

# Next Generation Electrical and Optical Cable Termination Systems for the Drilling Industry

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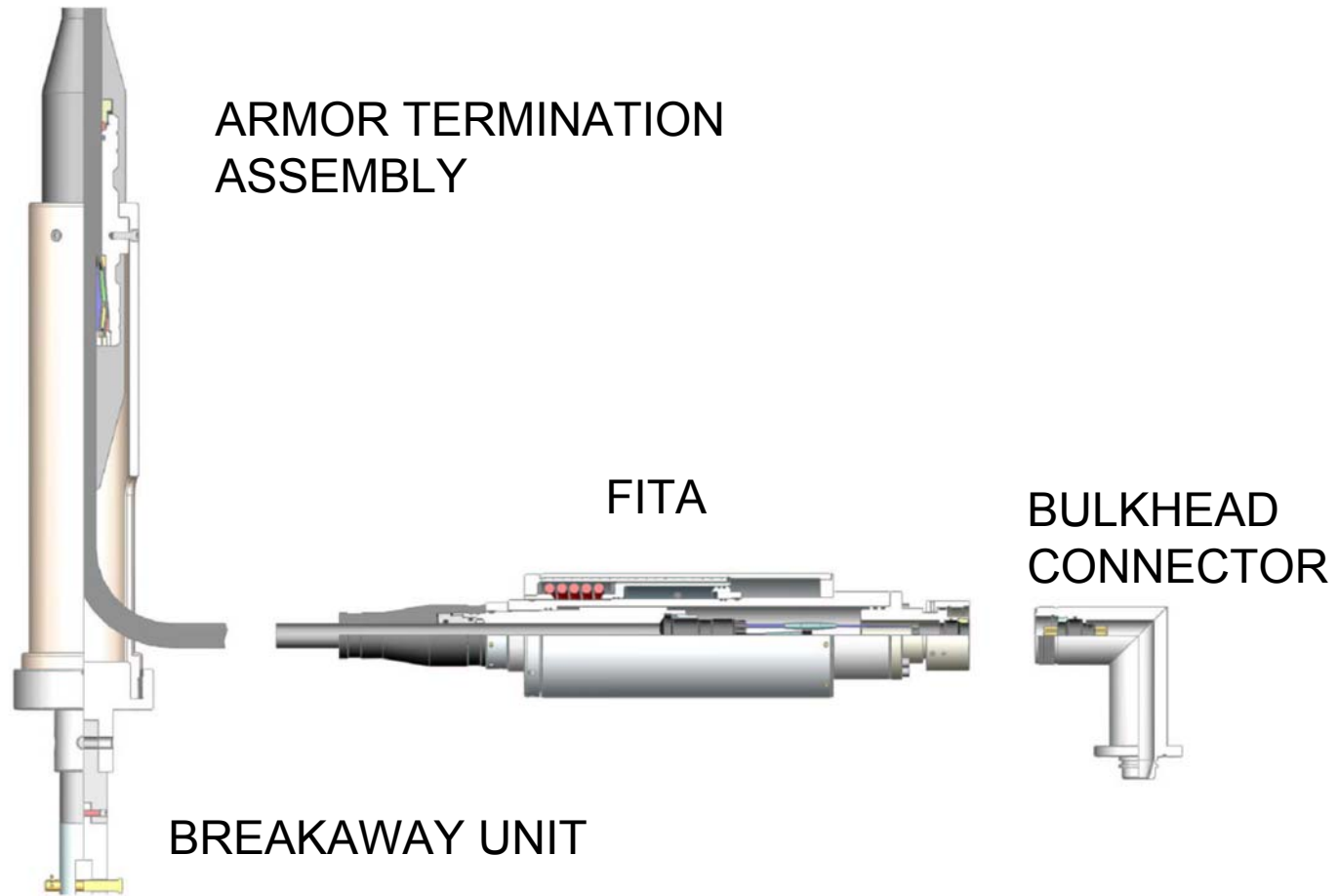
**S E A C O N** 

# Customer Driven Designs



- Connectorization
- Component Separation
- Positive Compensation
- Field Installable
- Field Testable
- Emergency Breakaway
- Bend Restrictor
- Dual Barrier Sealing
- Flooded Operation
- Leak Detection
- Component Integration

# Component Separation



# Armor Termination Assembly

A detailed view of a metallic armor termination assembly. It consists of a long, cylindrical stainless steel body with a threaded end. A braided metal cable is inserted into the body and secured by a locking mechanism at the end. The assembly is shown against a background of a blue globe with water droplets.

- Field Installable
- No Compounds
- Full Ocean Depth Rated
- Adaptable to Most Cables

# Field Installable Testable Assembly

A stainless steel industrial assembly, likely a wellhead or test assembly, is shown against a background of a globe and water droplets. The assembly is cylindrical with a brass fitting at the end. The fitting has the text "SEADON E0" engraved on it. There are two red markings on the side of the assembly. The background is a blue globe with water droplets, suggesting a marine or industrial environment.

- Field Installable
- No Compounds
- 700 lb. Pull-Out
- 10,000 ft. Rated
- O-Ring Test Ports

# Positive Pressure Compensation Technology



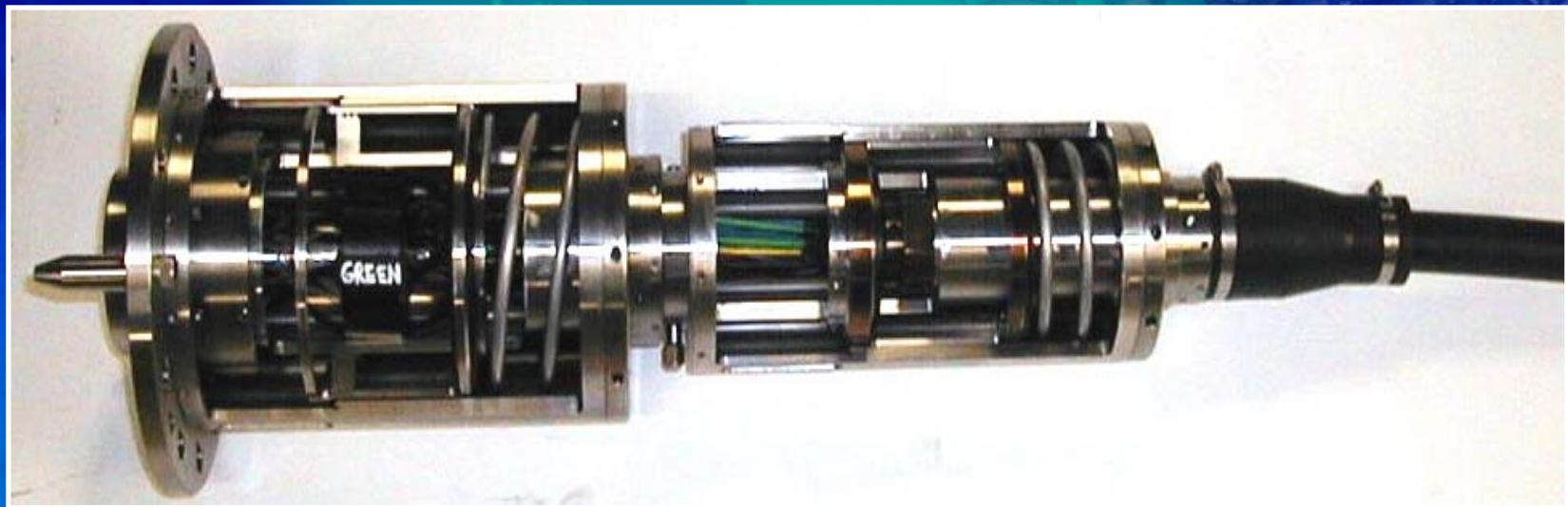
- Low Differential Pressure
- 30 psi Positive Internal Pressure

# Leak Detection

- RUFFNECK™ and FITA designed to continue operating in the event of water ingress.
- FITA equipped with 'Meggar Pin' that allows quick water detection test.

# Component Integration

- RUFFNECK™ Connector
- Positive Compensation
- Electric / Fiber Optic
- Integrated Armor Termination with Connector
- 10,000 psi Rated





# Field Installation and Testing

- All Equipment Field Installable
- Training Available for Rig Personnel
- Why is Connector Testable?
  - Conventional pressure testing not possible.
- How is Connector Testable?
  - Recommended to use O-ring test ports
  - Design allows connector to be filled with water in field and assured operational when flooded

# Dual Barrier Sealing

- Dual O-ring sealing on all water paths
- Where possible, dual seals are not on same diameter



# Breakaway Unit

- Field Installable
- No Compounds
- Shear Pin

# Right Angle Bulkhead

- Field Installable
- No Compounds
- Rated 5,000 psi open-face forward & backward



# Bend Restrictor



- 2.5 " Diameter
- 60,000 lb. Operating Tensile Load
- 11,000 lb. Dynamic Cyclic Bend Load



# Electrical/Optical Characteristics

- FITA
  - 12#16 AWG Configuration fully developed, tested, and field proven.
  - Additional configurations, including fiber optic, under development.
  - 600 Volt / 15 Amp electrical contacts.
  - IR > 500 MΩ@500 VDC.
- RUFFNECK™
  - 4#10 AWG with 8 Fiber Optic Contacts.
  - Same electrical characteristics as FITA.
  - Optical Attenuation < 0.5 dB per contact.

# Test Results

- Electrical connectors pressure tested in flooded condition, 7,500 psi.
  - 75 GΩ lowest IR flooded.
  - Three 10 minute cycles, one 1 hour cycle.
- FITA cable pull-out tested ~700 lb.
- Armor Termination Assembly pull-tested with customer cable, failure mode was armor breakage.
- Breakaway Unit tests within 5% of target load.
- Universal Bend Restrictor dynamically cycled under tension over 36" sheave.

# Field Results

- RUFFNECK™ in Brazilian waters for over two years with no failures.
- ATA / FITA in operation on the Transocean Offshore Deepwater Drilling Inc. Deepwater Nautilus in 9000+ ft record depth for a moored rig.



# Conclusions

- Reliability
  - 20 year design life
  - Positive pressure compensation major factor
- Robustness
  - Significant design input from offshore personnel to ensure practicality
  - Added size / strength to accommodate larger MUX cables in future
- Suitability
  - Modularized design allows flexibility
- Costs
  - Competitive with conventional MUX connectors

# Acknowledgements



- Seacon Worldwide Teams
  - Over 40 years continuous experience
- Transocean Offshore Deepwater Drilling Inc.
  - Partnership in development of ATA / FITA.