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1.0 Contents

2.0 Introduction

This Installation and Operation Manual covers Teledyne Oil & Gas, Inc. Dry-Mate submersible plug and receptacle connectors. Outline and interface details will be provided from drawings supplied by Teledyne Oil & Gas.

3.0 Receiving Inspection

Dry-mate connectors are frequently supplied with loose fiber optic pigtails. Great care must be taken while unpacking the connectors to prevent damage to these pigtails. Damage to these pigtails will most likely require the connectors be returned to Teledyne Oil & Gas, Inc. for repair. Only personnel trained in handling of fiber optic components should perform the receiving inspection.

3.1 Check list

- Inspect the shipping container for visible signs of damage. If damage is found, document the damage and contact Teledyne Oil & Gas.
- Upon opening the shipping container, check to see if the contents appear to have been disturbed.
- Taking care not to damage any fiber optical pigtails that may be present, remove the connector assemblies from the packing crate.
- Verify there is no damage to the fiber optic pigtails.
- Inspect the connector assembly for any signs of damage.
- Remove the protective cover and inspect the face of the connector

4.0 Installation

The dry-mate hybrid connectors are simple and straightforward to install if the special handling instructions given here are followed. The installation can usually be carried out without the need for special tools. However, the following sections should be read to prevent damage to the connectors.

NOTE: Where cable termination work and mounting are carried out by those other than Teledyne Oil & Gas, Inc. the responsibility for that work lies with the customer or his subcontractor. The following information is provided for guidance only.

4.1 Terminations

For most applications, we recommend that these connectors be terminated to their cabling at Teledyne Oil & Gas, Inc. In the event that the connectors must be terminated in the field, then they will be supplied with optical and/or electrical pigtails, as required.

4.1.1 Electrical Terminations

The receptacle may be provided with 18 AWG pigtails for cable connection. Conventional crimping or soldering techniques should be employed to terminate accordingly. Termination should be performed per a commercially recognized soldering standard such as IPC/E1A JSTD-001C.

4.1.2 Optical Terminations

The receptacle may be provided with fiber optic pigtails. It is recommended that these be fusion-spliced to the cable fibers.

4.2 **Boot Seals**

4.2.1 Electrical Terminations

If rubber "mechanical" boot seals are employed, then both wire jacket and boot seal nipple should be cleaned with a warm, 50% distilled water/alcohol solution (verify wire jacket is compatible with alcohol), dried, and then lightly lubricated with dielectric silicone lubricant (e.g., Dow Corning, DC-4). Take care to verify the wire is cut cleanly and that no sharp edges or stray wires are sticking out that may damage the boot seals during installation. It is recommended that the integrity of seals be verified using standard Insulation Resistance practices.

NOTE: If other cleaning agents or solvents are to be used, contact Teledyne Oil & Gas for confirmation of their compatibility with the plastic and rubber parts of the connector.

4.2.2 Optical Terminations

Rubber "mechanical" boot seals are employed on the fiber optical pigtails for strain relief and are in place when the connector is delivered. These boot seals should not be removed.

These connectors are supplied with custom manufactured fiber optical circuits. They are of the ceramic ferrule type and any damage to an optical circuit will necessitate return of the whole connector to Teledyne Oil & Gas. The connectors are always supplied with fiber optical pigtails, 125/900 micron or 125/250 micron, either single or multi-mode depending upon customer requirements. As with all fiber optical connections, care should be taken to ensure the fiber optic contacts are kept clean and not exposed to and dirt or debris. Cleaning, if required, should be limited to the use of lint-free wipes. There is NO need to use any optical gel while mating these connectors.

4.3 O-rings

Both connectors are supplied with O-rings required for sealing the connector onto its mounting. Normally, these are Nitrile O-rings and their compatibility with the contained fluid (if any) should be confirmed. The O-rings are supplied in a separate bag. Prior to installation, verify that the O-ring groove in the connector is clean. Lightly lubricate the O-ring with silicone lubricant and install in groove. The connectors are supplied with their shell seal O-rings pre-installed and lightly lubricated. The condition of these O-rings should be verified prior to connection. Spare O-rings may be obtained from Teledyne Oil & Gas.

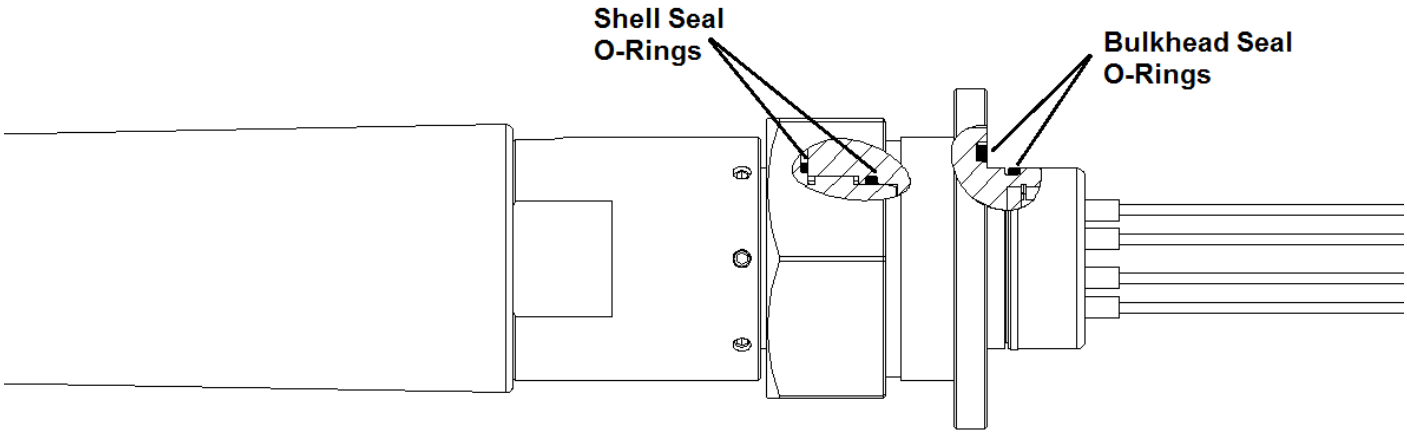

Figure 1: Location of Dry Mate Connector O-Rings

4.4 Mating Guidelines

These connectors are dry-mate submersible type. Mating should be done in a dry and clean environment. There are sealing O-rings in both halves of the connector. Their condition should be inspected prior to mating. To mate connectors, first roughly align the keyway of the connectors. Apply a small about of axial force and rotate the plug and receptacle until the keyways have engaged. While applying 10 to 30 lbs (44 to 133 N) of axial force to the plug termination, rotate the locking sleeve clockwise to engage the threads. The locking sleeve should be fully hand tightened while applying axial force to the termination until snug. The locking sleeve should then be tightened, in accordance with Table 1, with the use of a torque wrench. Refer to Figure 2 for torque correction equation. The torque values that are specified are for connector retention only, fiber optical and electrical performance of the connector are not improved by over-torqueing the locking sleeve.

Table 1: Dry Mate Connector Locking Sleeve Torque Requirement

Connector Type	Maximum Locking Sleeve Torque[A]
Dry Mate Submersible (DMS) Connector Series	15 ± 3 Ft lbf (20 ± 4 Nm)
All Other Dry Mate Connector Series	30 ± 5 in lbf (3.5 ± 0.5 Nm)

[A]: Exceeding the torque values does not improve connector performance

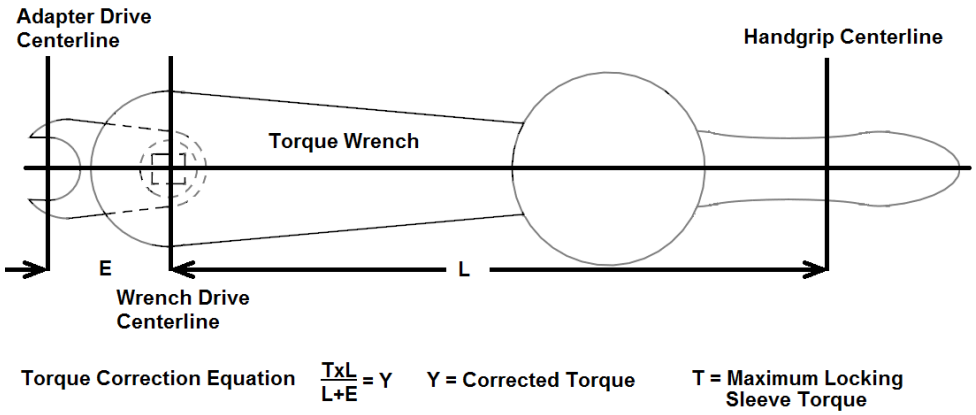

Figure 2: Torque Correction when Using a Short Open End Adapter and Torque Wrench

5.0 General Notes of Caution

The Teledyne Oil & Gas dry-mate hybrid requires special handling to function properly. Failure to follow correct procedures, as outlined below, will most likely cause severe damage.

5.1 Never exceed the connector specifications.

5.2 Do not insert anything into the submersible dry-mate receptacle except the submersible dry-mate plug. Insertion of foreign objects, such as test probes, may damage the electrical contacts and fiber optical junctions. Similarly, probing the submersible dry-mate plug could result either in cracking of the pin insulation or damaging the fiber optical junction.

5.3 Great care should be taken not to drop these connectors. Their solder pots and fiber optic pigtails are vulnerable to mechanical damage.

5.4 Live Connection and Disconnection - These connectors are not designed to be connected or disconnected while power is applied to the electrical circuits. Severe damage (including connector failure) can occur if this is done. In the event that live connection may occur or has occurred, please contact Teledyne Oil & Gas, Inc. for further guidance.

5.5 Be extremely careful not to sharply bend the fiber optics, which is particularly vulnerable at the point where they exit the connector. Fiber optic breakage resulting in the permanent loss of the affected circuit would result.

6.0 Operation

Dry-mate electrical, fiber optical, and hybrid connectors require no special instructions regarding their operation. See section 6.3 for general operational specifications, project specific specification may differ.

NOTE: The specifications, shown in Table 2, refer to the submersible dry-mate connector's qualified capabilities and not to the factory acceptance test actually carried out on the delivered connectors. Refer to test procedures for details of the delivered connector's test parameters.

NOTE: A mating log record of the connector use should be kept, particularly for test connectors, as exceeding the lifetime may result in damage to the connector and to any other connector to which it is mated.

6.1 Corrective Action

Should any difficulty be found with mating or de-mating a connector, or should a visual inspection show a reason for concern, it is critical that no further mates be carried out with that connector. Teledyne Oil & Gas, Inc. should be contacted immediately for instructions on how to proceed or what corrective action needs to be taken.

6.2 Maintenance

Dry-mate hybrid connectors require no periodic maintenance and are maintenance-free for their intended life. If their mating cycle lifetime is exceeded, the connectors should be returned to Teledyne Oil & Gas, Inc. for refurbishment. If damage occurs to the connector, then the entire connector must be returned to Teledyne Oil & Gas, Inc. for repair or replacement.

6.3 **Specifications**

Table 2: Dry-Mate Electrical and Optical Specifications

Characteristics	These connectors are intended for general subsea use. They are dry-mate and submersible in operation.
Pressure Rating[A]	≤ 410 Bar (6000 PSI)
Maximum Operational Current per Circuit	7 Amps
Insulation Resistance	≥ 10 GΩ @ 1 KVDC
Contact Resistance	≤ 10 mΩ per contact
Mated Connector Continuity Resistance	≤ 0.2 Ω per contact
Maximum Operational Voltage	700 VAC / 1000 VDC (Mated)
Optical Fiber	125 / 900 or 125 / 250 µm Single or Multi-Mode
Typical Optical Insertion Loss	≤ 0.5 dB (connector) +≤0.1 dB per Splice
Optical Return Loss	≥ 30 dB
Operating Temperature	-5°C to + 40 °C (23°F to + 104 °F)
Storage Temperature[B]	-30°C to + 60 °C (-22°F to + 140 °F)
Mating Cycle Lifetime[C]	100 mate cycles

[A]: Pressure ratings are dependent on design parameters and may vary.

[B]: +60 °C maximum allowable product temperature including ambient, solar and internal contributions

[C]: Maximum number of allowable mate cycles before connector refurbishment.

7.0 Revision History

Revision	CO #	Revised By	Summary of Changes	Release Date
B	33537	K. Hanecki	Changed email address on cover page	8/6/14
A	24335	S. Jackson	Initial Issue / Released doc after customer reviewed	12/22/11