ODI

Optical and Hybrid Interconnect Solutions

Product selection guide

ROLLING SEAL
HYBRID WET MATE
CONNECTOR

NAUTILUS™
ROLLING SEAL
HYBRID WET MATE
CONNECTOR

HYBRID
FIELD ASSEMBLED
CABLE TERMINATION
(FACT)

TELEDYNE ODI
Everywhereyoulook™

Subsea Data Transmission:

Teledyne ODI designs complex engineered solutions for subsea interconnect applications, meeting challenges brought on by high pressures and temperature extremes in turbid and saltwater environments. Teledyne ODI offers a comprehensive line of fiber optic and electro/optic hybrid wet mate interconnect products. All optical and hybrid wet mate connectors are fully qualified to 10kpsi ambient pressure. Wet mate connectors are available in ROV Mate, Stab Mate and Manual Mate configurations.

The product line includes:

- Optical wet mate connectors
- Electrical/optical hybrid wet mate connectors
- Optical penetrators
- Angled Physical Contact (APC) optical wet mate connectors
- Field Assembled Cable Terminations (FACTs)

Applications include:

- Subsea control modules
- Data transmission systems
- Umbilical terminations
- Electrical/optical junction boxes

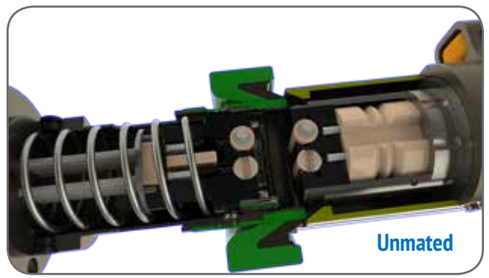
Features:

- Differential pressure capable
- Low insertion loss/ optional low return loss
- Pressure balanced
- Wet Mate configurability
- UPC or APC contacts

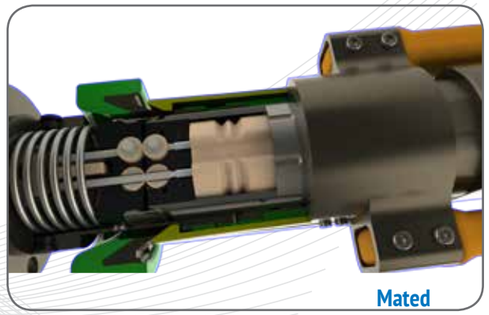
Benefits:

- Pressure independence - Pressure-Balanced, Oil-Filled (PBOF)
- Multiple configurations
- Optical contacts never exposed to water
- Design flexibility in both optical and electrical power
- Over 10,000 units deployed - proven high reliability

Rolling Seal Wet Mate Connector



The patented Rolling Seal optical connector design functions by excluding water and shuttling silt away from the region where the optical ferrules are brought into contact; creating a clean, oil-filled conduit for the optical ferrules to connect.

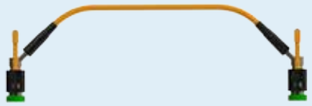


The result is a reliable low-loss optical throughput.

Subsea Data Transmission: Optical Wet Mate Connector Configurations

ROV Mate Configurations

Bulkhead (Fixed) Mount Cable End (Flying) Mount



Jumper assembly with pressure-balanced, oil-filled (PBOF) hose

Cable Termination to Wet Mate Connector

Additional Configurations

Stab mate

Stab mate connectors are used as fixed elements where two pieces of equipment are coupled and held in place through gravity with no mechanical locking mechanism. The alignment of the connections is built into the equipment.

Manual mate

Manual mate connectors, sometimes referred to as "Diver Mate," feature a manually actuated threaded locking sleeve arrangement for mechanical coupling and are available with two material configuration options.

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Optical and Hybrid Interconnect Product Line:

Product		Description	Contacts	Voltage Ratings	Current Ratings	IL/RL	Temp Rating	Pressure Rating	Mating Cycles	Mate/Demate Force	Design Life (years)
RSH		Rolling Seal Hybrid Wet Mate Connector	Up to 8 total, any mix of FO (UPC) & Electric	700VAC / 1000VDC	7A	≤0.5 dB / ≥30 dB	-5°C to +40°C (Seawater) -18°C to +50°C (Air) -30°C to +60°C (Storage)	10,000 psi ambient 5,000 psi differential (bulkhead)	100 Mates w/o Refurbishment	<120 lbs / <100 lbs	30
APC-RSH		Angled Physical Contact Rolling Seal Optical Wet Mate Connector	Up to 8 FO (APC)	N/A	N/A	≤0.5 dB / ≥45 dB	-5°C to +40°C (Seawater) -18°C to +50°C (Air) -30°C to +60°C (Storage)	10,000 psi ambient 5,000 psi differential (bulkhead)	100 Mates w/o Refurbishment	<120 lbs / <100 lbs	30
NRH		Nautilus Rolling Seal Hybrid Wet Mate Connector	2 electric Up to 4 FO (UPC)	1.0 kVAC Phase to Ground 1.73 kVAC Phase to Phase 3.3 kVDC	30A	≤0.5 dB / ≥30 dB SM	-5°C to +40°C (Seawater) -18°C to +50°C (Air) -30°C to +60°C (Storage)	10,000 psi ambient**	100 Mates w/o Refurbishment	≤120 lbs / <100 lbs	30
Reverse Gender NRH		Nautilus Rolling Seal Hybrid Wet Mate Connector with sockets in the cable end configuration	2 electric Up to 4 FO (UPC)	1.0 kVAC Phase to Ground 1.73 kVAC Phase to Phase 3.3 kVDC	30A	≤0.5 dB / ≥30 dB SM	-5°C to +40°C (Seawater) -18°C to +50°C (Air) -30°C to +60°C (Storage)	10,000 psi ambient**	100 Mates w/o Refurbishment	≤120 lbs / <100 lbs	30
Optical Penetrator		Optical Feedthrough for Differential Pressure Applications	N/A	N/A	N/A	≤0.25 dB / ≥50 dB	2°C to +42°C (Seawater) -40°C to +60°C (Air)	9,100 PSI (operational) 10,000 PSI (test)	N/A	N/A	30
Hybrid FACT		Hybrid Field Assembled Cable Termination (FACT)	based on cable design	1.8kV U 2.0kV U 3.3kVDC*	30A	≤0.25 dB per penetrator ≤0.1 dB per splice ≥50 dB per channel (excluding connectors)	-10° C to +50° C (Operational) 40° C to +60° C (Storage)	4,400 PSI (operational) 6,600 PSI (test)	N/A	N/A	30
Optical FACT		Optical Field Assembled Cable Termination (FACT)	based on cable design	N/A	N/A	≤0.25 dB per penetrator ≤0.1 dB per splice ≥50 dB per channel (excluding connectors)	-10° C to +50° C (Operational) 40° C to +60° C (Storage)	6,600 PSI (operational) 10,000 PSI (test)	N/A	N/A	25
DMS		Dry Mate Submersible Electrical/ Optical/Hybrid Connector	Any Combination of Elec/Optical 1-3, 1-12 (Others on Request)	700VAC / 1000VDC	7A	≤0.5 dB / ≥30 dB	-5° C to +40° C (Seawater) -30° C to +50° C (Air) 30° C to +60° C (Storage)	Up to 9,100 PSI (operational)	100 Mates w/o Refurbishment	N/A	25

* higher voltages are available for cables with energized armor and reduced amperage requirements

**NRH bulkhead plugs are not to be used in differential pressure configuration

Ultra Physical Contact vs. Angled Physical Contact

Teledyne ODI's optical and hybrid connectors use an Ultra Physical Contact (UPC) polish for the optical end face, resulting in a connector-level return loss of >30 dB. While UPC end faces employ a non-angled polish, the Angled Physical Contact (APC) end face geometry has a polish angle of 8°. This contact angle of 8° between the two optical end faces results in a wet-mate connector return loss of >45 dB.

UPC Contacts

APC Contacts

Gross Alignment Funnel (GAF) and Enhanced Latching Indicator (ELI)

Teledyne ODI now offers two wet-mate connector enhancements, designed to optimize ROV mating efficiency and reduce operator time, thus lowering total installed cost.

The Gross Alignment Funnel (GAF) is intended to overcome severe approach angles of ROV connectors during mating, resulting in faster mating/demating operations.

The Enhanced Latching Indicator (ELI) allows visible confirmation of the mating operation. When unmated, four yellow indicators rest inside the handle, and when a successful mate occurs, the indicators extend outward.

The GAF/ELI system is standard on optical and hybrid wet mate connectors, and retrofittable to existing bulkhead mounted wet mate connectors.

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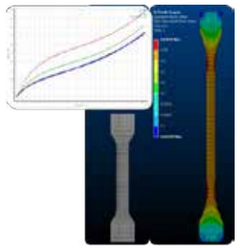
Subsea Innovation:

The Technology Development center, headquartered in Daytona Beach, FL, houses a state-of-the-art subsea engineering center, test lab, and ocean simulation lab, staffed with teams of mechanical and electrical engineers, materials experts, and reliability engineers.

Capabilities include:

- Finite Element Analysis (Structural, thermal, electrical, vibration)
- Subsea engineering and circuit board design
- Reliability Engineering and Accelerated Life Testing (ALT)
- Molding design and process development



Subsea Reliability Testing:

To accurately predict operational conditions and ensure reliable performance for over 25 years, the test lab at the Teledyne Oil & Gas Technology Development Center features the following capabilities:

Optical Testing:

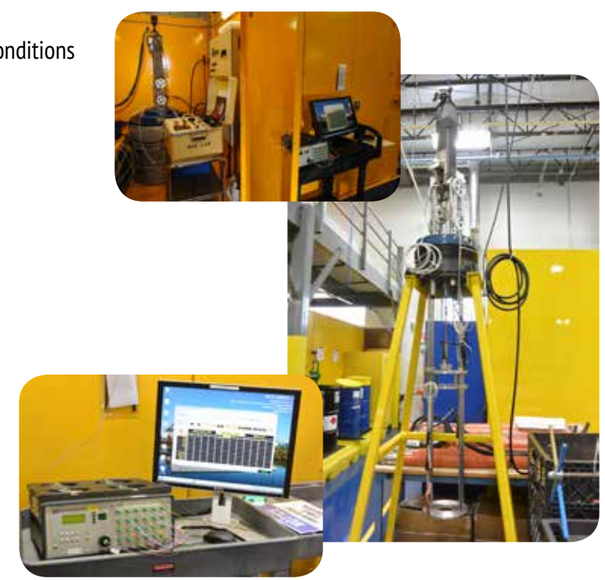
- Multi-stress testing to simulate subsea conditions
- Testing at 1310, 1430, 1505, 1550, 1580, 1625, and 1650 nm wave lengths
- Splicing singular and ribbon fiber
- IL & RL measurements at temperature, under pressure, and turbid conditions

Mate/De-Mate Testing:

- 1 Atmosphere, ambient temperature, or turbid conditions
- At pressure up to 20kPSI
- Temperatures from +2 ˚C to +150 ˚C
- Turbid available at pressure and temperature
- Horizontal mate and de-mate available

Reliability Analysis:

- Life data analysis using Weibull++
- Accelerated Life Test data analysis
- Reliability Block Diagram analysis
- General statistical analysis

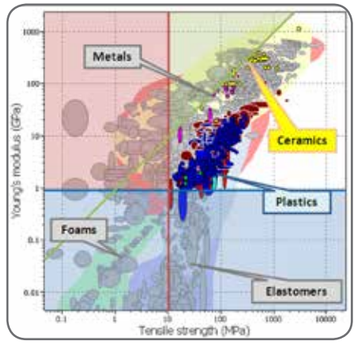


Materials Science Expertise:

Teledyne Oil & Gas works closely with research partner Teledyne Scientific to provide cutting-edge materials expertise for challenging applications.

Materials Database Development:
Teledyne Scientific Company and Teledyne Oil & Gas have completed nearly 20,000 material analyses in an ongoing joint R&D program. Subsea materials are ranked based on key performance requirements that meet subsea operating conditions, based on predicted End-of-Life performance. The partnership between TSC and TOG allow operators to solve their materials challenges with a science-based approach.

TELEDYNE SCIENTIFIC & IMAGING



A comparison of common subsea materials based on tensile strength vs. rigidity.

Related Product Offerings From Teledyne ODI:

Active Flying Leads:
Teledyne Oil and Gas has evolved the flying lead design to integrate electronics components in-line with the jumper, transforming the Flying Lead into an active component in a subsea data transmission system.

Nautilus Electrical Wet Mate Connector:
The industry-standard, multi-channel, 30 amp subsea connector in 4, 7, or 12 circuit configurations, qualified for 10,000 psi. Available in ROV mate, stab mate, and manual mate.

Modular Connectorized Distribution Unit (MCDU):
A modular family of factory qualified subsea distribution units.

Pressure-Balanced, Oil-Filled (PBOF) Hose Assemblies:
PBOF hose assemblies with attached connectors or sensors on one end or both ends.

Related Product Offerings From Teledyne Oil & Gas:

DGO – High Differential Pressure Interconnect & Penetrators:
Multiple shell and insert configurations in glass reinforced epoxy with glass-to-metal sealing for high temperature / high pressure challenges.

Impulse – Dry Mate Submersible Electrical Assemblies:
Multiple design configurations for subsea instrumentation. Expertise in complex molding and encapsulation design assembly.

Storm Cable – Application-specific Cables for Harsh Environments:
Ruggedized interconnect assemblies and custom bulk cable.

Cormon – Corrosion and Sand Erosion Monitoring, Pressure and Temperature Sensing Solutions:
Multiple in-line intrusive sensor configurations for high resolution, real-time data collection on metal loss, pressure/temperature, and sand particle detection.

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Global Presence

Teledyne Oil & Gas is a global organization with manufacturing facilities and service and test centers around the world. A team of 30+ cross-trained, multi-lingual field service technicians remain ready 24/7 for routine and emergency deployments anywhere Teledyne products are being used.

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