

Diamould Power Connector

Tubing hanger feedthrough

The OneSubsea™ Diamould power tubing hanger feedthrough allows power to be transmitted through a tubing hanger to drive electric submersible pumps (ESPs). It has been field proven in many installations in deep water, particularly offshore Brazil.

The feedthrough connector has an upper wet-mate receptacle connector and a mating lower dry-mate plug. The wet-mate receptacle is configured with electron beam-welded contacts to form a gas barrier at the tubing hanger. The connector has been PR2 tested to strict API 6A requirements. The lower dry-mate plug is suitable for terminating to a downhole ESP power cable (round or flat cable construction). The plug provides the connection to the rear (underside) of the tubing hanger wet-mate receptacle.

DESIGN

Protection is provided to the electrical contacts by oil-filled pressure-balanced enclosures. The

Diamould power connector uses a proprietary wet-mate technology to protect both pin and socket contacts while the connectors are un-mated, allowing the connectors to be deployed subsea, open face, without the need for expensive protective connectors.

During mating, the receptacle connector male contact pin wiper establishes a seal with the front face of the female plug connector, forming a continuous insulation system. The receptacle male contact pins first enter the female connectors' primary and then secondary diaphragms, where they make a connection with the plug socket contacts. This dual-protection system graduates the voltage field between the connectors when mated and energized, eliminating the earthing effect of seawater.

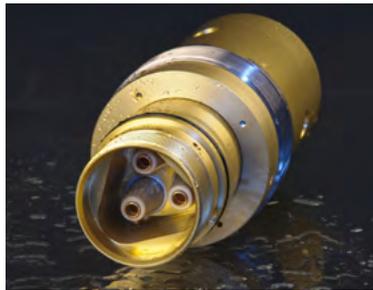
METALIZED INSULATION SYSTEM

At high voltages, insulators often experience discharges at the interface to metallic housings where air voids are present, typically around O-rings. A proprietary process for metalizing polyetheretherketone (PEEK) insulators reduces the effects of electrical discharge, thereby extending the life of the insulator.

INSTALLATION

The use of an external metal seal (proprietary or customer-supplied designed) and internal electron beam welding ensures that the feedthrough provides a high-integrity gas and fluid barrier within the tubing hanger. The design of the tubing hanger feedthrough, with the incorporation of the lower dry-mate plug for terminating to the downhole power cable, eliminates the need to remove the wet-mate receptacle from the tubing hanger after factory installation and system integration testing (SIT).

The downhole power cable can be terminated either onshore or offshore to the lower dry-mate plug. This termination simplifies the installation and scope of work offshore when the ESP completion is run, saving valuable rig time and significantly reducing the risk of nonproductive time on the rig floor. For offshore cable termination, the procedure for connector/cable termination allows a quick, reliable and repeatable process using simple mechanical hand tools.



Top: Tubing hanger feedthrough receptacle connector.

Bottom: Tubing hanger feedthrough receptacle connector rear with three-pin welded assembly.

APPLICATIONS

- ESPs

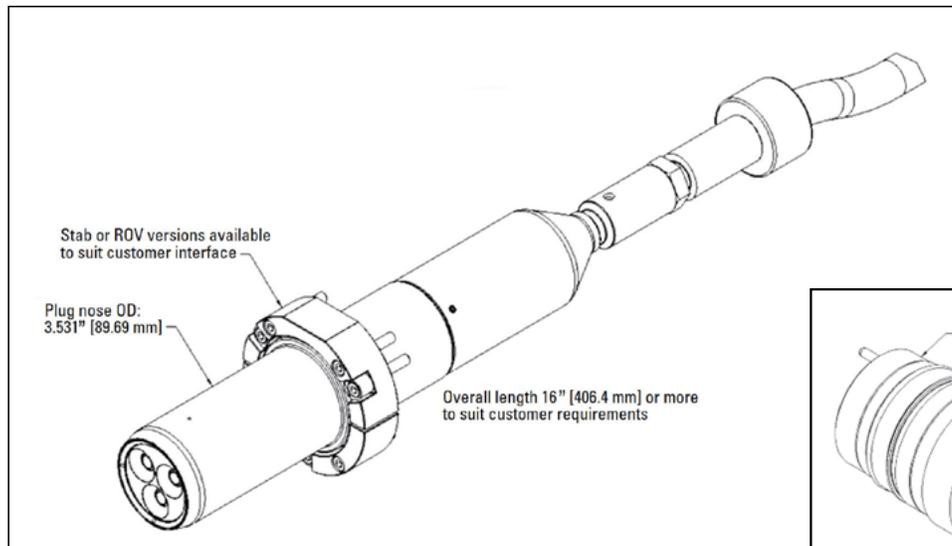
ADVANTAGES

- Pressure-balanced design to reduce stress across seals
- Male and female electrical contacts that are protected from the environment
- Crimped cable terminations (no soldering required)
- Capability of repeated subsurface mates and de-mates without loss of operational integrity
- Resistance to ingress of sand and silt deposits
- Coatings to prevent risk of galling
- Maintenance-free design
- Partial discharge-free contacts to 8.0 kV AC

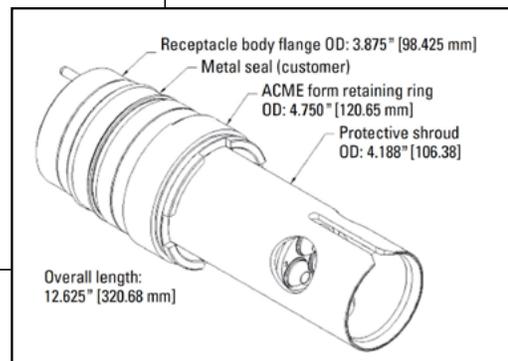
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TECHNICAL SPECIFICATIONS

MAX. OPERATING TEMPERATURE, ° F (° C)	250 (121)
STORAGE TEMPERATURE, ° F (° C)	-40 to 122 (-40 to 50)
MAX. OPERATING DEPTH, ft (m)	10,000 (3048)
WELL PRESSURE, MPa (psi)	34.5 (5000)
DESIGN LIFE (DOWNHOLE), Y	10
NUMBER OF CONTACTS	3
VOLTAGE RATING (U ₀ /U _{Um}), kV	4.6/8.0/9.2
WITHSTAND TEST VOLTAGE, kV AC	16.1
POWER FREQUENCY TEST VOLTAGE, kV AC	18.5
BREAKDOWN VOLTAGE (>8 U ₀), kV AC	>37
IMPULSE VOLTAGE LEVEL, kVp	>75
CURRENT RATING (CONTINUOUS), amp	220
INSULATION RESISTANCE AT 68° F (20° C), GΩ	>10
CONTACT RESISTANCE AT 68° F (20° C), mΩ	<2.5
HOUSING	Super-duplex stainless steel
CONTACTS	Gold-plated beryllium copper
INSULATION	Polyetheretherketone (PEEK)
SEALING SYSTEMS	Various compounded elastomers



Tubing hanger feedthrough upper plug details.



Feedthrough details.

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