

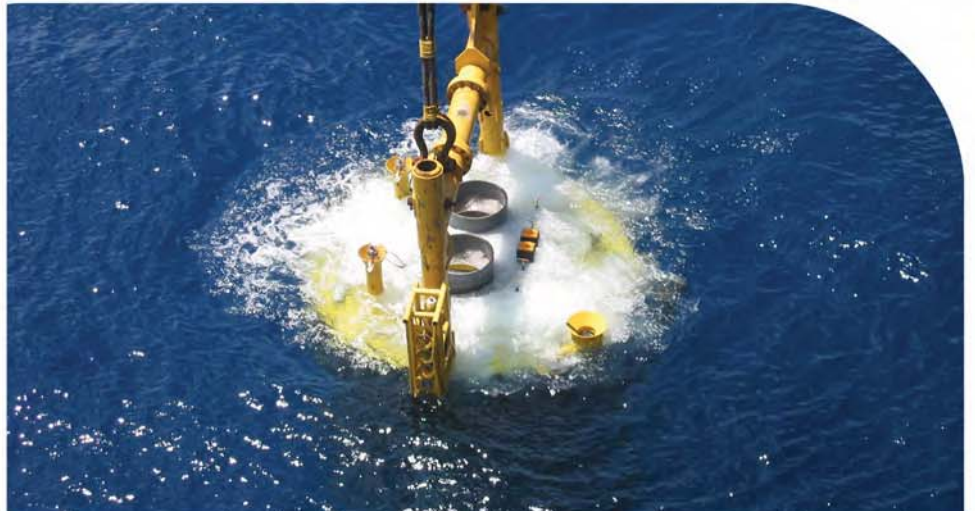
FirstSubsea

Subsea Mooring Connector

First Subsea's class leading permanent and disconnectable Ballgrab® Subsea Mooring Connector (SMC) is typically used for FPSO, Semi Sub, MODU, STP and Spar mooring requirements such as suction, driven and SEPLA pile installations. With a speed of installation of less than 10 minutes, it offers significant cost savings over other types of mooring such as H Link or Hook connectors. The ABS and DNV certified SMC is produced from forged high strength material in accordance First Subsea's Material Process Specification (MPS). The SMC offers a quick connect/disconnect system in permanent mooring lines.

Ball and Taper

First Subsea's Ballgrab® connectors have a proven history with over 700 systems being supplied into a multitude of markets for subsea mooring, case running, pipe recovery, internal lifting, riser connections and tendon lift tools. Our class leading connectors are based on ball and taper technology, which ensures their suitability for any application involving gripping, pulling and holding connections under load.



Thunderhorse Series II Receptacle on Suction Pile

Ball and taper connection technology, in its simplest form, is the action of balls held securely in tapers machined into the connector's mandrel. The balls are free to move up and down the taper, however when the balls grip the item to be held, they grasp it in direct proportion to the load applied.

Utilising ball and taper technology, First Subsea's Ballgrab® connectors can be used in a wide variety of scenarios.

Interfaces and Design

Pad Eye for LTM D Shackle
Clevis to enlarged chain link/common link
Spelter Socket for Wire Rope or H Link

Series I - rated up to 663T
Series II - rated up to 1,397T
Series III - rated up to 2,600T



Series I SMC for Jubilee FPSO Mooring

Testing

The Ballgrab® SMC has been extensively fatigue tested to over 3 million fatigue cycles by DNV in Oslo using test criteria that significantly exceeds established norms for mooring equipment. At our head offices based in Lancaster UK, we have upgraded our test facilities to 2,600T to ensure we remain the class leading supplier for deep water projects.

Classification

- ABS Guide for Certification of Offshore Mooring Chain (2009)
- DNV Offshore Mooring Chain (2008) to DNV-OS-E301 & E302
- Lloyds Register Rules and Regulations for the Classification of Floating Offshore Installation at a Fixed Location (April 08)
- Bureau Veritas



World Records and Industry Firsts

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|--|---|
| • 2008 World Depth Mooring Record | Perdido Spar (GoM) |
| • 2009 World FPSO Depth Mooring Record | Cascade Chinook (GoM) |
| • 2013 Highest Rated Load SMC | 2,600T - Jack and St. Malo Semi-submersible (GoM) |



The Anadarko Technip Lucius Spar - Image courtesy of Technip USA Inc

Case Study - FPSO Submerged Turret Production (STP) Mooring

Maersk Peregrino FPSO is situated off the coast of Brazil in 328 ft water depth. The STP buoy is held in place by 10 mooring lines, each attached using Ballgrab® mooring line connectors. Prior to the FPSOs arrival, each Series III Ballgrab® (MBL 1,200T) was attached to the pull-in rope and lowered into the female connector installed on the buoy. Once the FPSO was in position, the buoy, held 22 m (72 ft) below the surface, was pulled into the vessel's mating cone module. With the STP buoy locked in position, the FPSO is permanently moored.



It is the ball and taper mechanism that lies behind our strong, reliable connectors. Speed, ease of use and versatility make this technology so significant. Our class leading products are tried, tested and proven in service in a wide range of applications meaning there is always a Ballgrab® for you.

FirstSubsea

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