Gasket installation guide

Practical good practice for bolted flange joints.

A bolted joint seals only when a clean, sound gasket is compressed evenly between clean, aligned faces. Most leaks trace back to one of a few avoidable steps. This guide sets out practical good practice for assembling flanged joints with Rankine gaskets.

Your procedure comes first. Where your site has a written joint assembly procedure, or ASME PCC-1 is specified, follow it. No torque values are given here: target torque depends on bolt size and grade, gasket type, flange design and the lubricant used, and should come from your joint design or procedure.

01 Inspect the flange faces

- Clean the sealing faces with a soft wire brush (brass or stainless) or a non-scratching pad. Remove all old gasket material.
- Look across the sealing face for radial scratches and tool marks. A scratch running from bore to outside diameter is a ready-made leak path and must be repaired.
- Check for pitting, corrosion, weld spatter and dents. Light circumferential marks matter less than radial ones.
- Confirm the surface finish suits the gasket. For spiral wound gaskets on raised faces, 3.2 to 6.3 µm Ra (125 to 250 µin) is commonly specified; check your flange and gasket standards.
- For ring type joints, inspect the groove walls where the ring seats. They must be clean, undamaged and free of marks from earlier rings.

02 Check alignment and bolting

- Faces should be parallel and bolt holes should line up without force. Do not use the bolts to pull misaligned pipework together; correct the pipe supports first.
- Use bolts and nuts of the specified grade and length. Nuts should run freely along the full thread by hand.
- Replace any bolt with damaged, corroded or stretched threads.
- Fit through-hardened washers where your procedure calls for them, so the nut bears evenly.

03 Handle the gasket with care

- Store gaskets flat, in their packaging, in a clean and dry place until needed.
- Check the marking against the specification: size, pressure class, winding metal, filler and ring colour codes.
- Carry spiral wound gaskets by the outer ring. Support large gaskets so they do not bend or twist.
- Inspect before fitting. Reject a gasket with loose or separated windings, a damaged facing, a missing inner ring where one is required, or kinks in a jacket.
- Never reuse a gasket. Once compressed, it cannot recover to seal a second time.

04 Lubricate bolts, not gaskets

- Apply lubricant to the bolt threads and to the bearing face of every nut that will be turned.
- Use the lubricant your torque values were calculated for. A different lubricant changes friction, and the same torque then gives a different bolt load.
- Check the lubricant suits the service temperature and process.
- Keep lubricant, grease and anti-seize off the gasket and flange sealing faces. Do not use tape or grease to hold a gasket in place; if a positioning aid is needed, use only one approved for the service.

05 Assemble and centre

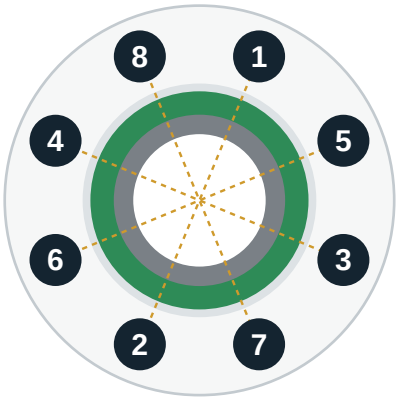
1. Fit the lower bolts first, so they form a cradle for the gasket.
2. Place the gasket between the faces. On raised faces the outer ring of a spiral wound gasket rests on the bolts, which centres it.
3. Bring the faces together evenly, fit the remaining bolts and run the nuts down by hand.
1. Snug each bolt lightly with a hand wrench, working across the flange.
2. Measure the gap between the flanges at four or more points around the circumference. It should be even before tightening begins.
3. Number the bolts around the flange so the tightening sequence can be followed and checked.

06 Tighten in passes, in a cross pattern

The legacy cross pattern in ASME PCC-1 brings the faces together evenly by tightening opposite bolts in turn, and building the load in stages rather than all at once. A typical pass sequence is shown below.

PASS	LOAD	PATTERN	WHAT TO CHECK
Install	Hand tight, then snug	Cross	Gasket centred; flange gap even all round
1	30% of target torque	Cross	Measure gap at four points; correct unevenness in the next pass
2	60% of target torque	Cross	Gap still even; faces closing parallel
3	100% of target torque	Cross	All bolts reached target
4 and on	100% of target torque	Circular, bolt to bolt	Repeat until the nuts no longer turn at target torque

Percentages follow the staged approach of the ASME PCC-1 legacy method; some procedures use different steps. For flanges with more bolts, apply the same principle: tighten diametrically opposite bolts in turn, then work round in quarters.



Eight-bolt cross pattern. Tighten in number order, 1 to 8. Going clockwise, the bolt positions read 1, 5, 3, 7, 2, 6, 4, 8.

Keep the gap even

Measure the flange gap at four or more points after each pass. If one side is closing faster, favour the open side in the next pass. Do not slacken bolts to correct it.

After assembly

Do not re-tighten a joint that is under pressure or at temperature unless your procedure specifically allows it. If a re-check is required after a rest period, do it at ambient temperature with a circular pass at target torque.

07 Spiral wound gaskets: compress to the ring

A standard spiral wound gasket has windings 4.5 mm thick and centring and inner rings 3.0 mm thick. The rings act as a compression stop. Tighten until the windings are compressed to about **3.2 to 3.4 mm**, just above the ring thickness.

At that point the windings are fully seated but not crushed. Torque beyond it adds little sealing stress and loads the rings instead. Too little compression leaves the windings without enough stress to seal, especially after thermal cycling.

Windings, new	**4.5 mm**
Rings	**3.0 mm**
Target, assembled	**about 3.2 to 3.4 mm**
Check	**Flange gap even all round**

08 Never reuse a gasket

Every gasket works by deforming into the flange surface. Spiral windings take a permanent set, graphite and PTFE facings flow into the face finish, and ring type joints deform plastically into the groove. A used gasket cannot repeat that, so fit a new one every time the joint is opened, even if the old one looks undamaged. The solid core of a Kammprofile gasket may be inspected, cleaned and re-faced, but its facings are always replaced.

09 Common causes of joint failure

When a joint leaks, look at the old gasket before discarding it. The pattern of compression and damage usually points to the cause.

CAUSE	WHAT YOU MAY SEE	PREVENTION
Uneven tightening	Gasket crushed on one side and barely marked on the other; flange gap varies.	Tighten in passes using the cross pattern; measure the gap after each pass.
Too little bolt load	Leak at start-up or after the first heat cycle; light, patchy compression marks.	Use the correct target torque for the lubricant used; lubricate threads and nut faces.
Too much bolt load	Spiral windings buckled or crushed below ring thickness; sheet gasket extruded into the bore.	Stop at target torque; choose a gasket suited to the flange class and bolting.
Missing inner ring	Inner windings buckled into the bore, sometimes carried downstream.	Use style RIR or CGI. ASME B16.20 calls for an inner ring with PTFE and flexible graphite fillers unless the purchaser specifies otherwise.
Damaged flange face	Leak path aligned with a radial scratch, dent or corrosion pit.	Inspect every face; refinish or replace damaged flanges before assembly.
Misalignment	Uneven gap that cannot be corrected by tightening; bent bolts.	Correct pipe supports and alignment before fitting the gasket.
Wrong material for the service	Corroded windings or jacket; filler oxidised, burnt or washed out.	Check winding metal, filler and facing against temperature and media.
Wrong size or off-centre	Gasket intruding into the bore or overhanging the raised face.	Check marking against the flange size and class; centre on the bolts.
Reused gasket	Leak on restart after maintenance, with an apparently sound joint.	Fit a new gasket every time the joint is opened.
Lubricant or compound on gasket	Gasket slid out of position; facing softened or contaminated.	Keep sealing faces clean and dry; lubricate the bolting only.

10 Record the joint

- Tag the joint with the gasket type, size and materials fitted.
- Record the target torque, lubricant and tool used.
- Note the measured flange gaps after the final pass.
- Have the assembly checked and signed off as your procedure requires.

Need help with a joint? Send the flange details, service conditions and any leak history to sales@rankinegaskets.com and our engineers will advise on gasket selection and assembly.