dams, Inlet and Vent



Condition	TWI Steel Assembly Allowance or Shop Check
Fillet across the weld	About 0.8mm per weld when leg length does not exceed three quarters of plate thickness.
60° V butt across the weld	About 1.5–3mm per weld. These are assembly estimates, not acceptance limits.
Worked assembly example	Two separate 60° V welds acting in the same dimension give a planning estimate of 3–6mm if their effects add. Verify direction, restraint and sequence on the actual assembly.
Strongbacks and pre-setting	Use only with an agreed attachment, restraint and release plan. A preset should be based on a measured trial, not an assumed angle.
Mistakes to catch	Gap closing as tacks cool, overlarge tacks obstructing the root, cracked tacks left in the weld, missing preheat and offset masked by clamps.

Pipe Purge

Keep the purge dams clear of the hot area for the chosen equipment and leave a vent. Check the root gap and purge oxygen at the specified sample point. Shielding gas can displace breathing air.

Before the First Production Run

Record gap, offset, angle and tack condition. Check the arc can reach the root and that backing or purge can be inspected before it is hidden.

For clamping and fit-up help, give the joint detail, component size, access and the allowable gap and mismatch. Call 023 8033 9443 or email sales@rhdaveywelding.co.uk.

Bessey Welding Table Clamps
Parweld XTM
Jasic TIG Range Guide
Parweld XTT

TWI · Steel shrinkage allowances
HSE · Shielding gas asphyxiation
TWI · Distortion control

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