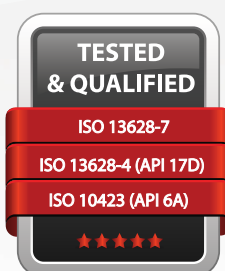
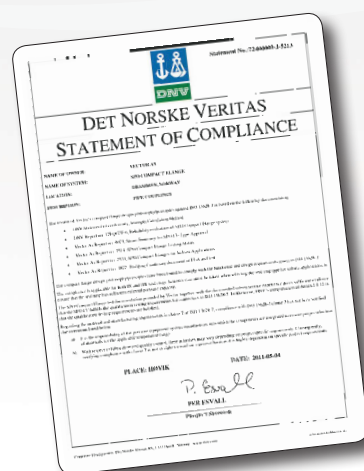


SPO-S CF : high integrity subsea flange connector

Offering the most comprehensive range of bolted connectors

With the introduction of the 5K, 10K and 15K Vector SPO® Compact Flange standards, Freudenberg Oil & Gas Technologies (FO>) now offers a comprehensive range of bolted pipeline connectors for all recognized subsea piping applications. These additions to the already extensive Vector SPO® range ensure that FO> is more than capable of meeting the diverse requirements of all our clients. The SPO-S CF range offers an alternative that engineers have been waiting for and represents the ideal choice on an even greater variety of subsea applications.



What makes the Vector SPO® Compact Flange ideal for subsea piping applications?

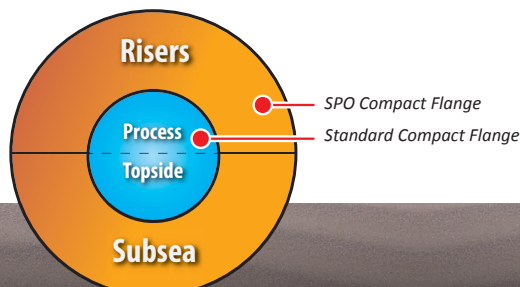
SPO-S CF offers all of the following advantages over API flanges for your subsea piping system.

- High pressure flanges for subsea ASME B31.3 piping systems**
SPO Compact Flanges are designed to suit standard ASME B36.10M nominal pipe size's, therefore, eliminating the necessity to incorporate tapers through the length of the flange to match bore the corresponding pipe.
- Flush bore**
Reducing the likelihood of flow disturbance / flow irregularities whilst also offering ideal conditions for your pigging processes, a requirement of DNV-OS-F201.
- Exceptional fatigue characteristics**
SPO Compact Flanges possess superior fatigue properties than both API and ASME flanges. Finite Element Analysis (FEA) testing confirms that the SPO compact flange fatigue properties exceed those of the weld adjoining the corresponding pipe.
- Static bolted pipeline connection**
Loads are transferred via metal to metal contact points between the flange faces so as to completely eliminate the potential for movement between the assembled SPO Compact Flanges whilst under dynamic loading.
- High integrity sealing**
SPO Compact Flanges incorporate two independent metal to metal sealing mechanisms. The seal ring is a non-load carrying seal which is unaffected by flanges loads, a requirement of DNV-OS-F201.
- Limited leakage probability**
SPO Compact Flanges possess equivalent integrity to a girth welded pipe joint from a leakage probability perspective.
- Swivel ring flanges**
SPO Compact Flanges are DNV type approval qualified and available in swivel design for all sizes listed within each pressure class.
- Reduced size and weight envelope**
SPO Compact Flanges are both smaller and lighter than conventional API and ASME flanges, including swivel ring flanges.



Vector SPO® Compact Flanges are most commonly found on

- Subsea production flowlines
- Subsea gas-lift and water injection flowlines
- Subsea metering equipment
- Subsea valves, pumps and compressors
- Flexible and rigid risers
- Christmas tree equipment

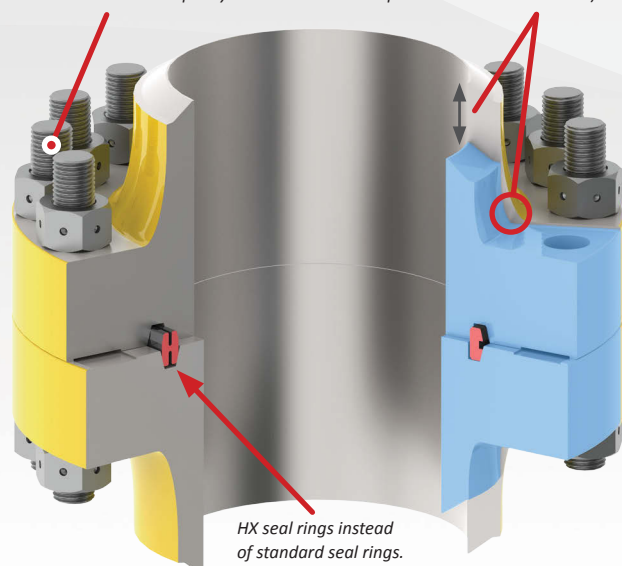


Differences with standard Compact Flange

■ SPO-S CF ■ Standard SPO CF

The flanges are designed for NACE bolting such as A320 L7M and A453 Gr660. Standard L7 can be used and will give additional external load capacity.

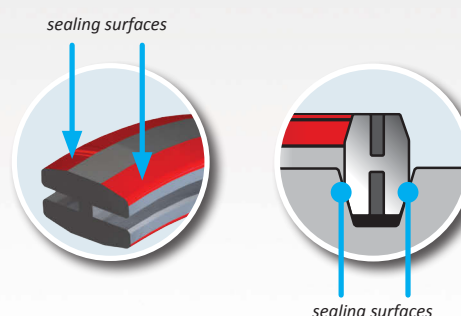
Optimized geometry of transition from flange ring to flange neck in combination with a longer neck (in order to meet HISC requirements in DNV-RP-F112).



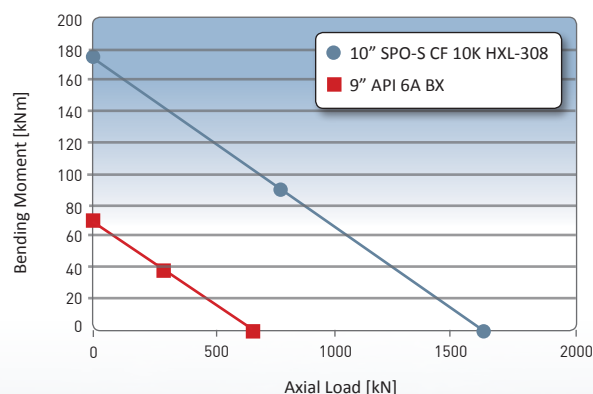
HX seal rings instead of standard seal rings.

HX profile seal ring

The HX profile seal ring, a bi-directional seal ring recommended for use with SPO® Compact Flanges for subsea piping applications, is an elastic seal ring which is energized by the deformation of the seal flanges towards the seal centre line. This deformation is governed by the groove and seal geometries. In addition, the seal will become pressure energized when subjected to either internal line pressure or external hyperbaric pressure. The shape and design of the HX profile seat and seal ring arrangement is ideal for flange alignment and can also compensate for flange misalignment.



Additional external load capacity for 8000psi at ambient temperature, NACE bolting A193 B7M bolts



Vector SPO® Compact Swivel Flanges

Available in all sizes within each SPO® compact flange pressure class, SPO compact swivel ring flanges are designed to be at least as strong as the mating weld neck flange. SPO compact swivel ring flanges are specifically designed to withstand the gross assembly load applied when hydraulic tensioning are acting simultaneously upon each bolt-set at time of flange assembly.

Vector SPO-S CF v API Class 10K weld neck flanges : Weight and dimension comparison chart

Nominal Size		Maximum Bore		Weight			Outside Diameter		Flange Thickness		Overall Length	
		mm		kg			mm		mm		mm	
NPS	api size	API	SPO-S CF	API	SPO-S CF	Saving	API	SPO-S CF	API	SPO-S CF	API	SPO-S CF
2	1 13/16	46.7	55.1	8.0	3.6	55 %	187	147	42.2	32	107.6	80
2 1/2	2 1/16	53.1	64.5	9.8	6.5	34 %	200	181	43.9	38	114.3	90
3	2 9/16	65.8	73.8	15.4	10.1	34 %	232	210	51.3	43	129.9	100
4	3 1/16	78.5	90.2	23.9	15.6	35 %	270	246	58.4	50	146.6	115
5	4 1/16	103.9	110.3	40.4	30.2	25 %	316	300	70.4	65	174.2	144
6	5 1/8	131.1	140.1	58.0	45.0	22 %	357	333	79.5	79	196.6	173
8	7 1/16	180.1	187.5	135.4	79.5	41 %	480	426	103.1	86	247.4	209
10	9	229.4	232.1	211	134.2	37 %	552	516	124.0	95	280.5	248
12	11	280.2	264.9	337	219.0	35 %	654	614	141.2	109	319.9	290
16	13 5/8	347.0	344.7	549	368	33 %	768	729	168.1	135	374.4	362
20	16 3/4	426.2	439.0	655	692	-6 %	871	890	168.1	170	352.0	454

Beside its superior performance, the SPO Compact Flange saves weight, overall length and reduces outside diameter.

NOTE : following SPO-S CF sizes are also available but are not included in the table because they are not covered by API : ½", ¾", 1", 1½", 14", 18", 22" and 24".