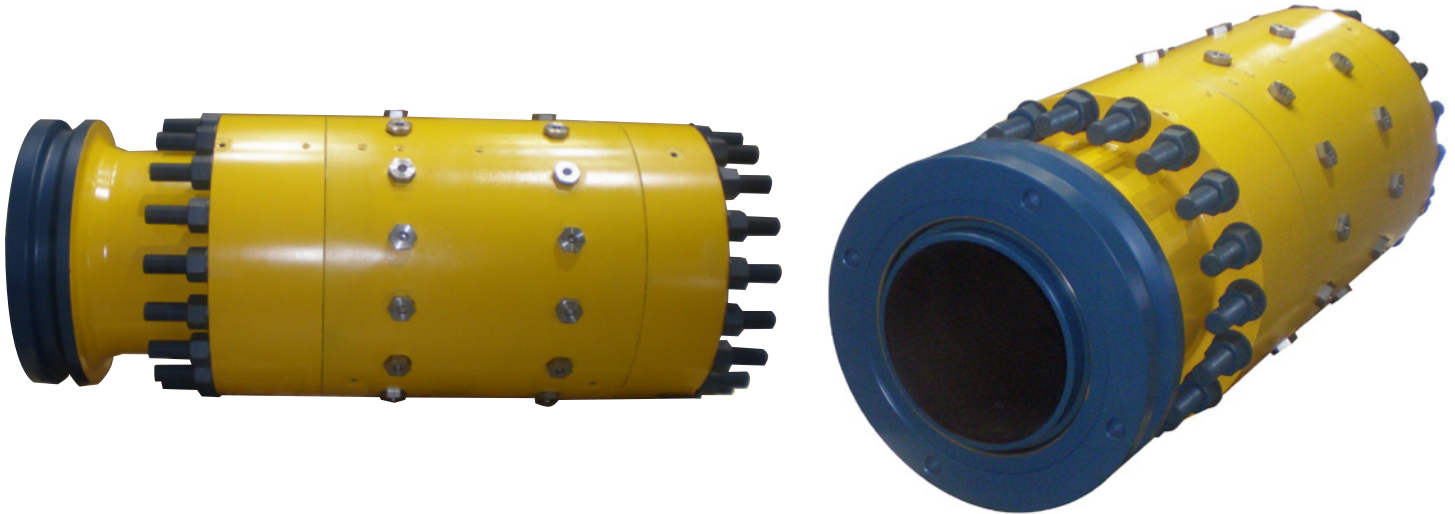


HYDRAULIC SMART FLANGE (HSF) CONNECTOR



For deepwater pipeline and riser repairs, Oceaneering PRS offers a hydraulically-set mechanical connector based on the proven technology of the Smart Flange Plus Connector. The connector is designed to provide a structural connection point subsea. When actuated, the Hydraulic Smart Flange (HSF) Connector will structurally attach to and seal against the pipe. It's capable of withstanding full pipeline axial, bending, and torsional loads while maintaining full line pressure integrity.

The HSF may be provisioned with a GRAYLOC® male hub, a flange, or may be connected with another HSF in a double arrangement, making it a double grip and seal type connector.

The ROV uses a single hot stab to pressurize the port in the connector in order to set the gripping and sealing mechanisms on the pipe.

The HSF has dual setting pistons. During the initial setting of the connector, the seal piston is driven axially to set the main and test seals around the pipe. The pressure is then increased to drive the slip piston axially in the opposite direction from the seal piston to set the gripping mechanism on the pipe. Both pistons are locked into final position by a series of spring-energized ratcheting locking mechanisms positioned radially inside the connector housing. These locking devices ensure a positive lock preventing any possible back driving. An annulus test port feature allows the sealing integrity to be confirmed by pressurizing the annulus between the main and test seals.

Hydraulic Smart Flange (HSF) Connectors can be designed in sizes and pressure ratings to meet any customer requirements. The connectors are available in configurations with other connectors and fittings.



HYDRAULIC SMART FLANGE (HSF) CONNECTOR SPECIFICATIONS

Design Parameters:

- Nominal Pipe Size (NPS): any API Specification 5L pipe, wall thickness & grade
- Service: Standard (i.e. crude oil, natural gas, hydrocarbons, water or chemical injection, etc.)
- Design Pressure Rating & Applicable Dimensions: ASME, MSS or API
- Design Temperature Range: -20° F (-29° C) to 100° F

Material Specifications:

Housing:	AISI 4140 Forging Q & T
End Cap:	AISI 4140 Forging Q & T
Pistons:	AISI 4140 Forging Q & T
Slips:	AISI 8630 Case Hardened
Seals:	Viton
Studs & Nuts:	ASTM A193 Gr. B7 studs and ASTM A194 Gr. 2H heavy hex nuts, all XYLAN coated (i.e. PTFE, dark blue)
External Coating:	Carboline 890 Marine Epoxy Paint System, Safety Yellow Color

Applicable Design Codes, Standards & Specifications (latest editions):

- OIE/PRS Hydraulic Smart Flange (HSF) Connector Drawings, Bill of Materials (Controlled Copies) and Vendor Supplied Material Test Reports
- OIE ISO 9001:2000 Quality Assurance – Quality Control Procedures & PRS Operating Procedures
- Oceaneering A07844B - Three Coat Paint Diverless Connector for Subsea Equipment
- ASME Boiler & Pressure Vessel Code, Section VIII, Division 1 and 2
- ASME B31.4, Pipeline Transportation Systems for Liquid Hydrocarbons and Other Liquids
- API SPEC 5L, Specification for Line Pipe
- API SPEC 6A, Specification for Wellhead and Christmas Tree Equipment
- API SPEC 6H, Specification on End Closures, Connectors and Swivels
- API RP 1111, Design, Construction, Operation, and Maintenance of Offshore Hydrocarbon Pipelines

Certifications:

- ISO 9001:2008 – World Certification Services Ltd. – Accredited by UKAS Quality Management
- Det Norske Veritas (DNV) – per unit basis

