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REDA Cables

Power cables and motor lead extensions


Schlumberger has been the
recognized leader of ESP power
cables for more than 70 years.

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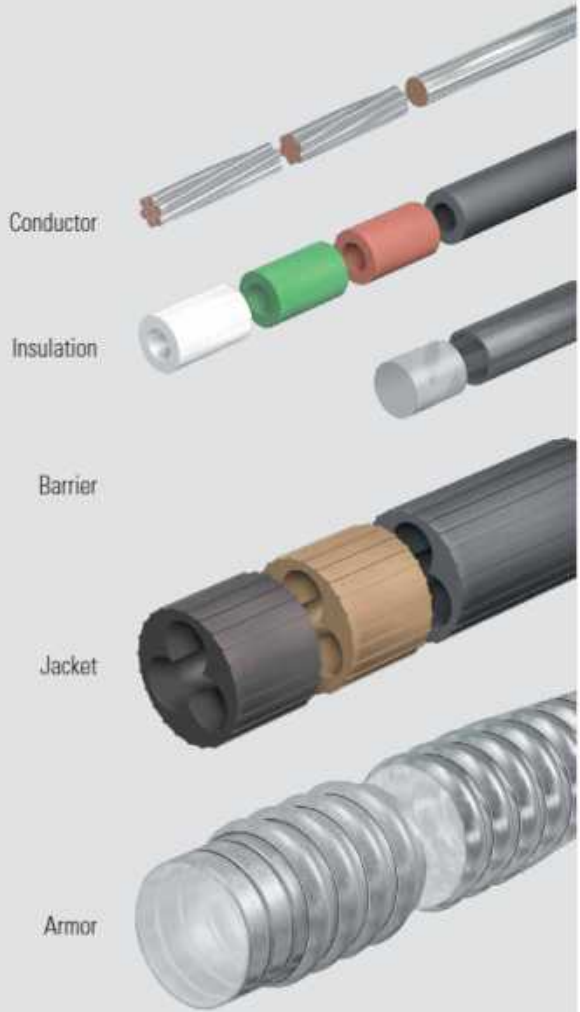


REDA ESP Power Cables

High-integrity cable products

Constructed from the latest material technologies, built with advanced manufacturing, and tested using the industry's most sophisticated methods, the REDA* ESP power cables are strategically designed to maximize overall ESP system run life. All REDA ESP cables incorporate fully annealed, high-conductivity copper and tin, lead, alloy-coated conductors for additional protection against corrosion. An optional armored capillary tube design combines the power cable and an injection tube into one package—simplifying workover operations and preventing damage to the injection tube.

Customized design and manufacturing

The REDA ESP power cables consist of three family lines:

- REDA MAX* ESP Power Cables, REDA Lead* ESP Power Cables, and REDA 8 kV Power Cable

These cables cover a wide range of ESP applications, from low-temperature, low-gas-content wells to high-temperature, high-pressure, gassy and corrosive conditions. A basic configuration of the main components is suitable for most well conditions. Each standard cable can be customized to suit the specific requirements of a given well, including temperature and pressure ratings, corrosive properties, and gas/oil ratios.

Specifications[1]

Type	Profile	Maximum Temperature	Insulation	Barrier	Jacketing
REDA MAX 250 PPEO	Round	96 degC [205 degF]	Polypropylene	None	Nitrile
REDA MAX 250 PP	Flat	121 degC [250 degF]	Polypropylene	None	Polypropylene
REDA MAX 250 PTB	Flat	121 degC [250 degF]	Polypropylene	Fluoropolymer tape and braid	None
REDA MAX 250 POTB	Flat	121 degC [250 degF]	Polypropylene	Fluoropolymer tape and braid	Nitrile
REDA MAX 400 EE	Round	204 degC [400 degF]	EPDM	None	EPDM
REDA MAX 400 ETBE	Flat, round	204 degC [400 degF]	EPDM	Fluoropolymer tape and braid	EPDM
REDA Lead ELB	Flat	232 degC [450 degF]	EPDM	Lead and braid	None
REDA Lead ELBE	Round	232 degC [450 degF]	EPDM	Lead and braid	EPDM
REDA Lead EHLTB	Flat	232 degC [450 degF]	EPDM	Heavy lead and fluoropolymer tape	None
REDA 8 kV	Round	204 degC [400 degF]	EPDM, semiCon	Metallic shield, heavy lead, and fluoropolymer tape	EPDM

[1] Materials and specifications are subject to change without notice.

REDA MAX Family Cables

Long-term integrity for typical well environments

REDA MAX family cables are designed primarily for nonaggressive conditions. The cables are made of either a modified variant of ethylene propylene diene rubber (EPDM) or an enhanced polypropylene formulation, both of which contribute to a long insulation system life. This material was developed through years of research and continuous improvements in thermoplastic and elastomer technology. The polypropylene formulation supports a high-temperature rating of up to 121 degC [250 degF] without compromising mechanical and insulating properties. The EPDM insulation-jacket compounds are based on our extensive experience in elastomer formulation and mixing. The EPDM has high elasticity, tensile strength, and maximized dielectric and thermal aging properties, supporting an elevated temperature rating up to 204 degC [400 degF].

The REDA MAX ESP power cables family consists of two product lines:

- **REDA MAX 250** ranges from water and oil well applications with low-temperature and nonaggressive wells (PP) to low temperatures and low levels of gas (PPEO).
- **REDA MAX 400** covers oil applications with high temperatures and moderate gas levels (EE, ETBE).

ALL SCHLUMBERGER POWER CABLES OFFER

- fully annealed, high-conductive copper
- alloy-coated copper conductors for increased corrosion protection
- an adhesive layer between the conductor and insulation to prevent gas migration
- various grades of armor, ranging from standard galvanized steel to Monel® alloys
- various voltage ratings
- cables with integral stainless steel tubing(s) for continuous downhole chemical treatment.


Cost-effective
solution for
less demanding
environments

REDA MAX 250 ESP Power Cables

Polypropylene nitrile-jacket construction (PPEO)

Applications

- Low-gas-content wells
- Low-temperature wells

Key Features

- Polypropylene insulation with an oil-resistant nitrile jacket
- Exterior metal armor wrap for protection from mechanical damage

Polypropylene construction (PP)

Applications

- Medium-temperature, nonaggressive oil wells

Key Features

- Polypropylene insulation and a polypropylene jacket on each conductor
- Exterior metal armor wrap for protection from mechanical damage

Polypropylene tape-and-braid construction (PTB)

Applications

- Medium-temperature, mildly aggressive oil wells

Key Features

- Polypropylene insulation jacket
- Fluoropolymer tape barrier and braid for protection from more aggressive well fluids and mechanical hoop strength to protect against explosive decompression in gassy environments

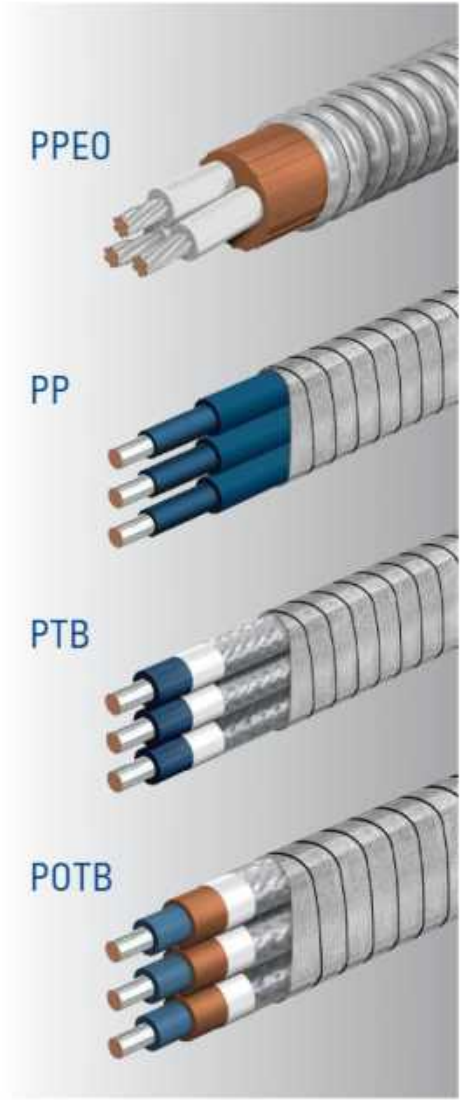
Polypropylene nitrile-jacket, tape-and-braid construction (POTB)

Applications

- Moderate-gas, moderately corrosive, and moderate-temperature wells

Key Features

- Polypropylene insulation with an oil-resistant nitrile jacket on each conductor
- Fluoropolymer tape barrier and braid for protection from more aggressive well fluids and mechanical hoop strength to protect against explosive decompression in gassy environments



REDA MAX 400 ESP Power Cables

ETBE construction

Applications

- Moderately gassy wells
- High-temperature applications

Key Features

- High maximum conductor temperature, 204 degC [400 degF]
- Adhesive layer between conductor and EPDM to prevent gas migration and eliminate damage caused by gas ingress
- EPDM insulation and jacket that offers long-term insulation electrical properties and damage resistance for reuse and extended run life
- Fluoropolymer tape barrier and braid for protection from aggressive well fluids and mechanical hoop strength to protect against explosive decompression in gassy environments
- Available in round and flat profiles

EE construction

Applications

- Low-gas wells
- High-temperature applications

Key Features

- EPDM insulation and jacket that offers long-term insulation electrical properties
- High maximum conductor temperature, 204 degC [400 degF]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REDA Lead ESP Power Cables

Best-in-class lead barrier formulation for HPHT conditions

REDA LEAD family cables are designed primarily for oil well applications with high-temperature, gassy or corrosive wells, or both (ELB and ELBE). All REDA Lead cables incorporate advanced EPDM insulation, as well as best-in-class impervious lead barriers, for long-lasting durability. The EPDM-insulation-jacket compounds are based on our extensive experience in elastomer formulation and mixing. A thicker lead barrier provides excellent protection to gas and corrosive fluids.

ELB and ELBE construction

Applications

- Oil wells with high temperatures
- Gassy or corrosive wells, or both

Key Features

- Maximum temperature conductor, 232 degC [450 degF]
- Alloy-coated copper conductor to protect against corrosion
- Impervious lead barrier that prevents failure from chemical attack and gas decompression

EHLTB construction

Applications

- Heavy lead version combined with fluoropolymer tape provides additional resistance in high-temperature or highly corrosive wells, or both

Key Features

- Thicker lead barrier provides excellent protection to gas and corrosive fluids
- Fluorocarbon tape barrier for protection from chemicals and gas decompression and mechanical hoop strength to protect against explosive decompression in gassy environments

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Safety
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Safety

REDAV8

Highly reliable shielded cable for downhole applications

Offshore deepwater high-horsepower ESP projects demand specific, high-quality products. The power cable is an essential component to achieve long run life of the system. The REDAV8* shielded 8kV high-voltage ESP cable complements ESP systems that have been successfully implemented in deepwater projects where maximum reliability is expected.

The patented REDAV8 cable is the first shielded 8-kV cable with a conductor shield, insulation shield, and metallic shield, and it meets the high-voltage industry standards for ESP applications. In addition, it incorporates fully annealed high-conductivity copper with tin-lead alloy coating for corrosion protection, advanced ethylene propylene diene monomer (EPDM) rubber insulation, best-in-class impervious lead barriers, and double armor for additional mechanical protection.

REDA 8 kV power cable

Applications

- Offshore deepwater and subsea ESP applications
- Applications with high-horsepower requirements
- Applications requiring increased reliability
- High-temperature wells

Key Features

- 8-kV–voltage rating from phase to phase
- Increased insulation wall thickness
- Semiconductive conductor shield and insulation shield
- Metallic shield
- High-current capability, above 200 A
- Compliant with industry standards for medium-voltage cables (ANSI/ICEA S-93-639, IEC 60502-2)

SESLTBE

Created for the most demanding offshore environments.

Motor Lead Extensions

Optimum combination of installation clearance and downhole performance

The maximum conductor temperature ratings for the motor lead extension (MLE) designs range from 250 to 550 degF [121 to 288 degC]. MLEs incorporate flat cable profiles to facilitate better clearance. Polyimide, used as the primary insulation for numerous designs, significantly reduces cable dimensions creating a slim profile for tight downhole conditions. The KEOTB, KELB, and KELTB motorlead constructions use a dual-layer insulation system, consisting of a primary layer of polyimide tape and a secondary layer of EPDM. Lead and fluorocarbon tape barriers prevent chemical attack and gas decompression failures for superior performance in hot, gassy environments.

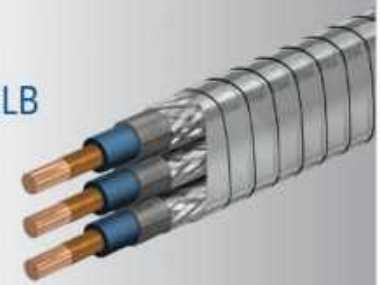
For extreme-high-temperature or specialty applications, PEEK is utilized as the primary dielectric material. The same patented and proprietary materials used in REDA ESP power cables are used in the MLE designs as secondary insulations and jackets, maximizing system reliability to its fullest.

Specifications[1]

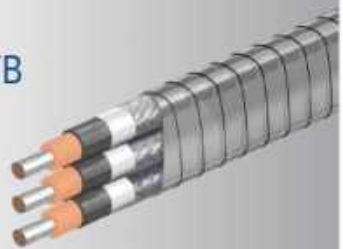
Cable Construction	Maximum Temperature	Pothead/Motor Compatibility	Insulation	Barrier	Applications
KEOTB	121 degC [250 degF]	Legacy tape-in, legacy plug-in, MaxLok* plug-in	Polyimide/EPDM	Fluoropolymer tape and nitrile	Low temperature, low gas, potable water
KELTB-LP	149 degC [300 degF]	Legacy tape-in, legacy plug-In	Polyimide/EPDM	Lead and fluoropolymer tape	Moderate temperature, moderate gas, reduced clearance
KELB	149 degC [300 degF] 204 degC [400 degF]	Legacy tape-in, legacy plug-in, MaxLok plug-in	Polyimide/EPDM	Lead	Moderate to high temperature, high gas
PEEKLB	232 degC [450 degF]	Trident*	PEEK	Lead	High temperature, high H_2S, high hp, extreme reliability
PEEKLB	260 degC [500 degF]	Hotline* 550	PEEK	Lead	Very high temperature, SAGD, steam flooding
XHLTB	288 degC [550 degF]	HotlineSA3*	High-temperature polyimide	Heavy lead and fluoropolymer	Extremely high temperature, SAGD, steam flooding

KEOTB

KELB



XHLTB



MaxLok ESP Motor Lead Extension

Plug-and-play pothead connection

The MaxLok ESP motor lead extension is an integral component of the overall Maximus ESP system, which addresses the needs of extreme weather operations by providing a quick plug-and-play capability during ESP assembly. These connectors eliminate the taping process of the pothead to the motor at the wellsite, considerably reducing the assembly time. Maximus motors include a spring-loaded, sealed terminal block that prevents oil loss when the MaxLok extension is disconnected but allows pressure equalization when the motor head is attached.

Currently being used in thousands of Maximus ESP system installations worldwide, the MaxLok 400 design has proven to be successful in the field. It incorporates advanced materials and design within the traditional MLE concept. Its numerous advantages over conventional plug-in and tape-in systems include improved temperature rating, longer path to ground, 5-kV uniform voltage rating, and a proprietary sealing method that minimizes the internal stresses on pothead components.

MaxLok 400 MLE

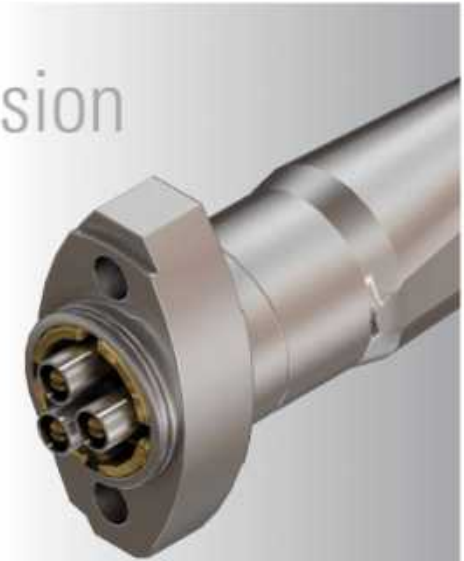
Applications

- Standard 456 and 562 REDA Maximus ESP systems

Key Features

- Longer path to ground
- Uniform voltage rating, 5 kV
- Proprietary sealing methods
- Temperature rating of -40 to 400 degF [-40 to 204 degC]

HotlineSA3 ESP Motor Lead Extension



Improved reliability, simplified connection

The HotlineSA3 ESP system is specially designed for steam injection wells. The fully integrated system provides improved reliability, increased temperature rating and range, extra functionality, and simplifed installation. It also features a completely new MLE for challenging SAGD environments.

The HotlineSA3 ESP motor lead extension has been developed to handle the high temperatures inherent to thermal applications and corrosive conditions. It incorporates a plug-in pothead concept with high-temperature elastomers and a dual O-ring design (high- and low-temperature O-rings) to maintain a reliable seal at all times, including during shipping, cold-installation conditions, and operation.

HotlineSA3 MLE

Applications

- Thermal recovery projects, such as SAGD

Key Features

- Temperature rating of -40 to 550 degF [-40 to 288 degC]
- New, high-temperature MLE insulation
- New, high-temperature taped barrier
- Completely sealed motor plug-in connection
- Dual O-ring configuration

Trident Extreme Conditions Motor Lead Extension

Robust, plug-in design for critical applications

Trident ESP pothead connectors are designed with materials specifically selected and qualified to improve reliability in subsea, offshore, and onshore high-profile wells, as well as environments with high presence of hydrogen sulfide. PEEK-insulated copper conductor leads plug directly into the motor through individual connectors. This design minimizes the space required for the connector, provides greater heat dissipation during operation, and minimizes the need to manually manipulate the cable and connector during connection into the motor.

The motorhead design ensures that the MLE and individual Trident connectors are protected from mechanical damage while the ESP system is being lowered into the well. Test ports for each individual conductor verify the integrity of the O-ring seal during installation, before running the system into the hole.

Applications

- High-horsepower REDA Maximus ESP systems
- High-H_2S environments
- Offshore and onshore high-profile wells

Key Features

- PEEK-insulated conductors
- Optional test ports in motorhead for each individual conductor
- Advanced elastomers to handle wide temperature swings

Specifications[1]

ESP System	Connector Size	Maximum Temperature	Motor OD, in	Minimum Casing Size, in
Maximus, 738 series	Trident, 1 AWG	204 degC [400 degF] 232 degC [450 degF]	7.38	8⅝
Maximus, 562 series (high HP)	Trident, 1 AWG	204 degC [400 degF]	6.25 (motor head) 5.62 (motor housing)	7⅝
Maximus, 562 series (standard HP)	Trident, 4 AWG	149 degC [300 degF] 204 degC [400 degF]	5.62	7

[1] Materials and specifications are subject to change without notice.

Lawrence Technology Center

Designing and manufacturing power cable products since 1989

The Schlumberger Lawrence Technology Center (LTC), located in Lawrence, Kansas, USA, consists of approximately 350,000 ft^2 of the world's most modern cable fabrication and custom molding space. More than 160 employees work together to design, manufacture, and test custom-designed power cables for ESP systems. The primary product line manufactured at LTC is the REDA MAX ESP power cables. With state-of-the-art facilities and equipment and extensive research and development at the polymer laboratory, products created at LTC provide customers with unparalleled performance.

More than 80 years of artificial lift experience

Schlumberger offers industry-leading systems for any application, well, or environment. In addition to our wide range of ESP components, we offer state-of-the-art surface electrical equipment, engineering services, and real-time monitoring solutions to optimize lift operations around the world.

- Assembly, repair, and testing center
- Technology center
- Manufacturing center

REDA Cables

Power cables
and motor lead extensions

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