Making Connections in Harsh Environments

<table>
<thead>
<tr>
<th>Application</th>
<th>Product Description</th>
<th>Environment</th>
</tr>
</thead>
<tbody>
<tr>
<td>1. Surface / Shipboard / Shallow Water Cables &amp; Connectors</td>
<td>Cables and connectors designed for use in wet and submerged environments such as on the deck of a ship, on a surface buoy, or in shallow water sensing or observing operations.</td>
<td>0 - 200 M 0 - 300 psi</td>
</tr>
<tr>
<td>2. Seismic Survey Interconnect</td>
<td>Waterblock and rugged electrical connectors designed to withstand the seismic shocks from sound sources during offshore surveys and rough on-deck handling.</td>
<td>0 - 200 M 0 - 300 psi</td>
</tr>
<tr>
<td>3. Subsea Instrumentation Cables &amp; Connectors</td>
<td>Electrical and optical connectors and cables for a wide range of underwater functionality, including mooring buoys, sensors, current profilers, sonar systems, and more.</td>
<td>0 - 7000 M 0 - 10,200 psi</td>
</tr>
<tr>
<td>4. Unmanned Vehicle Interconnect</td>
<td>Designed for use on remotely operated vehicles (ROVs), unmanned surface vehicles (USVs), gliders, and autonomous unmanned vehicles (AUVs), these connections reliably operate lights, cameras, sensors, detection equipment, or sonar in harsh underwater conditions.</td>
<td>0 - 7000 M 0 - 10,200 psi</td>
</tr>
<tr>
<td>5. Subsea Observatory Interconnect</td>
<td>Built for tsunami and ocean monitoring networks, a collection of wet and dry-mateable interconnect to power sensors and transmit data over long distances underwater.</td>
<td>0 - 7000 M 0 - 10,200 psi</td>
</tr>
<tr>
<td>6. Subsea Drilling Interconnect</td>
<td>Electrical and optical connections designed for power or transmit data in subsea drilling equipment. Typically wet-mateable via diver or remotely operated vehicle.</td>
<td>0 - 7000 M 0 - 10,200 psi</td>
</tr>
<tr>
<td>7. Subsea Production / Feedthrough Interconnect</td>
<td>Electrical and optical connections designed for power or data transmission in subsea oil field or wellheads, reliable for the life of an oil field (25-30 years).</td>
<td>10,000 - 20,000 M 14,500 - 29,000 psi</td>
</tr>
<tr>
<td>8. Manned Vehicle Interconnect</td>
<td>Glass-to-metal sealed interconnect rated for high differential pressure that provides an extremely reliable pressure hull barrier for the maximum protection of human life inside.</td>
<td>0 - 7000 M 0 - 10,200 psi</td>
</tr>
</tbody>
</table>
Reliable Operation in Ocean Environments from the Surface to the Sea Floor

MARINE ENVIRONMENT EXPERTISE

Teledyne Marine offers the industry's largest selection of cables and connectors designed for harsh and marine environments. In addition to an extensive standard product offering, Teledyne Marine can design an interconnect system for nearly any application. We have expertise working with rugged materials, molding processes, and extensive qualification testing capabilities that ensure your equipment is operational the first time and every time you need it.

Teledyne Marine integrates the resources of six interconnect product lines into a single organization that supplies innovative, high-performance solutions.

Solutions for these harsh environments include wet-mate, splash-mate, and dry-mate connectors, pressure boundary penetrators, cable assemblies, cable terminations, and custom-engineered encapsulation and molding. They are available as stand-alone items or as complex, value-added systems.

PRODUCT SELECTION

This product selection guide is designed to help you identify a connector family that fits your application, whether on the surface or 10,000 ft (3,000 m) deep.

This collection represents standard products, and is a small fraction of the capabilities we can offer in connector design. Our custom engineering services offer innovative solutions for new and unique applications.

When you are ready to request a quote or discuss a custom design, please contact info@teledynemarine.com.

WET-MATE CONNECTORS

Wet-mate connectors are capable of being connected and disconnected while submerged. The most common family of wet-mate connectors in the Teledyne Marine catalog is the Nautilus™ and Rolling Seal Hybrid offering of electrical and optical connectors, which are capable of operating at full ocean depth, thanks to their pressure-balanced, oil-filled design.

PENETRATORS

Designed for applications that require maximum pressure protection and minimal maintenance over long-term deployments, penetrators facilitate a cable assembly or harness through bulkhead or instrument package without the use of connectors. Penetrators are typically used where the need to mate and demate is not necessary, generally at the end of a pressure-balanced oil-filled (PBOF) assembly with a connector at the opposite end. A penetrator is usually attached directly to a pressure vessel, which can be either pressure-balanced or at 1 ATM.

DRY-MATE CONNECTORS

Dry-mate connectors must be connected in air, prior to being submerged, and require the face to be clean and dry when doing so. Dry-mate connector designs are generally more compact than comparable wet-mate connector configurations, and a wide variety of options exist. Dry-mate connectors are the widest offering in the Teledyne Marine catalog, and can be ordered as electrical, optical, or hybrid configurations.

Splash-Mate Connectors

The splash-mate connector designation allows the connectors to be mated even when the faces are wet or otherwise contaminated. This capability is generally achieved by overmolding an elastomeric layer on the face of the connector. Splash-mate functionality is best used in applications where full wet-mate capability is not required, but the connections must be made on the deck of a ship, in the splash-zone, or in other areas where ensuring a clean, dry-mating interface is not practical.

Feedthrough Systems

Teledyne offers a comprehensive line of fully qualified electrical feedthrough systems (EFS) that are designed to provide continuous reliable electrical connections for downhole gauges in subsea trees. A feedthrough electrical connection may need to withstand considerable pressure difference across its length. Teledyne EFS systems are rated to 15,000 psi.

Industry’s Broadest Selection of Interconnect

The primary connector product lines within Teledyne Marine are AG Geophysical, DGO, Impulse, Impulse-PDM, and ODI. In general, each Teledyne Marine connector can be categorized as a wet-mate, dry-mate, splash-mate, penetrator, or feedthrough system. These can be offered in a variety of configurations, from electro-optical to Ethernet systems.

Teledyne Marine Product Offering

<table>
<thead>
<tr>
<th>Connector Type</th>
<th>Electrical</th>
<th>Optical</th>
<th>Ethernet</th>
<th>High Power</th>
<th>Hybrid</th>
</tr>
</thead>
<tbody>
<tr>
<td>Wet-Mate</td>
<td>✓</td>
<td>✓</td>
<td>✓</td>
<td>✓</td>
<td>✓</td>
</tr>
<tr>
<td>Splash-Mate</td>
<td>✓</td>
<td>✓</td>
<td>✓</td>
<td>✓</td>
<td>✓</td>
</tr>
<tr>
<td>Dry-Mate</td>
<td>✓</td>
<td>✓</td>
<td>✓</td>
<td>✓</td>
<td>✓</td>
</tr>
<tr>
<td>Penetrator</td>
<td>✓</td>
<td>✓</td>
<td>✓</td>
<td>✓</td>
<td>✓</td>
</tr>
<tr>
<td>Feedthrough</td>
<td>✓</td>
<td>✓</td>
<td>✓</td>
<td>✓</td>
<td></td>
</tr>
</tbody>
</table>
## Connector Specifications

<table>
<thead>
<tr>
<th>ELECTRICAL INTERCONNECT</th>
<th>Operating Pressure (PSI/BAR)</th>
<th>Voltage (AC)</th>
<th>Current (per contact)</th>
<th>No. of Contacts</th>
<th>Brand</th>
<th>Product Family</th>
</tr>
</thead>
<tbody>
<tr>
<td>Dry-Mate</td>
<td>300/20.6</td>
<td>1500</td>
<td>8</td>
<td>2 to 4</td>
<td>AGG</td>
<td>1000 Series</td>
</tr>
<tr>
<td></td>
<td>300/20.6</td>
<td>1500</td>
<td>8</td>
<td>2 to 16</td>
<td>AGG</td>
<td>2000 Series</td>
</tr>
<tr>
<td></td>
<td>300/20.6</td>
<td>-</td>
<td>-</td>
<td>1 (Coaxial)</td>
<td>AGG</td>
<td>4000 Series</td>
</tr>
<tr>
<td></td>
<td>2000/138</td>
<td>1600</td>
<td>7.5</td>
<td>3 to 40</td>
<td>DGO</td>
<td>100 Series</td>
</tr>
<tr>
<td></td>
<td>2000/138</td>
<td>1000</td>
<td>3</td>
<td>1 (Coaxial)</td>
<td>DGO</td>
<td>110 Series</td>
</tr>
<tr>
<td></td>
<td>625</td>
<td>625</td>
<td>4 to 80</td>
<td>3 to 48</td>
<td>DGO</td>
<td>107 Series</td>
</tr>
<tr>
<td></td>
<td>600</td>
<td>300, 450, or 600</td>
<td>2 to 12</td>
<td>2 to 12</td>
<td>Impulse</td>
<td>Mini High Density</td>
</tr>
<tr>
<td></td>
<td>600</td>
<td>300, 450, or 600</td>
<td>2 to 15</td>
<td>2 to 61</td>
<td>Impulse</td>
<td>Mini High Density – Oil Filled</td>
</tr>
<tr>
<td></td>
<td>230</td>
<td>Ethernet</td>
<td>8 and 12</td>
<td>2 to 12</td>
<td>Impulse</td>
<td>NET</td>
</tr>
<tr>
<td></td>
<td>200, 250, 300, 400, 500, 600, 700, or 800</td>
<td>3 to 55</td>
<td>2 to 36</td>
<td>Impulse</td>
<td>GRE</td>
<td></td>
</tr>
<tr>
<td></td>
<td>300, 600, 1000, 1500, 2000, or 3000</td>
<td>2 to 200</td>
<td>2 to 96</td>
<td>Impulse</td>
<td>Metal Shell</td>
<td></td>
</tr>
<tr>
<td></td>
<td>10,000/689</td>
<td>750</td>
<td>12 to 20</td>
<td>2 to 18</td>
<td>Impulse</td>
<td>Splash-Mate</td>
</tr>
<tr>
<td></td>
<td>10,000/689</td>
<td>600</td>
<td>2 to 25</td>
<td>4 to 37</td>
<td>Impulse</td>
<td>Metal Key Titan</td>
</tr>
<tr>
<td></td>
<td>10,000/689</td>
<td>300 or 600</td>
<td>2</td>
<td>2 to 8</td>
<td>Impulse</td>
<td>Wet-Mate</td>
</tr>
<tr>
<td></td>
<td>1730</td>
<td>30</td>
<td>4, 7, or 12</td>
<td>2 to 14</td>
<td>ODI</td>
<td>Nautilus</td>
</tr>
<tr>
<td></td>
<td>600</td>
<td>Ethernet</td>
<td>8 and 12</td>
<td>2 to 12</td>
<td>Impulse</td>
<td>NET</td>
</tr>
<tr>
<td></td>
<td>600</td>
<td>2</td>
<td>1</td>
<td>1</td>
<td>DGO</td>
<td>Horizontal Electrical Feedthrough</td>
</tr>
<tr>
<td></td>
<td>10,000/1034</td>
<td>500</td>
<td>5 to 7</td>
<td>1 to 200</td>
<td>DGO</td>
<td>111 Series</td>
</tr>
<tr>
<td></td>
<td>1730</td>
<td>30</td>
<td>4, 7, or 12</td>
<td>2 to 14</td>
<td>ODI</td>
<td>P17 - 30</td>
</tr>
<tr>
<td>Penetrator</td>
<td>Ranges from 4500 to 30,000/310 to 2068</td>
<td>500</td>
<td>5 to 7</td>
<td>1 to 200</td>
<td>DGO</td>
<td>111 Series</td>
</tr>
<tr>
<td></td>
<td>10,000/689</td>
<td>1730</td>
<td>30</td>
<td>4, 7, or 12</td>
<td>ODI</td>
<td>P17 - 30</td>
</tr>
<tr>
<td></td>
<td>10,000/1034</td>
<td>500</td>
<td>5 to 7</td>
<td>1 to 200</td>
<td>DGO</td>
<td>111 Series</td>
</tr>
<tr>
<td></td>
<td>1730</td>
<td>30</td>
<td>4, 7, or 12</td>
<td>2 to 14</td>
<td>ODI</td>
<td>P17 - 30</td>
</tr>
<tr>
<td></td>
<td>Single phase: 12,880/888</td>
<td>10,000</td>
<td>250</td>
<td>1 or 3</td>
<td>ODI</td>
<td>P10 - 250</td>
</tr>
<tr>
<td></td>
<td>Three phase: 10,000/689</td>
<td>10,000</td>
<td>250</td>
<td>1 or 3</td>
<td>ODI</td>
<td>P10 - 250</td>
</tr>
<tr>
<td>OPTICAL INTERCONNECT</td>
<td>8700/600</td>
<td>-</td>
<td>-</td>
<td>1</td>
<td>Impulse-PDM</td>
<td>Omicron</td>
</tr>
<tr>
<td></td>
<td>17,500/1206</td>
<td>-</td>
<td>-</td>
<td>1</td>
<td>Impulse-PDM</td>
<td>12km Optical Connector</td>
</tr>
<tr>
<td></td>
<td>10,000/689</td>
<td>700</td>
<td>7</td>
<td>8</td>
<td>ODI</td>
<td>Rolling Seal</td>
</tr>
<tr>
<td>Penetrator</td>
<td>10,000/689</td>
<td>-</td>
<td>-</td>
<td>1</td>
<td>ODI</td>
<td>Optical Penetrator</td>
</tr>
<tr>
<td>ELECTRO OPTICAL (HYBRID) INTERCONNECT</td>
<td>7200/496</td>
<td>600</td>
<td>12</td>
<td>1 to 7</td>
<td>Impulse-PDM</td>
<td>Omega</td>
</tr>
<tr>
<td></td>
<td>10,000/689</td>
<td>-</td>
<td>-</td>
<td>1 to 10</td>
<td>DGO</td>
<td>153 Series</td>
</tr>
<tr>
<td></td>
<td>10,000/689</td>
<td>1730</td>
<td>30</td>
<td>2 E/4 O</td>
<td>ODI</td>
<td>Nautilus Rolling Seal</td>
</tr>
<tr>
<td>Penetrator</td>
<td>2000/158</td>
<td>625</td>
<td>3 to 8</td>
<td>1 to 361</td>
<td>DGO</td>
<td>108 Series</td>
</tr>
</tbody>
</table>
AG Geophysical Products

Dry-mate, high shock survivable interconnect components and assemblies engineered for marine seismic and shallow water research applications.

1000 SERIES
Standard marine connectors engineered for high shock, shallow water environments such as those found in offshore seismic surveys. Standard or water-blocked inline configurations and with flange mounted, straight thread or NPT thread bulkhead connectors available in 2 or 4 pin counts.

2000 SERIES
Positive marine connectors engineered for high shock, shallow water environments such as those found in offshore seismic surveys. Standard or water-blocked inline configurations and with flange mounted, straight thread or NPT bulkhead connectors available. Up to 16 pins available.

4000 SERIES
50 Ohm coaxial connector suited for marine seismic survey operations. Inline and bulkhead configurations available.

6000 SERIES
Seismic source energy connectors that can withstand extremely high shock environments and maintain required reliability. Heavy duty version available.

Cable Solutions

Cable and cable assemblies for demanding industries such as subsea and marine, defense, and oil and gas.

MARINE CABLE
A wide variety of components, materials, and capabilities to formulate solutions in the harshest and most critical of environments, addressing issues from electrical and environmental performance to flex-life and buoyancy features.

DGO

Dry-mate solutions for high pressure and/or high temperature applications using the proven reliability and long-term stability of glass-to-metal seals. Glass seals can withstand conditions that quickly degrade and deteriorate other sealing methods.

100 SERIES
The 100 Series receptacle connector contains integral glass-to-metal seals for proven pressure protection of equipment with a standard pressure rating of 2,000 psig. Available in multiple shell insert arrangement configurations from 3-40 contacts.

107 SERIES
A rugged, metal shell connector series for submerged applications where reliability is crucial. Designs are based on MIL-C-24217 and feature a glass-to-metal sealed pressure barrier in the receptacles for optimal operational performance.

110 SERIES
A simple coaxial connector series designed to accommodate 50 Ohm cables. The receptacle contains an integral glass-to-metal seal for water blocking the plug/receptacle interface in molded or PBOF cable terminations.

111 SERIES
The 111 Series header (also referred to as a penetrator or feedthrough) features a glass-to-metal sealed pressure barrier and is designed for extreme conditions (up to 30,000 psi).

128 SERIES
A high-density instrumentation connector series for submerged applications where size and cost are major drivers in selection. Receptacles feature glass-to-metal sealed pressure barriers.

153 SERIES
Fiber optic connectors and cable assembly products that are designed for use in hostile environments up to 10,000 psi. Single or multi-mode fiber available, and PBOF capability can be specified.

FEEDTHROUGH SYSTEMS
A comprehensive line of fully qualified electrical feedthrough systems (EFS) to provide reliable electrical connections for downhole gauges. The EFS design from DGO incorporates highly durable glass-to-metal sealing technology for maximum long-term reliability in subsea and downhole environments.
IE55 RUBBER MOLDED METAL SHELL SERIES
Industry standard dry-mate electrical connectors available in a wide variety of shell sizes and contact configurations. The robust design and durable materials used means they are well-suited for challenging operational environments, including subsea lights, cameras, and other instrumentation.

METAL SHELL SERIES
Designed for rugged military, commercial, aerospace, and marine applications, the metal shell series is a versatile yet durable choice for power and communications in harsh environments. Available with overmolded or pressure-balanced oil-filled assemblies.

GLASS REINFORCED EPOXY (GRE) SERIES
Waterproof, submersible, non-metallic electrical connectors available in different body sizes and contact configurations. Specifically designed for harsh environment, the GRE series includes rugged and reliable connectors for a wide range of low to high pressure applications where corrosion may be an issue.

RUBBER MOLDED SERIES
An economical, industry standard series of dry-mate rubber molded connector assemblies and GRE bulkheads used on a wide range of legacy subsea instruments and vehicles.

WET-MATE SERIES
Molded pressure-balanced neoprene connectors that permit underwater mating and demating by divers.

SPASH-MATE SERIES
Available in a wide range of shapes, sizes and contact configurations, splash-mate connectors are well suited for applications where mating and demating takes place in wet environments.

METAL KEY TITAN (MKS) SERIES
Robust, ruggedized, watertight electrical connectors with the ability to be blind mated or demated in wet environments. Available in a wide range of shell sizes and contact configurations. Well-suited for underwater vehicles such as ROVs, AUVs, and UUVs, where space and weight are typical design constraints.

MINIATURE HIGH DENSITY (MHD) METAL SHELL SERIES
Miniature high density dry-mate electrical connectors available in six shell sizes with up to 96 contacts. Compact, robust design is well-suited to a wide variety of subsea instrument applications. Available with overmolded or oil-filled assemblies.

NET SERIES
A cost-effective solution for high data rate (1Gb) subsea Ethernet applications where performance and reliability are essential. The NET Series was custom engineered to maximize the data transmission rates possible from a rugged, user-friendly compact design.

OMEGA SERIES
The Omega Series hybrid connector range offers any combination of multi-mode or single-mode optical channels and 16 AWG electrical circuits from a single way through to seven ways. Connectors feature low optical loss (<0.2db) utilizing industry standard self-aligning ferrules.

OMICRON SERIES
Omicron optical connectors utilize proven small form factor ferrule technology and are available for multi-mode or single-mode operation. Connector bodies can be manufactured in materials other than stainless steel, either to address specific anti-corrosion requirements or to increase depth rating.

Impulse-PDM
Dry-mate, optical, and hybrid cost-effective solutions for marine instruments and vehicles. Custom-engineered encapsulation and molding of components for harsh environment subsea applications.

WET-MATE SERIES
Molded pressure-balanced neoprene connectors that permit underwater mating and demating by divers.

NAUTILUS™
Teledyne ODI’s patented Nautilus is recognized as the leading choice for high reliability wet-mateable, multi-channel electrical connectors. Over 110,000 Nautilus connectors have been delivered for projects in diverse industries including oil and gas, oceanography, and defense.

NAUTILUS™ ROLLING SEAL HYBRID
A highly reliable submersible wet-mate connector rated to 10,000 psi for applications requiring up to four optical circuits and two 30-amp electrical circuits.

ROLLING SEAL HYBRID
Teledyne ODI’s Rolling Seal is a wet-mate, multi-channel, underwater optical connector. The patented design functions by excluding water and shutting silt away from the optical ferrules, creating a clean, oil-filled conduit for connection, resulting in a reliable, low-loss optical throughput.

OMEGA SERIES
The Omega Series hybrid connector range offers any combination of multi-mode or single-mode optical channels and 16 AWG electrical circuits from a single way through to seven ways. Connectors feature low optical loss (<0.2db) utilizing industry standard self-aligning ferrules.

OMICRON SERIES
Omicron optical connectors utilize proven small form factor ferrule technology and are available for multi-mode or single-mode operation. Connector bodies can be manufactured in materials other than stainless steel, either to address specific anti-corrosion requirements or to increase depth rating.

OBI
Dry-mate, optical, and hybrid cost-effective solutions for marine instruments and vehicles. Custom-engineered encapsulation and molding of components for harsh environment subsea applications.

OMEGA SERIES
The Omega Series hybrid connector range offers any combination of multi-mode or single-mode optical channels and 16 AWG electrical circuits from a single way through to seven ways. Connectors feature low optical loss (<0.2db) utilizing industry standard self-aligning ferrules.

OMICRON SERIES
Omicron optical connectors utilize proven small form factor ferrule technology and are available for multi-mode or single-mode operation. Connector bodies can be manufactured in materials other than stainless steel, either to address specific anti-corrosion requirements or to increase depth rating.

NAUTULUS™
Teledyne ODI’s patented Nautilus is recognized as the leading choice for high reliability wet-mateable, multi-channel electrical connectors. Over 110,000 Nautilus connectors have been delivered for projects in diverse industries including oil and gas, oceanography, and defense.

NAUTULUS™ ROLLING SEAL HYBRID
A highly reliable submersible wet-mate connector rated to 10,000 psi for applications requiring up to four optical circuits and two 30-amp electrical circuits.

ROLLING SEAL HYBRID
Teledyne ODI’s Rolling Seal is a wet-mate, multi-channel, underwater optical connector. The patented design functions by excluding water and shutting silt away from the optical ferrules, creating a clean, oil-filled conduit for connection, resulting in a reliable, low-loss optical throughput.
Teledyne Marine Interconnect

Beginning as a small collection of unique marine solution providers and expanding to a powerhouse of highly engineered, high-performance solutions for a broad range of markets, Teledyne Marine now offers the largest breadth of marine technology in the industry.

A global network of agents and distributors ensure top-notch sales and service support nearly anywhere in the world. Our goal is to provide one-stop purchasing capability, worldwide customer support, and the technical expertise to solve your toughest challenges.

Members of:

TELEDYNE AG GEOPHYSICAL PRODUCTS
14880 Skinner Road
Cypress, Texas 77429
Tel: +1 281 373 5952
TeledyneMarineSeismic@teledyne.com
www.teledyneaggeophysical.com

TELEDYNE CABLE SOLUTIONS
9215 Premier Row
Dallas, TX 75247
Tel: +1 214 637 1381
cablesolutions@teledyne.com
www.teledynecablesolutions.com

TELEDYNE DGO
162 Corporate Drive
Portsmouth, NH 03801
Tel: +1 603 474 5571
dgo@teledyne.com
www.dgo.com

TELEDYNE IMPULSE
9855 Carroll Canyon Rd
San Diego, CA 92131
Tel: +1 858 842 3100
impulse@teledyne.com
www.teledyneimpulse.com

TELEDYNE IMPULSE-PDM
4-6 Alton Business Centre
Omega Park
Alton, Hampshire
England GU34 2YU
Tel: +44 (0) 1420 552200
pdmsales@teledyne.com
www.teledyneimpulse-pdm.com

TELEDYNE ODI
1026 N. Williamson Blvd
Daytona Beach, FL 32114
Tel: +1 386 236 0780
odi@teledyne.com
www.odi.com

Contact info@teledynemarine.com for more information.

©Teledyne Marine 2018. Proprietary, all rights reserved. For reference only Rev 6/2018