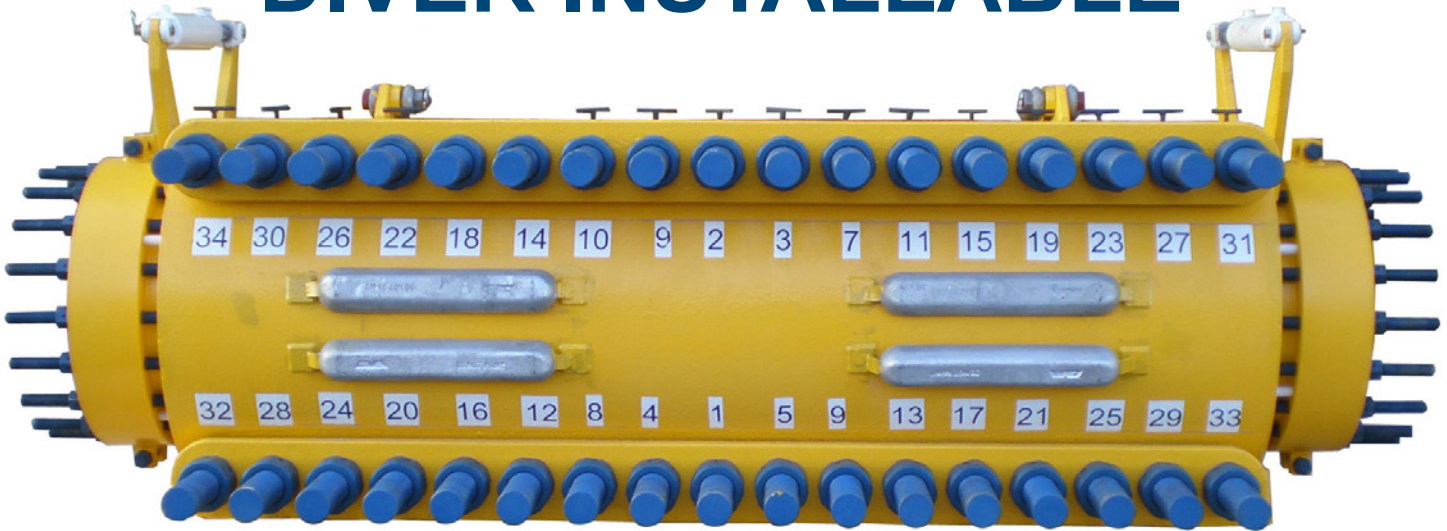


SMART CLAMP - DIVER INSTALLABLE



Permanent Pipeline Repair Clamp

Oceaneering's Smart Clamp is a diver installable split mechanical fitting used to repair a damaged or leaking subsea pipeline. The fitting eliminates costly pipeline shut downs and expensive hyperbaric welding associated with other repair methods.

The fitting is available in structural and non-structural versions that provide pressure containment to the pipeline within the encapsulated area. The non-structural version may be used to repair a pipeline that is structurally sound and has only minor damage such as pinhole leaks, local pipe wall thinning or shallow dents. The structural version, utilizing a grip and bowl mechanism, replaces structural integrity in more severely damaged pipelines with cracked girth welds, kinks, or punctures.

After installation, the Smart Clamp design provides a permanent high quality seal with structural reinforcement extending for the design life of the pipeline.

Smart Clamp Design Features:

- Viton-B circumferential and longitudinal seals as standard, Buna-N (Nitrile) or other elastomeric compounds can be provided for compatibility with pipeline contents or inhibitors
- Elastomeric circumferential seals are mechanically set, permanently pressurized and fully restrained, mitigating concerns of explosive decompression effects for gas service
- Seal extrusion guards for 12-in Nominal Pipe Size (NPS) and larger when API 5L pipe outside diameters tolerances become significant
- Port for annulus testing, grout injection or filling with inhibitor between the seals and pipeline
- Galvalum III anodes sufficient for 25-yr design life
- Externally coated with 3-part marine epoxy
- Hardened steel grips and bowls (structural version) provide reinforcement to the pipeline by transferring axial loads from the pipeline into the body of the fitting, effectively replacing structural integrity and removing longitudinal stresses from the damaged pipeline section
- Internal components are securely retained whether the fitting is open or closed, before or after installation



SMART CLAMP - DIVER INSTALLABLE SPECIFICATIONS

Design Parameters:

- Nominal Pipe Size (NPS): any API Specification 5L pipe and wall thickness
- Service: Standard (i.e. crude oil, natural gas, hydrocarbons, water or chemical injection, etc.) and Sour (i.e. hydrogen sulfide, carbon dioxide, etc.)
- Design Pressure Rating: up to ASME Class 2500
- Hydrostatic Test Pressure (min): 1.5 times Design Pressure Rating rounded up to nearest 25 psig
- Hydrostatic Test Duration (min): 4-hrs
- Design Temperature Range: 25°F (-4°C) to 250°F (121°C)
- Design Life: 25-yrs
- Length Between Circumferential Seals (Non-Structural version): design standard is the greater of 12" or 1-nominal pipe diameter
- Length Between Tension Grips (Structural version): design standard is nominal pipe outside diameter + 1.75"
- Internal Diameter at Center of Clamp: design standard is pipe outside diameter + 1.625"
- Hydraulic Cylinder Pressure (max): 2500 psig (172 barg)

Material Specifications:

- Body: ASTM A105 forging for 12 in NPS and larger; ASTM A516 Gr. 70 pressure vessel plate for 10" NPS and smaller
- Actuator Flanges: ASTM A105 forging or ASTM A516 Gr. 70 pressure vessel plate
- Tension Bowl and Grips (Structural version): AISI 4140 (i.e. ASTM A-519 Gr. 4140, Heat Treat to 34-40 Rc, NQ&T)
- Compression Rings and Structural Attachments: ASTM A36 or ASTM A516 Gr. 70
- Seal Extrusion Guards (12 in NPS and larger): Type 316 stainless steel
- Elastomeric Circumferential and Longitudinal Seals: Viton-B, 70/80 durometer
- Studs and Nuts: ASTM A193 Gr. B7 and ASTM A194 Gr. 2H, respectively, all Xylan coated (i.e. PTFE, dark blue color)
- Anode(s): Galvalum III
- External Coating: Carboline 890 Epoxy Paint System, Safety Yellow Color

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

- OIE/PCRS Group Smart Clamp Drawings, Bill of Materials (Controlled Copies) and Vendor Supplied Material Test Reports
- OIE ISO 9001:2000 Quality Assurance - Quality Control Procedures & PCRS Operating Procedures
- ASME Boiler Pressure Vessel Code, Section V Nondestructive Examination
- ASME Boiler Pressure Vessel Code, Section VIII, Division 1 and 2
- ASME Boiler and Pressure Vessel Code, Section IX Welding and Brazing Qualifications
- ASME B31.4, Pipeline Transportation Systems for Liquid Hydrocarbons and Other Liquids
- ASME B31.8, Gas Transmission and Distribution Systems
- ASME B18.2.1, Square and Hex Bolts and Screws Inch Series
- API SPEC 6H, Specification on End Closures, Connectors and Swivels
- API SPEC 5L, Specification for Line Pipe
- NACE MR0175, Sulfide Stress Cracking Resistant Metallic Materials for Oilfield Equipment
- DNV Recommended Practice RP B401, Cathodic Protection Design
- Code of Federal Regulations, Title 49, Parts 192 and 195

Certifications:

- ISO 9001:2008 - World Certification Services Ltd. - Accredited by UKAS Quality Management
- EN 10204 Section 3.1.B (DIN 50049), Inspection Documents for the Delivery of Metallic Products

