Seapower 01
Single-phase wet-mateable connector

APPLICATIONS
- ESPs
- Subsea pumps for pipeline boosting and water injection
- Oil and gas separators
- Subsurface dewatering systems
- Pipeline heating systems

ADVANTAGES
- Pressure-balanced design to minimize stress across seals
- Sliding contact design that accommodates large stack-up tolerance
- Male and female electrical contacts that are protected from 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
- Resistance to H₂S and CO₂ sour well corrosion
- Capability of deployment in vertical and horizontal wells
- Coatings to prevent risk of galling
- Stab design for ESP applications; diver-mate and remote operating-vehicle-mate options are available
- Compact, maintenance-free design

The Seapower 01 single-phase wet-mateable connector provides power downhole to wireline-retrievable ESPs. Derivatives of this highly reliable and high-performance connector can also be used in other medium- and high-power applications, including subsea pumps for pipeline boosting and water injection, oil and gas separators, subsurface dewatering, and pipeline heating systems.

Design
The Seapower electrical contacts (male pin and female socket) are housed within the connector halves to protect them from the environment, thereby preventing contact corrosion. The male contact is protected with a type of dielectric oil, which is recirculated from one position in the connector to another as the connector halves are mated and de-mated. This recirculation is achieved using a sealed wiper plate and piston. When the connector halves are mated, oil flows along the male contact pin through channels moulded into the pin. The oil is then transferred through a series of drillings to a pressure-compensated reservoir inside the connector casing. When the connector halves are de-mated, oil is sucked back along the pin, forming a protective barrier.

Packaging
Connector halves are individually packaged and supplied with protective caps and installation instructions.
Seapower 01 Connector Specifications

Environmental and Mechanical

Max. operating depth, ft [m] 9,843 [3,000]
Pressure rating at 250 degF [121 degC], psi [MPa] 5,000 [34.47]
Test pressure rating, psi [MPa] 7,500 [51.71]
Operating temperature, degF [degC] 32 to 250 [0 to 121]
Storage temperature, degF [degC] –40 to 122 [–40 to 50]
Stack-up capability, in [mm] ±0.250 [6.35]
No. of wet mate/de-mate cycles 100
Design life, years
  Downhole 10
  Subsea 25

Electrical

Max. continuous operating voltage, kV DC 5
Max. test voltage at 60 s, kV DC 22
Max. continuous operating current, A 125 (depending on cable construction and ambient temperature)
Pulse current at 30 s, A 250
Insulation resistance, GΩ at 68 degF [20 degC] >1
Contact resistance at 5 kV, mΩ ≤2.5

Materials

Housing INCONEL® alloy and stainless steel options
Contacts Gold-plated beryllium copper
Insulation Polyetheretherketone (PEEK®) insulators
Diaphragms Fluorosilicone rubber and hydrogenated nitrile butadiene rubber (HNBR)

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During a temperature cycle test, the insulation resistance of the connector pair never dropped below or near the acceptance level, even at the highest temperature.

During repeated hydrostatic pressure wet mate/de-mate testing, insulation resistance of the connector decayed, possibly because of the small amount of dielectric oil lost. Up to the 100 mate/de-rate criteria, however, the resistance never dropped below the acceptance level.