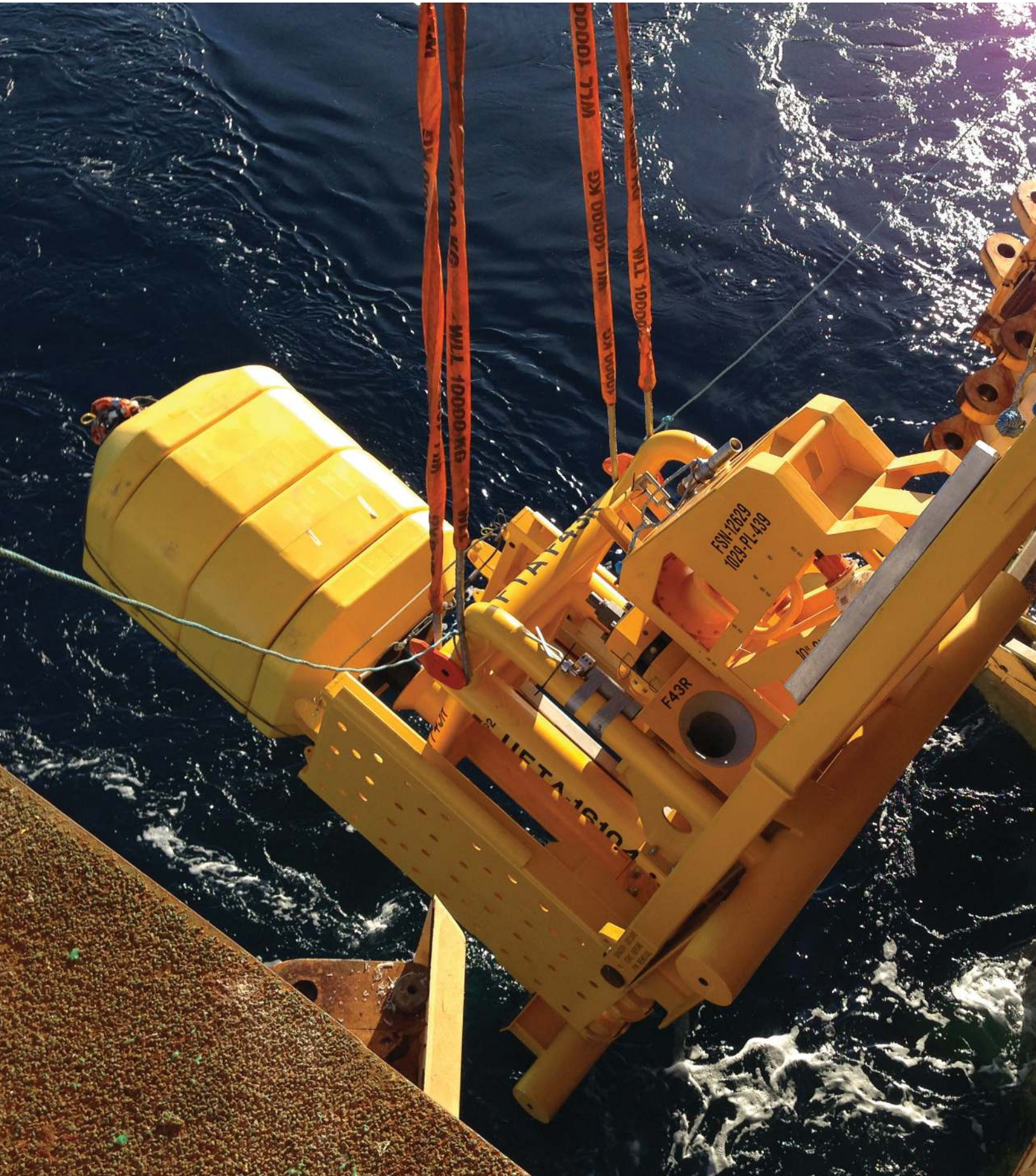




VIRTUS™ CONNECTION SYSTEMS

Advanced Diverless Connection Solutions
for any Subsea Field Application





Virtus™ Subsea Connectors – Delivering Long-Lasting Reliability at Each Subsea Connection

Subsea production and processing systems are only as reliable as the connections that link the equipment together. AFGlobal's Virtus™ series of diverless connector systems is engineered, built, and delivered with a focus on reducing the risks associated with subsea connections.

Each connection needs to be absolutely safe and reliable to avoid operating problems that can hinder or completely halt a well's production. Connection failures anywhere along the pathway from the wellhead to the platform may leak oil or gas into the ocean, creating costly and potentially catastrophic damage to surrounding marine life. Adding to these risks is the reality that subsea production infrastructure has to transport harsher, higher-temperature and higher-pressure production fluids from deeper waters—making the long-term reliability and safety of the connection systems a top priority.

Whatever your subsea connection challenge, AFGlobal has a solution. The versatility and completeness of our *Virtus* series of diverless connection systems means that we can provide a cost-effective connector solution with long-term reliability for any scenario.

Our Connectors – Diverse Applications, Shared Strengths

Engineered and manufactured using our own in-house expertise and manufacturing facilities, each *Virtus* connector enables subsea structures to be designed to the most lightweight and compact arrangement possible. Our connectors are engineered to deliver technical advantages that include:

- Contingencies, including secondary clamp release
- Risk mitigation features that include a recessed inboard hub protected by the subsea structure, which lowers the risk of damage from dropped objects
- High mechanical load capacity
- Ease of installation and wet parking features, which reduces the install costs associated with a crane vessel
- An optimized size and weight, which helps minimize the size of the host structure and avoids the need for heavy running tools
- High reliability that comes from the solid foundation of our field-proven technologies
- Efficient installation with technologies designed around minimizing installation vessel times



Connectors for Every Application and Any Angle

AFGlobal's *Virtus* series has successfully made more than 1,600 connections in subsea fields around the world with a continuous service history of more than 20 years. We provide connection solutions in both vertical and horizontal applications, or at any angle in between, and in standard sizes ranging from 2 to 48 inches.

The Retlock® Clamp Connector

The field-proven Retlock® diverless clamp connector is the heart of the *Virtus* series and the central building block for each subsea connection. A twin-bolt clamp capable of connecting mono-, multi-bore, and umbilical, the *Retlock* clamp ensures reliable and robust connections for vertical and horizontal applications, or any angle off the vertical as the situation requires. The compact and lightweight *Retlock* clamping technology also incorporates a continual leak-monitoring system that provides visual verification of the condition of the connection throughout field life.

Application: Vertical Rigid or Flexible Jumpers, Risers, and Flowlines

The Virtus™ Vertical Type Connector (VTC) is ideally suited for installing both rigid and flexible vertical jumpers and flowlines. This connector is the first of its kind to allow wet parking of the jumper. The operator can save on installation costs later by deploying a service vessel to make the final connection. This also allows for flexible scheduling and weather windows, and makes batch deployment of vertical connections feasible for significant cost savings.

Application: Freestanding Hybrid Risers, Riser Tower Base, FPSO Flexible Risers

The Virtus™ Riser Type Connector (RTC) is a robust, fatigue-resistant tie-in solution for making connections at the upper and lower riser assemblies. The RTC can be oriented to the ideal departure angle of the riser, which minimizes fatigue on the tower and the flexible riser for increased operational

life. The RTC's high-strength capacity and low weight make it ideally suited for connecting submerged turret loading systems and single anchor-leg mooring systems.

Application: Horizontal Connections for Manifolds, Flexible Risers, Jumpers, and Umbilicals

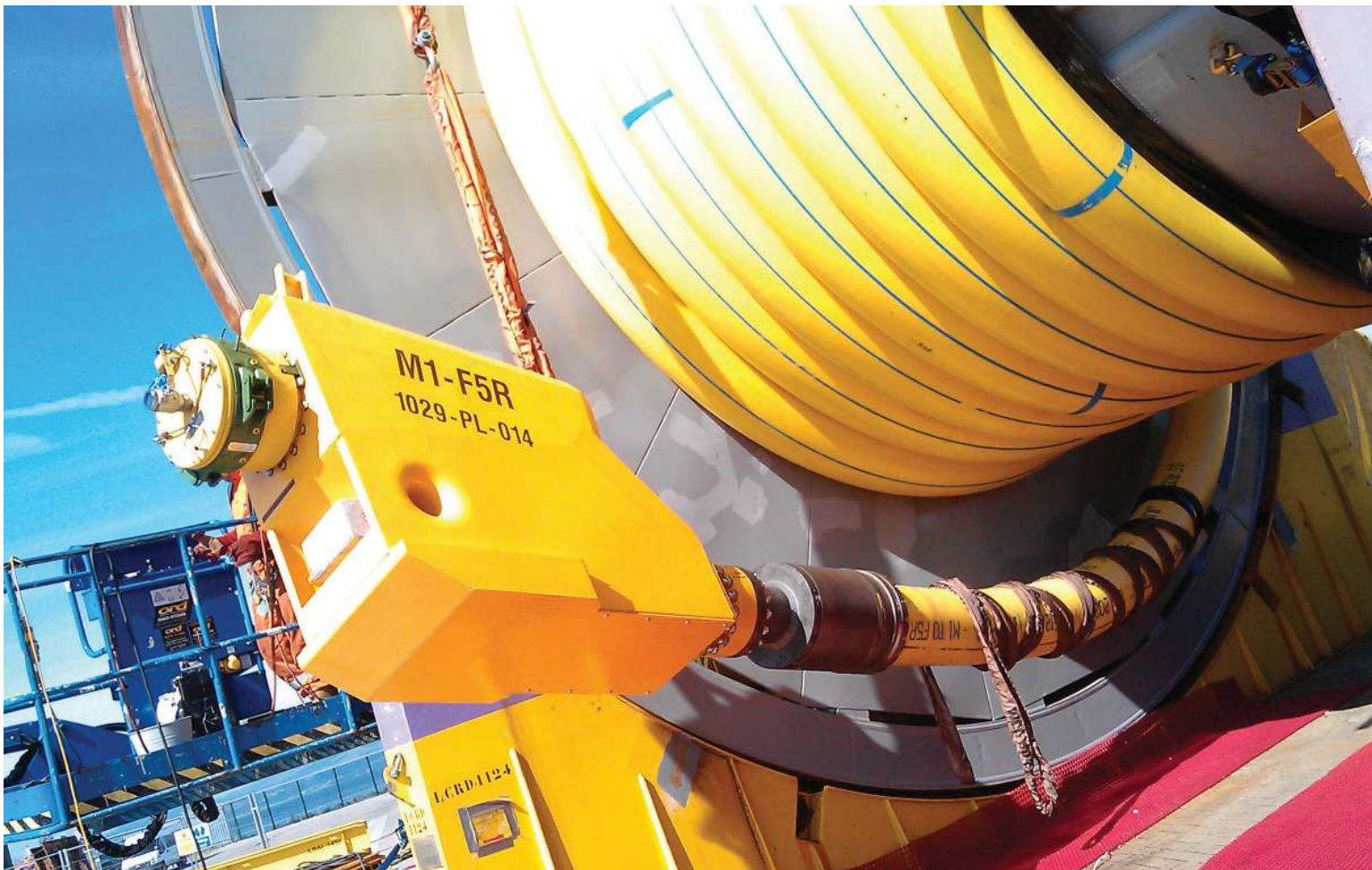
The *Virtus* series includes the Diverless Maintained Cluster (DMaC), a compact and lightweight drag-to-place system suitable for the horizontal connection of flexible pipe, jumpers, and umbilicals. Designed to operate in extreme environmental and deepwater conditions, the DMaC uniquely wet parks flowlines and jumpers on the seabed for installation at a later time. The system provides flexible, interruptible installation allowing the jumper, tree, and manifold to be deployed in any sequence.

Our Flowline Type Connector (FTC) offers a run-to-place or stab and hinge-over horizontal connection of rigid or flexible flowlines. The FTC is designed to provide a reliable, cost

effective, adaptable means of installing and connecting both rigid and flexible flowlines and jumpers. This system is available for fast-track delivery and ideally suited for both conventional and high-pressure/high-temperature developments in shallow or deepwater.

Application: Connecting Utilities Umbilicals, Flying-leads, and ROV-replaceable Hardware

Our multi-purpose connectors (MPCs) are fly-to-place connection systems for flying-leads. Fully adaptable to all hydraulic, electrical, or chemical couplers from any vendor, the MPC is a low-cost solution with umbilical snag protection. It can be configured easily as a chemical-injection crossover plate or to carry retrievable instrumentation packs or flowmeter differential pressure cells. Additionally, the MPC is used in pod applications for the installation of subsea control modules.





Engineering, Aftermarket, and Tooling Services

Beyond our connection technologies, AFGlobal is committed to your operational success for the life of the project. As part of our cradle-to-grave philosophy, we provide engineering, aftermarket, and tooling services designed to help you succeed with optimized equipment development and operation.

Our engineering services include:

- Field architecture that draws on our 20 years of practical field experience. We conduct subsea FEED studies and help optimize field architecture configuration to reduce costs. We also review installation plans to ensure that each drill cluster, tree, and manifold is oriented correctly for connection.
- Detailed design of integrated subsea systems and structures, looking for any reductions in structure, envelope, and weight to save on material and installation costs for the client.
- Full interfacing support across the life and operating breadth of the subsea field. AFGlobal supports a subsea project from design through installation. With our *Retlock* and *Taper-Lok*® connection systems, we provide connections from topsides to seabed, bolted flange to ROV make-up.
- API and ASME-accredited designing, testing, and inspection services.

Our aftermarket services include:

- Installation support that draws on our expansive subsea installation experience collected on projects all over the world.
- Our engineers and technicians plan and direct all technical activities required for a successful installation—with a focus on efficiency and cost effectiveness.

Our tooling services include:

- Universal subsea tooling available for purchase or rental, designed to get you connected quickly while providing flexibility on your capital spend.
- The flexibility of offerings that range from a simple, modular system for one-off connector supplies to a fully integrated tooling system for large-connector orders.
- Offshore technicians who accompany the installation contractor, providing the size of team required to support operations.
- Offshore site supervision during installation, which ensures that all equipment is operating properly.
- Tooling maintenance and operation.
- Custom tooling design and manufacture for any application.





Gain the peace of mind that comes from
robust and reliable subsea connections.

Call AFGlobal to learn more about our *Virtus* subsea
connection systems and how they can lower your risk
of leaks—from the seafloor to the surface.



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