VFD-1® Series

- 2000 Volt Rated
- IP-68 Ingress Protection
- Continuous 360 degree shielding
RigPower’s mission is to create new industry standards in industrial electrical connectors by combining appropriate technological advances, quality production methods and dependable customer support.

Background

Previous onshore drilling rig designs used DC motors and control systems, mostly derived from 1940-1950 era technology originally developed for diesel-electric locomotives. While these systems have proven to be reliable, many operators desire the benefits available only with Variable Frequency Drive (VFDs) systems. As these drive systems are rapidly being applied to land based drilling rigs, the unique needs of a VFD equipped mobile land rig cannot be met with standard connectors.

Variable Frequency Drives require special considerations for the proper installation and operation of the drive system as well as the proper operation of nearby or adjacent systems. The VFD-1® is the only connector both designed for the unique requirements of single conductor shielded VFD cables and rugged enough to survive in the harsh conditions of the drilling industry.

VFD Cable

Land rig VFD installations require the use of shielded single conductor cable rather than the shielded three conductor cable normally sold for VFD applications. The use of single conductor cable allows for two major advantages:

- The first advantage is the ease of manually installing and removing the cable. Each single conductor cable will obviously be lighter than a three conductor cable and, when handled individually, will be much easier to install and remove.
- The second advantage of using single conductor cables is that they only require single pole connectors. No, this isn’t trivial. The VFD-1® is commercially available, rated for 1135 amps at 2000 volts, maintains the integrity of the cable shield, is field repairable, and is safe and reliable to connect in the field. There is NO three pole connector available for shielded VFD cable.

Any multi-pole connector developed for shielded high power systems will have several intrinsic weaknesses as compared to the VFD-1® single pole connector.

- **SIZE** – The space necessary inside a conductor for three separate power connections, plus ground connections, makes for an extremely large connector. The VFD-1® connector, even with 777 cable, fits into a standard size 24 shell.
- **SAFETY** – Should a three conductor connector be accidentally disconnected under load, there will be severe phase to phase arcing. Unfortunately the arc path will have enough resistance that the breaker may not rapidly recognize the fault and current will continue to flow for several seconds, producing a spectacular fireball.
- **EMI PROTECTION** – A multi-conductor cable has only one braid shield enclosing all three phase leads and the ground(s). Often connections are made by breaking out short sections of the individual phase leads. These short segments of unshielded cable serve as almost perfect antennas for the EM noise inherent in the waveforms produced by VFD systems.

RigPower has solved these problems with the VFD-1® Series:

- **Service Ratings**: 1135 Amps, 2000 Volts
- **Small #24 Shell Size Footprint**
- **Contact Technology provides self-adjusting (Multilam) contact force for resistance to the severe load variations and vibration encountered in drilling service**
- **The conductivity of the cable shield braid is carried completely through the connector to ensure uninterrupted 360 degree protection of EMI radiation**
- **IP68 Level ingress protection to prevent moisture intrusion into cable system**
- **Cable-Receptacle mating pairs**
- **Available in nine colors for easy equipment/phase identification**

---

VFD-1® Female Receptacle

VFD-1® Male Receptacle

9/32 Dia (4) Holes (7 mm)

2 17/32 (64 mm) (83 mm)

3 1/4
All electrical carrying components on the VFD-1® series are made from Sn plated high conductivity copper. The receptacle lugs and plug contacts are designed to use the standard Hex crimp seen on all RigPower products. This standard crimp design provides a more robust and durable crimp and standardizes on the tools needed. One set of four hex die sizes will accommodate all RigPower contacts from 4/0 to 777 MCM cables.

Each insulator has an O-Ring Seal designed into the body which offers improved mounting between the insulator and receptacle shell. Additionally, the O-Ring provides a water tight seal so that the component won’t have the propensity to short or burn out, even when the cap is not installed.

90°/45° Stainless Steel Alignment Screw provides a secure attachment to the receptacle contact by way of a stainless steel Helicoil.

Bal Seal Canted Coil Springs® are versatile electrical springs that offer improved contact performance and can provide longer service life in demanding environments. The small coil size and the number of independent coils make the springs suitable for a wide variety of electrical connector designs, with maximum contact points for optimal current-carrying capability in electrical and/or EMI shielding uses.

VFD-1® Flexible Rubber Insulators

VFD-1® 90°/45° Male Receptacle Internal

The Flexible Rubber Insulation and the Flexible Electromagnetic Shield connect to the back end of the receptacle shell after installation. Once installed the ground contact band provides current carrying capability for EMI shielding.

The dead front tip design is on both male and female contacts which increases personnel safety.

VFD-1® 90°/45° Female Receptacle Internal

The Female connectors come with a Multilam Louver Strip and the RigPower patented (U.S. Patent No. 7442,096) Dead Front Delrin® Ring which provides increased safety by helping to prevent accidental contact.

RigPower CONNECTORS
**VFD-1® SERIES**

**DESCRIPTION AND DESIGN BENEFITS**

- **Patent Pending self-aligning 90/45 degree style lug** reduces cable bend radius and saves valuable space behind panel wall. Self-aligning lugs standard in 4/0, 313, 444, 535, 646 and 777 cable sizes. Metric sizes available on special order.

- **Quick acting double lead ACME threads** for rapid yet secure connections.

- **Dead front tip design** on both male and female contacts increases personnel safety.

- **Large robust safety cap** allows easy operation by personnel wearing work gloves.

- **Patent Pending flexible rubber boot** for using non-shielded cable inside enclosure. Flexes to accommodate 45 degree design lug.

- **Bal Seal Canted Coil Springs®** are versatile electrical springs that offer improved contact performance, and can provide longer service life in demanding environments. The small coil size and the number of independent coils make the springs suitable for a wide variety of electrical connector designs, with maximum contact points for optimal current-carrying capability in electrical and/or EMI shielding uses.

- **Female Receptacle Insulator** is designed to overlap the insulator of the male plug providing a double insulator layer thus allowing for increased voltage.

- **The dead front tip design** is on both male and female contacts which increases personnel safety.

- **VFD-1® Flexible Electromagnetic Shield** provides for an easy and safe connection to the receptacle.

- **Ground Contact System** provides the required grounding connection to/from the receptacle housing.
DESCRIPTION AND DESIGN BENEFITS

**Braid Shield Trap**
Cable Shield is trapped between the cone-shaped rim of the insulator and the EMI Braid Shield.

**VFD-1® Male Contact w/Braid Shield Trap**
Patent Pending EMI Braid/Shield trap allows quick connection on cable shield braid to body of connector while maintaining complete EMI protection.

**VFD-1® Female Contact w/Braid Shield Trap**
Patent Pending EMI Braid/Shield trap allows quick connection on cable shield braid to body of connector while maintaining complete EMI protection.

Both the Male and Female contacts have an O-Ring Seal designed into the body which provides a water tight seal with the plug insulator so that the component won’t have the propensity to short or burn out, even when the cap is not installed.

The dead front tip design is on both male and female contacts which increases personnel safety.

**VFD-1® Male Plug w/Kellems Grip – Red**

**VFD-1® Female Plug w/Cable Clamp – Black**

**VFD-1® Male Plug Shell Insulator**

**VFD-1® Female Plug Shell Insulator**

Each plug shell insulator has an O-Ring Seal designed into the body which offers improved mounting between the insulator and shell body. Additionally, the O-Ring provides a water tight seal so that the component won’t have the propensity to short or burn out, even when the cap is not installed.

The patented (U.S. Patent No. 7442,096) Dead Front Delrin® Ring provides increased safety by helping to prevent accidental contact.

Patent Pending EMI Braid/Shield trap allows quick connection on cable shield braid to body of connector while maintaining complete EMI protection.

Female contacts standard in 4/0, 313, 444, 535, 646 and 777 cable sizes.

**Industry Exclusive**
All RigPower Contacts have a Double Crimp Style base that is longer than other manufacturers, which provides a more complete and secure connection between the cable and contact.

- Termination method is double crimp style for cable mounted plug and receptacles
- Crimping locators are designed into the base for ease of installation
- Made from Sn plated high conductivity copper
- Uses the same crimping die sets as the RigPower “RMP®II, Secure Mount®, Safe Stab®, MCC-1™, HP20™ and MC20™” series connectors
**VFD-1® SERIES**

**PLUG FEATURES**

**VFD-1® Male Plug w/Kellems® Grip**
- **Industry Exclusive** Cable Adapter – Robust grip with knurling for easy assembly and handling.
- Cable Plugs can accommodate either a Kellems® Grip or Mechanical Clamp.
- Note the locking screw on the coupling nut provides for severe service environments.
- Quick acting double lead ACME threads are machined inside each coupling nut for rapid yet secure connections.

**VFD-1® Male Contact w/Braid Shield Tap**
- Patent Pending EMI Braid/Shield Trap allows quick connection on cable shield braid to body of connector while maintaining complete EMI protection.
- Female contacts standard in 4/0, 313, 444, 535, 646 and 777 cable sizes. Metric sizes available on special order.
- The dead front tip design is on both male and female contacts which increases personnel safety.
- Large robust safety cap allows easy installation by personnel wearing work gloves.
- The Male Insulator is designed to insert into the female plug providing a double insulator layer thus allowing for increased voltage.

**VFD-1® Female Plug w/Mechanical Clamp**
- **Industry Exclusive** Cable Adapter – Robust grip with knurling for easy assembly and handling.
- Cable Plugs can accommodate either a Mechanical Clamp or Kellems® Grip.
- Oversized, robust coupling nut allows for easy, yet secure, connection.

**VFD-1® Female Contact w/Braid Shield Tap**
- Patent Pending EMI Braid/Shield Trap allows quick connection on cable shield braid to body of connector while maintaining complete EMI protection.
- Female contacts standard in 4/0, 313, 444, 535, 646 and 777 cable sizes. Metric sizes available on special order.
- The patented (U.S. Patent No. 7442,096) Dead Front Delrin® Ring provides increased safety by helping to prevent accidental contact.
- Large robust safety cap allows easy installation by personnel wearing work gloves.
- The VFD-1® series female receptacles are available with the Multilam Contact System. The Multilam Louver Strip allows electrical contact to be made via a large number of defined, current carrying contact points.
  - High resistance to heat
  - Sufficiently high contact forces
  - High number of contact cycles
  - Excellent resistance to corrosion
  - Resistance to vibration
  - Long product life
  - High electrical and thermal conductivity
### VFD-1® Male or Female Plugs

<table>
<thead>
<tr>
<th>Part Number</th>
<th>Part Description</th>
<th>Part Number</th>
<th>Part Description</th>
</tr>
</thead>
<tbody>
<tr>
<td>VFD1-4F</td>
<td>4/0 Female Contact</td>
<td>VFD1-3F</td>
<td>3/0 Female Contact</td>
</tr>
<tr>
<td>VFD1-4F</td>
<td>4/0 Female Contact</td>
<td>VFD1-3F</td>
<td>3/0 Female Contact</td>
</tr>
<tr>
<td>VFD1-4F</td>
<td>4/0 Female Contact</td>
<td>VFD1-3F</td>
<td>3/0 Female Contact</td>
</tr>
<tr>
<td>VFD1-4F</td>
<td>4/0 Female Contact</td>
<td>VFD1-3F</td>
<td>3/0 Female Contact</td>
</tr>
</tbody>
</table>

### VFD-1® Panel Mount Receptacles

<table>
<thead>
<tr>
<th>Part Number</th>
<th>Part Description</th>
</tr>
</thead>
<tbody>
<tr>
<td>VFD1-PC-XX</td>
<td>Panel Mount Receptacle</td>
</tr>
<tr>
<td>VFD1-PC-XX</td>
<td>Panel Mount Receptacle</td>
</tr>
<tr>
<td>VFD1-PC-XX</td>
<td>Panel Mount Receptacle</td>
</tr>
</tbody>
</table>

### VFD-1® Female Assembly Tool
- Complete Three Piece Set
- Allows quick and easy installation of both front and rear retaining rings.
- Made of 316 Stainless Steel for Durability
- Allows field repair of VFD cables

### VFD-1® Male Assembly Tool
- Complete Two Piece Set
- Allows quick and easy installation of retaining rings.
- Made of 316 Stainless Steel for Durability
- Allows field repair of VFD cables

### Mechanical Clamp
Has a dual holding pattern. One size for larger cables, reverse it and it accommodates smaller cables more effectively.

### Kellems® Grip
Provides extra protection from high tensile loads on cables.

*Kellems*, a Registered Trademark of Hubbell Inc.
The VFD-1® Series:
- 2000 Volt Rated
- IP-68 Ingress Protection
- Continuous 360 degree shielding

Single Pole High-Amperage Connectors for Use with VFD systems on Land-Based and Off-Shore Oil Drilling Rigs and Other High-Amperage Power Generation Applications

For Use With Single Conductor Cables 4/0 MCM to 777 MCM

If You Want The Very Best Single Pole Electrical Connectors
Demand Genuine RigPower Electrical Parts

Look for these other fine products from RigPower:
RMP® II Series, Secure Mount® Series, Safe Stab®, Quick Stab®, Quad Stab Series,
MCC-1™ Series, HP20™ Series, MC20™ Series and The Phase-Lock® Sequential Locking System