



HydraLight, 8-channel, Wet-Mate, ROV Operable, Optical Connector



Figure 1 – HydraLight, bulkhead mounted plug (left), flying lead ROV receptacle (right)

Key Features

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| <ul style="list-style-type: none"> • 2nd generation optical wet-mateable connector • Modular optical contacts up to 8 channels • Oil filled and pressure balanced • Sealing mechanisms identical to field proven HydraStar • Smaller than the HydraStar • Optical coupling within oil-filled “joined chamber” • Outer sleeve to offer protection of plug • Seawater compatible interior • Fully enclosed main springs • ROV operable interface • Linear latch & de-latch mechanism • Omnitec MKII PBOF hose interface | <ul style="list-style-type: none"> • Average insertion loss of -0.2dB, with a standard deviation of 0.09dB • Currently qualified to 2,000m (6,500feet) and soon to be qualified to 7,000m (23,000 feet) • Any combination of single-mode or multi-mode optical fiber • Highly compatible elastomers • Field installable • Improved compensation fluid • Qualified to meet the “Optical Wet-Mate Connector Specifications” for: <ul style="list-style-type: none"> • Norsk Hydro • Statoil • Elf Exploration |
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Technical Description

Configurations

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| <ul style="list-style-type: none"> • Modular contacts with up to 8 optical channels • Suitable for any type of optical fiber • Parking Places (long-term and short-term) • Protective caps (long-term and short-term) • Plug configurations: <ul style="list-style-type: none"> • Bulkhead mounted • Flange mounted • Straight terminations • 90° terminations • Optical test connector configuration • Oil-fill and vent connector configuration | <ul style="list-style-type: none"> • Oil-filled and pressure balanced • Designed for use with or without cathodic protection • ROV operable interface • Receptacle configurations: <ul style="list-style-type: none"> • Flying lead • 45° Omnitec MKII interface • Parallel Omnitec MKII interface • Optical loop-back configuration • Optical test connector configuration • Oil-fill and vent connector configuration |
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Design Ratings

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| <ul style="list-style-type: none"> • Design life: 25 years • Depth Rating: Currently qualified to 2,000m (6,500feet) and soon to be qualified to 7,000m (23,000 feet) • Maximum Life-Cycle: 100 mate/de-mate cycles • Qualified to meet the following Optical Wet-Mate Connector Specifications: <ul style="list-style-type: none"> • Norsk Hydro NHT-I52-00073 Rev 04H • Statoil RA-SNØ-00182 Rev 01 • Elf Exploration AO-32-2-011-LT-00-SN-005 | <ul style="list-style-type: none"> • Average insertion loss of -0.2dB, with a standard deviation of 0.09dB • Average optical back reflection of -52dB, with a standard deviation of 8dB • Maintenance-free over design life (within number of mate/demate cycles) • Operating Temperature: -5°C to +45°C (23°F to +113°F) • Storage Temperature: -20°C to +60°C (-4°F to +140°F) |
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Operation

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| <ul style="list-style-type: none"> • Modular ROV handle design • Compliant handle • Linear latch & de-latch mechanism • Visible latch verification • Maximum mate/de-mate speed: 6 inches / second • Typical mate force: 445N (100lb) | <ul style="list-style-type: none"> • Typical mate stroke length: 121mm (4.8 inches) • Maximum rotational misalignment: 10° • Maximum angular misalignment: 5° • Maximum radial misalignment: 6.4mm (0.25 inches) • Maximum handling load: 2500N (560lb) |
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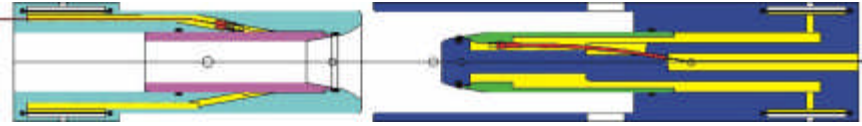
Materials

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| <ul style="list-style-type: none"> • Seawater-wetted parts: Titanium • Front elastomeric seals: Fluorosilicone • O-rings: Fluorosilicone or Nitrile | <ul style="list-style-type: none"> • Pressure compensation fluid: Synthetic oil • Scraper ring: Polyurethane • Internal components: All seawater-compatible |
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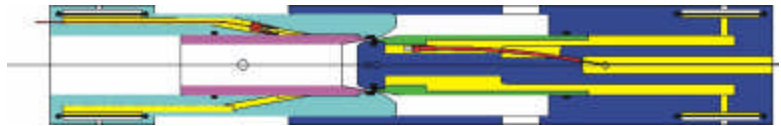
Principle of Operation

The critical fiber-to-fiber joint is made without exposure to the external contamination of a harsh subsea environment. This is achieved as both ends of the optical termination are protected from seawater, sand and silt by being enclosed within separate oil-filled and pressure compensated chambers. The sequence of mating is conducted as follows:

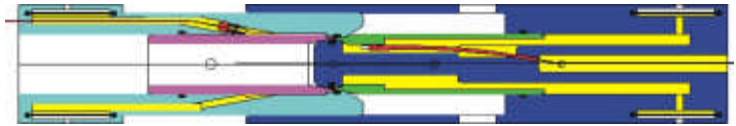
The first stage is the ‘physical alignment’ of the two connector halves.



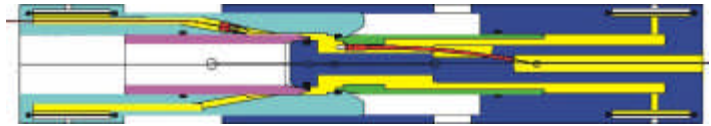
The next step is the ‘front seals’ of each connector half contact and engage on their respective other half.



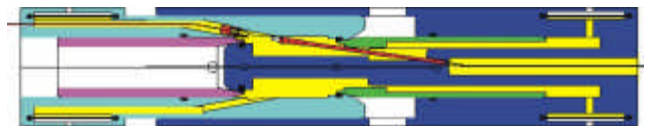
This squeezes out all external fluids and contaminants as the connector halves seal against each other.



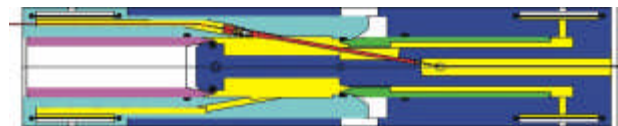
The two connector halves then open up into a single ‘joined chamber’.



The connectors continue to move and the flexible contact guide tubes splay and align via guide-ways which facilitates the coupling of the optical ferrules within the oil-filled environment.



The connector is fully mated.



Key Interface Information

1. Interface drawing, bulkhead plug connector, straight termination: SEA CON® Drawing No.: 7740-102
2. Interface drawing, bulkhead plug connector, 90° termination: SEA CON® Drawing No.: 7740-101
3. Interface drawing, flying lead receptacle connector: SEA CON® Drawing No.: 7741-101
4. Interface drawing, receptacle loop-back connector: SEA CON® Drawing No.: 7741-102
5. HydraLight Operation & Maintenance Manual: SEA CON® Document No.: OMM-ENG-1006

Qualification Testing

(1) Optical Wet-Mateable Connector System Specifications:

The HydraLight has been qualified to meet the requirements of the following Optical Wet-Mate Connector Specifications:

- Norsk Hydro NHT-I52-00073 Rev 04H
- Statoil RA-SNØ-00182 Rev 01
- Elf Exploration AO-32-2-011-LT-00-SN-005 Rev C

(2) Connector Qualification Tests:

- Optical Tests - Optical Attenuation, Optical Back-Reflection
- Mechanical Tests - Helium Leak, Locking Device, Mating Force, Mating Force (misalignment)
- Environmental Stress Screening - Shock, Vibration, Thermal Shock
- Hyperbaric Tests - Pressure, Sand/Silt, Wet-Mating, Partial Wet-Mating

(3) Optical Connector Jumper Assembly Tests:

- Oscillating Jumper, Jumper Pull, Drop, Jumper Handling Simulation and Simulated Deployment

(4) Optical Jumper Hose and Hose Termination Tests:

- Environmental Stress Tests - Hose Absorption/Compensation, Ozone Resistance, Ultra-Violet Resistance, Thermal Shock
- Destructive Tests – Tensile Failure, Burst Pressure, Crush Resistance, Outer Sheath Abrasion, Hose Kink

Field Maintenance

The HydraLight Optical Connector Systems (which incorporates Bennex Omnitec Hose and MKII hose fittings) are able to be maintained in the field and provision has been made in the design to simplify field maintenance of the connector, terminations and hose configurations.

SEA CON® recommends a functional test, maintenance check and final check of the oil-fill and air-vent as part of the Subsea System pre-deployment checks or whenever the connector host-system is brought to the surface. This enables a full check and verification of the integrity of the connector system.

Reference should be made to the HydraLight Operation and Maintenance Manual, OMM-ENG-1006.

Track Record & Reliability Data

The HydraLight Optical Connector Systems have been fully qualified to the above qualification tests and are now fully available, in the configurations listed on sheet 2, for use in deepwater applications.

Over 35 of the ROV versions of the HydraLight have been delivered to customers however there are none operating in the field yet and therefore the operational sample population is still too small to extrapolate any significant statistical data for reliability.