

INTRODUCTION

In recent years the search for oil has required operations in progressively deeper waters by mobile offshore drilling units. Drilling at these depths places strong demands on equipment, particularly the cable and connectors that link subsea operations to the surface. SEACON addressed the equipment problem by developing an underwater connector system with high reliability, improved condition assessment capability and better maintainability. SEACON's next-generation multiplex (MUX) cable termination system is the tangible result of the company's ability to apply real-world operator field experience to its product design and produce a step-change improvement in connector performance.

SEACON's range of MUX systems consist of 1 Atmosphere and Positively Pressurized (RUFF-NEK) connector solutions as well as the new underwater cable termination system which consists of the Armor Termination Assembly (ATA), Breakaway unit and RUFF-NEK connector.

The RUFF-NEK connector is an electro/optical/mechanical termination that contains an integral system that does not rely on separate external compensator systems to apply a constant overpressure (internal pressure greater than external pressure) to the end of the cable and termination volume. The overpressure is maintained at up to 60 psi over ambient pressure and helps to prevent water intrusion into the termination chamber that could be caused by flooding of the conductor strands (in the event of cable jacket and conductor insulation breach) or by seal failure. In the cable termination system the ATA is affixed to a clevis mount (padeye) at a convenient location on the BOP (Blow Out Prevention) stack while the RUFF-NEK connector mates to either a transformer module, crossover or directly to the subsea electronics module (pod). The orientation aspect that can be a problem with a conventional connector is eliminated due to the breakaway unit that interfaces the ATA with the BOP, enabling a connection in 90-degree intervals.

There are many benefits to the cable termination system including a lighter, more manageable connector, separate armor termination function from electrical connector function and a controlled break-away function.

Every static seal is redundant (e.g., dual versus single o-ring) for maximum reliability, and everywhere possible, the seals are testable to enable verification of seal integrity off the critical path. The RUFF-NEK connector provides visual verification of positive pressure over ambient. It also includes the ability to electrically check for fluid contamination without opening the connector.

AVAILABILITY

Connector materials include 316 Stainless Steel, 17-4PH Stainless Steel, Titanium, Neoprene, Nitrile (formerly known as Buna N) and Hypalon, however other materials are available for different environments. The materials used in the manufacture enable the connector to have a design life of 20 years.

The connectors can be rated up to 20,000 psi has many standard configurations (e.g., 6#10 electrical contacts and 8 fiber optic channels) and is available with single or dual-pressure compensated chambers.

Due to the absence of a requirement for resins and molding, the connector has a fully field-installable capability. In the event of a complete failure or loss of compensation medium, secondary seals on the electrical contacts allow operation even with a flooded connector.

APPLICATIONS

SEACON's Field Installable products are suitable for offshore harsh environment applications including drilling rigs and drilling vessels.

TESTING

The ability for the connector to operate in a flooded condition was proven in qualification. Testing included operational testing at pressure both with no compensating fluid and in a flooded condition.

The strength of the ATA was tested in a simulated operating environment. The test showed that the initial design could transmit in excess of 16,000 pounds and enabled an initial operating rating of 8,000 pounds, although different ratings are available on request.

Testing was also conducted to ensure that the cable separated from the connector without damage to the pod. The results showed that no damage occurred to interfacing components when the cable pulled out at approximately 700 pounds.

Pressure testing of the the RUFF-NEK connector was also conducted to a simulated operating environment of 7,500 psi, equivalent to 10,000 feet operating depth and also 8,400 psi, simulating 15,000 feet depth.

ATA RUFF-NEK TERMINATION SYSTEM

The ATA was designed to be an integral part of the MUX umbilical cable termination system shown in Figure 1. The Armor Termination Assembly is secured to the riser or control system framework using a Breakaway Unit that is designed to separate at a defined load. The smaller, more manageable RUFF-NEK is then routed and connected. In the case of accidental BOP droppage, the Breakaway Unit shears and the unarmored section of cable pulls out of the RUFF-NEK.

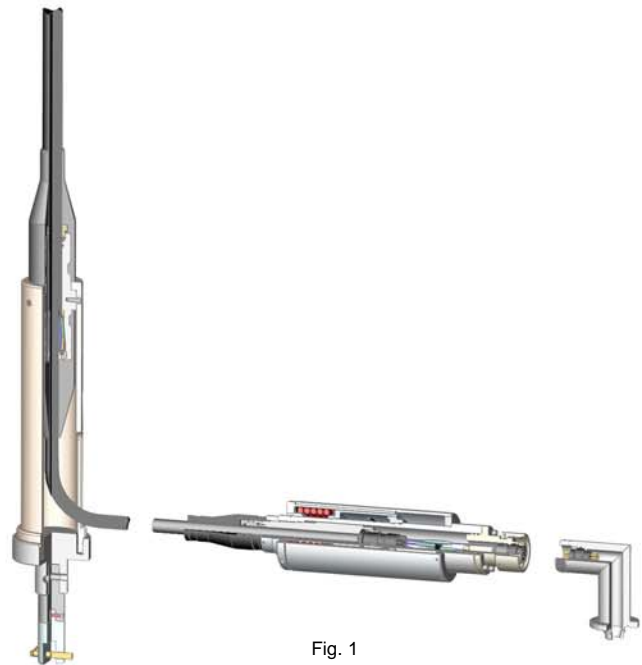


Fig. 1

For further information please contact SEACON.