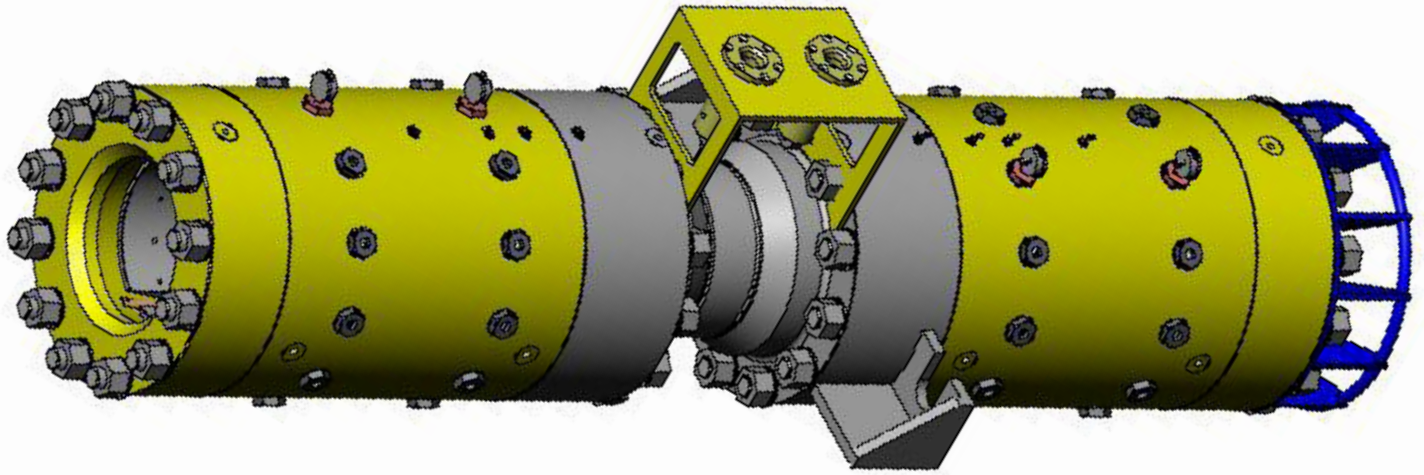


Hydraulic Double Grip & Seal Connector



Deepwater, Diverless Pipeline Repair

For deepwater pipeline repairs, Oceaneering Pipeline Connection & Repair Systems Division (PCRS) offers the Hydraulic Double Grip and Seal Connector (HDGSC). The hydraulic pipe end connector grew from the field proven technology of the Hydraulic Smart Flange (HSF) Connector and a mechanically set Smart Flange Plus Connector. The HDGSC consists primarily of two sets of HSF Connector's internal components which are designed in a mirror image configuration. The connector is designed to provide a structural connection between the jumper pipe and an existing pipeline subsea. When hydraulically actuated, the HDGSC will structurally attach to and seal against both pipe ends. The connector is capable of withstanding full pipeline axial, bending, and torsional loads while withstanding hydrostatic end loads from the pipeline.

In order to accomplish a deepwater pipeline repair, utilization of a pipe lift frame is required. The damaged pipeline is lifted above the seabed high enough to provide adequate room for an alignment base with dual alignment posts and an index frame to be lowered under the lifted pipeline section for support. The pipeline gets clamped in the index frame for full support and stabilization. The designated areas behind a damaged section get all the coatings removed to bare pipe and checked for roundness

and straightness before the cutting and removal of the section of the pipeline to be replaced.

After metrology is performed, a prefabricated horizontal jumper with a HDGSC on each end is lowered subsea and landed on the guide posts of the alignment base. The ROV uses a ROV panel to hot stab and actuate the hydraulic cylinders that allow the connector to move axially and stab onto the existing pipe end. The cylinders react against the alignment panel on the jumper and stroke fully until the half of the connector is stabbed over the bare indexed pipe. In the event of any misalignment, the index frame can be manipulated by a series of hydraulic jacks to align the subsea pipe with a bore of the connector on the jumper.

Once the connector is fully stabbed on the existing pipe end subsea, an ROV will hot stab into the ROV panel on the HDGSC to start setting the sealing and gripping mechanisms on both pipe ends. Each connector employs two sets of setting pistons. The hydraulic pressure applied behind the pistons forces the setting pistons to move axially in opposite directions to set the sealing and gripping mechanisms on the pipe. The annulus pressure test is performed after each set of packers is set, before engaging the gripping mechanisms. Each end of the hydraulic end connector is set independently.

Hydraulic Double Grip & Seal 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: 25°F (-4°C) to 250°F (121°C)

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-B, or customer specified |
| 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/PCRS Hydraulic Double Grip & Seal Connector Drawings, Bill of Materials (Controlled Copies) and Vendor Supplied Material Test Reports
- OIE ISO 9001:2000 Quality Assurance – Quality Control Procedures & PCRS 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

