

### FLANGE INSTALLATIONS

Recommendation to ensure a reliable and tight flange joint according to ESA/ESF guideline publication 009/98

#### ALIGNMENT

- I. The sealing faces of the two stub-ends in a joint should be parallel to each other all around the circumference and in full contact (see lines A-A, B-B in Fig. 1).
- II. The flange face C-C (see Fig. 2) should be in full contact all around the circumference with the upper face of the stub-end to avoid fulcrum effect which will lead to leaking and even breaking of the flange itself while torquing the bolts.

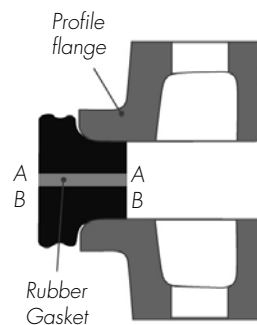


Figure 1: HDPE Stub-end

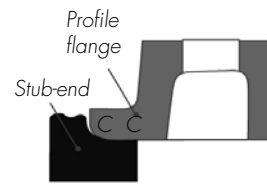


Figure 2

#### BOLT TIGHTENING

1. Install all the bolts and nuts finger-tight, ensuring at all times that the alignment conforms to figures 1, 2, and 3.
2. As the first torquing step, tighten the bolts in a crisscross sequence as shown in Fig. 4. Using a torque wrench with 20% of the final torque listed in the table on the other side of this sheet, taking care that points (I) and (II) are satisfied at all times.
3. In the four remaining steps, repeat step two four times, each time increasing the torque by 20% of the final value.
4. After reaching the final torque, use rotational tightening until all bolts are stable at the final torque value (in general two complete times around is required).

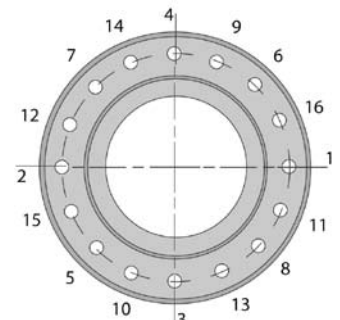


Figure 4: Tightening Sequence

Always use the crisscross pattern!

**CAUTION! DO NOT USE THIS PROCEDURE TO ALIGN AND/OR PULL THE JOINT TOGETHER.**

#### RE-TIGHTENING

- Boltjoints which are exposed to extreme thermal cycli
- Only at ambient temperature and pressure
- Consult manufacturers advice about retightening pressure of bolts

**STANDARD VALUES FOR TORQUE (DVS 2210 PART 1)**

d <sub>e</sub> (mm)	DN (mm)	BOLT CIRCLE	BOLT HOLE	BOLT COUNT	BOLT SIZE	BOLT TIGHTENING TORQUE (Nm)		
						FLAT RING GASKET (p <sub>acc</sub> ≤ 10 BAR)	PROFILE GASKET (p <sub>acc</sub> ≤ 16 BAR)	O-RING GASKET (p <sub>acc</sub> ≤ 16 BAR)
20	15	65	14	4	M12	15	10	10
25	20	75	14	4	M12	15	15	15
32	25	85	14	4	M12	15	15	15
40	32	100	18	4	M16	20	15	15
50	40	110	18	4	M16	30	15	15
63	50	125	18	4	M16	35	20	20
75	65	145	18	4	M16	40	20	20
90	80	160	18	8	M16	40	20	20
110	100	180	18	8	M16	40	20	20
125	100	180	18	8	M16	40	20	20
140	125	210	18	8	M16	50	30	30
160	150	240	22	8	M20	60	40	35
180	150	240	22	8	M20	60	40	35
200	200	295	22	8	M20	70 <sup>(1)</sup>	50	40
225	200	295	22	8	M20	70 <sup>(1)</sup>	50	40
250	250	350	22	12	M20	80 <sup>(1)</sup>	55	50
280	250	350	22	12	M20	80 <sup>(1)</sup>	55	50
315	300	400	22	12	M20	100 <sup>(1)</sup>	60	55
355	350	460	22	16	M20	100 <sup>(1)</sup>	70	60
400	400	515	26	16	M24	120 <sup>(1)</sup>	80	65
450	500	620	27	20	M24	190 <sup>(1)</sup>	90	70
500	500	620	27	20	M24	190 <sup>(1)</sup>	90	70
560	600	725	30	20	M27	220 <sup>(1)</sup>	100	80
630	600	725	30	20	M27	220 <sup>(1)</sup>	100	80

<sup>(1)</sup> p<sub>acc</sub> ≤ 6 bar

for elastomer sealing and accumulated friction factor μR = 0,15

**RE-TIGHTENING, MANUFACTURERS ADVICE**

Due to the reduced weight and the profile shape of the backing ring the need to re-tighten the fasteners is eliminated. The unique flange shape, acting like a „Belleville washer“, brings about the additional energy storage needed to overcome any thermoplastic material cold flow conditions. The design shape of the flanges is based on FEM calculations (Finite Element Method) whereby special considerations have been given to the thermoplastic stub end. For all flanges a safety factor of 2 is guaranteed on the material for the stated maximum operating pressures (MOP). For increased temperatures (>20 °C) it remains advisable to inspect the flange joint periodically and re-tighten the fasteners if necessary.