



VECTOR SPO[®] COMPACT FLANGE

FREUDENBERG
FLOW TECHNOLOGIES

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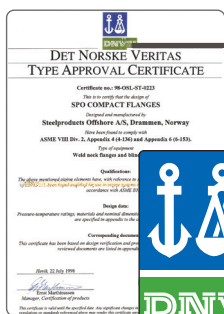
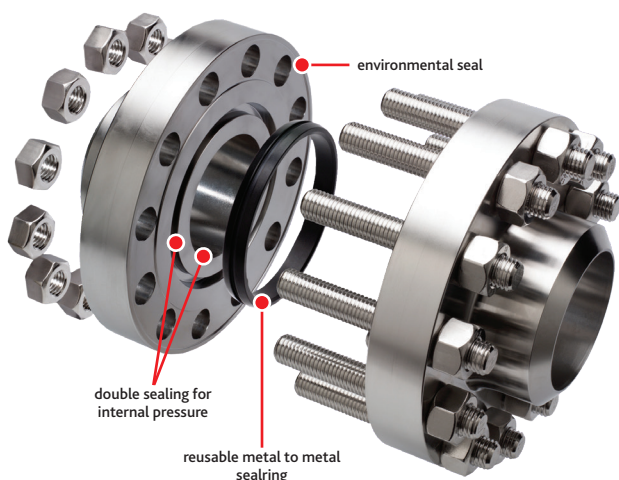
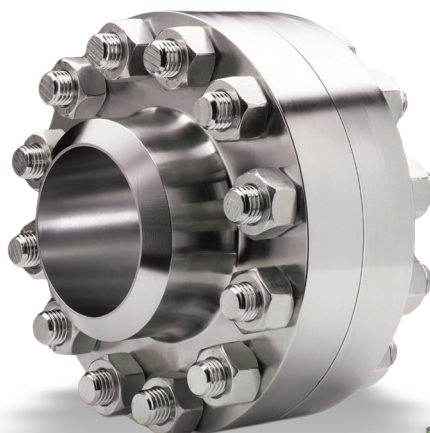
VECTOR SPO® COMPACT FLANGE

The proven new standard in Compact sealing technology delivering weight and space advantages while ensuring absolute integrity for all critical mechanical joints.

The Vector SPO® Compact Flange has been used across the globe since 1989, offshore, onshore and subsea, offering significant weight and space savings over conventional flanges, and therefore is the most effective environmentally friendly piping joint available today. Its double sealing action prevents hydrocarbon releases, addressing health and safety issues and concerns.

Typically weighing between 70% and 80% less than a conventional flange, the Vector SPO® Compact Flange is designed using state-of-the-art finite element analysis and is in full accordance with ASME VIII, Div 2 provisions and is in full acceptance with ANSI/ASME B31.3.

VECTOR
SPO® compact flange



Type Approval according
ASME VIII-Div2

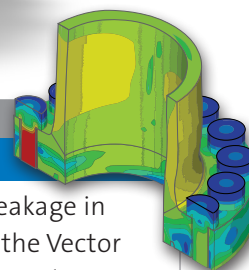
FEA plot for 16" SPO® CF WN CL2500 ▶

Compact through design

Highly reliable with a probability of leakage in the same range as a pipe-girth weld, the Vector SPO® Compact Flange has been subjected to an intensive, full-scale verification and testing programme. Finite element analysis and full scale testing was used in pre-qualification for riser installations. There was close correlation between FEA and full scale test results.

The full testing procedure comprised:

- Multiple make-up, break-out and interchangeability
- Combined external loading and hydrostatic pressure tests as well as high pressure gas tests
- Pressure & temperature cycling tests
- Fatigue test simulating 150 years of riser exposure
- Extended fatigue test to failure
- Fire tests according to API Specification 6FB
- Burst tests



MANY ADVANTAGES OVER CONVENTIONAL FLANGES

Up to 82% lighter and 60% smaller than a comparable ASME or API flange!

- **Smaller and lighter**

The Vector SPO® Compact Flange is a smaller and lighter proven alternative to conventional ASME flanges (see comparison below). Significantly reduced dimensions and weight allows more processing equipment in already restricted locations.

- **Corrosion/erosion prevention**

No corrosion/erosion problems on SPO® Compact Flange faces.

- **Fully flush bore**

The faces have full contact at the internal bore. There is no discontinuity which can disturb the flow.

- **Superior sealing**

High integrity product, often used in critical areas where conventional flanges are not accepted.

- **MaintenanceFree**

No re-tightening of bolts required.

- **Easy, quick and reliable make-up**

Compact bolt tensioners & standard torque tools are available for easy make-up. Compact Flanges require less time to make-up than conventional flanges.

- **Static connection**

The only flange meeting the strict design requirements in DNV-OS-F201 (Dynamic Risers) and ISO 13628-7.

- **A wider range of pressure classes and sizes than any other flange standard**

- **Swivel flanges available in all sizes and pressure classes**

- **Special design available upon request**

- **Reusable metal sealings**

- **Excellent load carrying capabilities**

- **Available in all metal types**



save life-cycle costs, by:

1

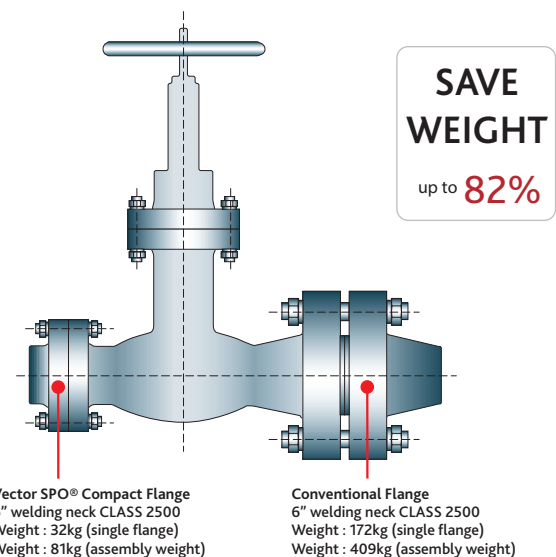
lowering initial capital costs due to major overall space and weight savings on the topside, additional savings when high pressure or exotic metals are specified

2

reducing operational cost due to maintenance free connection

3

eliminating down-time costs (no leaks, no lost production)



PROVEN PERFORMANCE IN A VARIETY OF INDUSTRIES



- subsea applications
- topside & processing applications
- industrial & power applications

Applications where the Vector SPO® Compact Flange was the preferred type of connection.

Because of the SPO® Compact Flange's superior capabilities it has become widely used in many highly demanding applications such as oil and gas topside, pipeline risers, subsea and demanding land based process plants.



Riser applications
Volve Field, North Sea
Operator: Statoil



Gas Injection applications
Snorre B platform, North Sea
Operator: Statoil



High Temp applications
Operator: Ineos Norway



Cryogenic applications
Leaking conventional flanges
vs. leakfree Vector SPO®
Compact Flange.

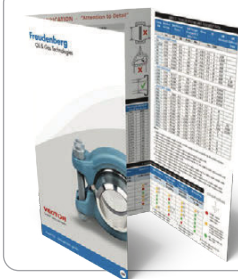
SIZES, PRESSURE CLASSES AND MATERIAL GRADES

Pressure Class	Size Range
150 Lbs	1/2" - 64" *
300 Lbs	1/2" - 64" *
600 Lbs	1/2" - 48" *
900 Lbs	1/2" - 48" *
1500 Lbs	1/2" - 48" *
2500 Lbs	1/2" - 24" *
5000 psi	1/2" - 24" *
7500 psi	1/2" - 24" *
10000 psi	1/2" - 24" *
15000 psi	1/2" - 24" *

* for bigger sizes please contact us

Common* Materials for Vector SPO® Compact Flange applications			
Material Group	Vector SPO® Compact Flange	Sealring	Bolting
Carbon Steel	A105N A350 LF2 A694 F52 A694 F60 A694 F65 AISI 4130 (Low Alloy)	AISI 4140	A193 B7/B7M A193 B16 A320 L7/L7M A320 L43 A320 B8M CL2 A453 Gr660
Stainless steel	A182 F316 A182 F44 (6Mo) A182 F49 (SuperAustenitic) A182 F51 (Duplex) A182 F53/F55 (Super Duplex)	A182 F51 (Duplex) A564 630 (17-4 PH) B564 Alloy 625	

* for other material grades please contact us



OTHER AVAILABLE DOCUMENTATION

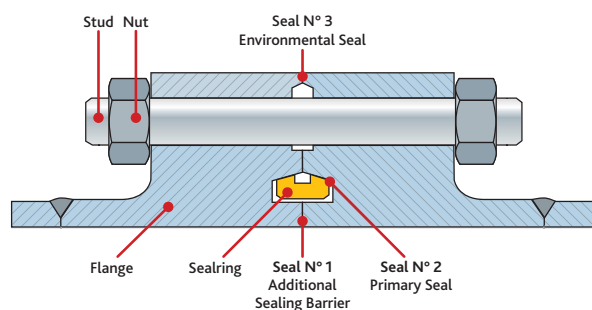
Electronic versions of our documentation can be found online

- Product Flyers: stay informed about our latest product developments and applications
- Technical brochures: dimensional data and pressure temperature tables
- Pocket Assembly-Disassembly guide: assembly & disassembly instructions in a handy pocket format

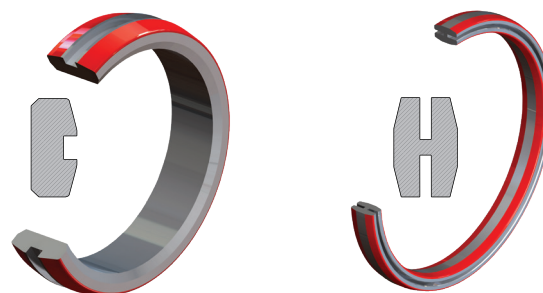
TRIPLE SEALING PERFORMANCE!

Three effective seals in sequence providing joint integrity and safety

- Vector SPO® Compact Flange was developed by Steelproducts Offshore A/S, using extensive testing and finite element analysis.
- First used for a workover riser in 1989 and subsequently for production and export risers. Currently over 100,000 Vector SPO® Compact Flanges in service.
- One sealing size for each nominal pipe size.
- The Vector SPO® Compact Flange has two independent seals in series together with an additional environmental seal (see below image).
- Accommodates external loads, valve configurations and standard make-up tools.
- Designed to be used in temperatures ranging from -200°C to 720°C .
- Designed as a static connection, removing the disadvantages provided by conventional flanges such as :
 1. Gasket relaxation
 2. Cyclic flange rotation
 3. Flange separation
 4. Bolt bending
 5. Non-uniform bolt load
- Vector SPO® Compact Flange is qualified for and widely utilized for subsea (please visit our website to find out more).



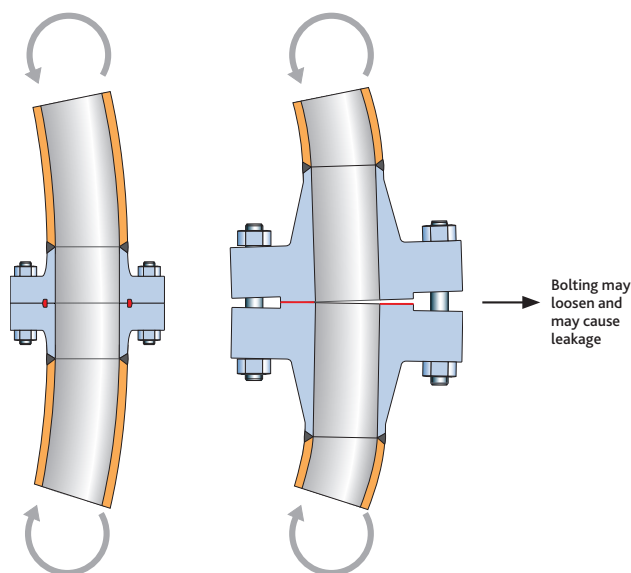
The Vector SPO® effective sealing system



The metal sealing, the heart of the Vector SPO® Compact Flange
left IX sealing — right HX sealing, both with profile details

A TRUE STATIC CONNECTION

The flange's static behavior under any design load condition ensures that neither dynamic, nor static loading, will degrade the seal performance or other characteristics within the capacity of the corresponding pipe. Furthermore, the bolted joint fatigue life exceeds the fatigue life of the adjoining welded pipe. This high performance is achieved through its unique design and full flange face contact. Due to the high preloading of the bolts, no adjustment or re-tightening is required in service. Indeed, the Vector SPO® Compact Flange has been successfully deployed in temperatures ranging from -200°C to $+720^{\circ}\text{C}$ with absolutely no need for bolt re-tightening.



Dynamic loading does not have an impact on the Vector SPO® Compact Flange, however, on the ASME flange the bolting may loosen and the flange will start leaking (when bolting hasn't been re-tightened within due time).



UNITED STATES

UNITED KINGDOM

UNITED ARAB EMIRATES

CANADA

MALAYSIA

NORWAY

SINGAPORE

VECTOR

PRODUCT LOCATIONS

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