



Electrical Downhole Cable

Weatherford's electrical downhole cable provides a reliable pathway between the in-well pressure and temperature gauges and surface data acquisition unit for both telemetry and power.

The permanent electrical downhole cable consists of four main elements plus optional encapsulation providing additional mechanical and chemical protection. Tubing encased cable consists of a seven stranded tinned copper core with an outer insulating coat, additional insulation is provided by the filler, which is used to centralize and anchor the conductor within the tubing.

Material specification (metallurgy, wall thickness, polymer encapsulation selection) of each component is important to ensure the cable is matched to well conditions ensuring reliability and performance is maximized.

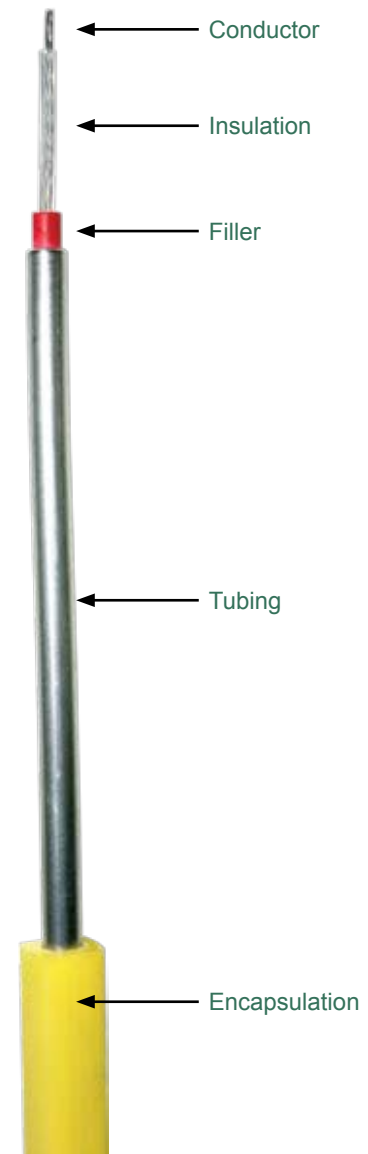
Applications

Weatherford's electrical downhole cable is used in conjunction with a range of permanently installed electronic downhole pressure and temperature sensing tools.

Features, Advantages and Benefits

- Splice free lengths >30,000 ft. (>9144 m.)
- Tubing material: 316L and Incoloy® 825
- All cables are pressure tested prior to leaving the manufacturing plant, testing verifies cable armor integrity, this is in addition to the standard 'Eddie Current Testing' process
- Encapsulation available in a range of polymeric materials to suit various well conditions
- Stranded core maximizes power and telemetry transmission characteristics
- Process enhancements such as improved core concentricity, diameter tolerance and surface finish improve reliability
- Installation technique isolates and protects the cable from stress, thus ensuring reliability throughout the life of the well

Incoloy is a registered trademark of the Special Metals Corporation group of companies.





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Specifications

| TEC Cable Specifications | Tube Wall Thickness, in. (mm) | | |
|--|--|--|-----------------------------|
| | 0.028 (0.71) 316L SS or INCOLOY 825 | 0.035 (0.89) 316L SS or INCOLOY 825 | 0.049 (1.24) INCOLOY 825 |
| Construction | | | |
| Conductor | 7 strand tin copper - 18 AWG | | |
| Insulator, in. (mm) | TEFZEL (ETFE) wall thickness 0.030 (0.76) | | |
| Filler layer | Expanded polyolefin | | |
| Tubing OD, in. (mm) | 0.25 (6.35) | | |
| Physical Properties | | | |
| Continuous maximum operating pressure, psi (bar) | 316L SS-11,500 (792.94) INC 825-13,500 (930.84) | 316L SS-17,500 (1206.65) INC 825-18,000 (1241.12) | INC 825-26,000 (1792.73) |
| Collapse pressure, psi (bar) | 316L SS-17,500 (1206.65) INC 825-20,000 (1379.03) | 316L SS-26,000 (1792.73) INC 825-27,000 (1861.68) | INC 825-39,000 (2689.10) |
| Weight, lbs per 1000 ft. (kg per 1000 m) | 316L SS-85 (126.5) INC 825-148 (220.25) | 316L SS-97 (144.36) INC 825-160 (238.12) | INC 825-120 (180.08) |
| Electrical Properties | | | |
| Armor DC resistance, 68°F (20°C), Ohms per 1000 ft. (Ohms per 1000 m) | 316L SS-17.9 (58.8) INC 825-27.3 (89.6) | 316L SS-15 (49.22) INC 825-22.5 (73.82) | INC 825-17.2 (56.43) |
| Capacitance, conductor to tube, pf per ft. (pf per m) | 316L SS-23.3 (76.45) INC 825-23 (75.46) | 316L SS-25 (82.03) INC 825-30 (98.43) | INC 825-36 (118.12) |
| Conductor DC resistance, 68°F (20°C), Ohms per 1000 ft. (Ohms per 1000 m) | 6.7 (21.98) | | |
| Voltage rating (continuous) | 1000 VDC | | |
| Insulation resistance, 68°F (20°C), conductor to tube, MOhms per 1000 ft. (MOhms per 1000 m) | 884 (2900) | | |

| Encapsulation Type | Maximum Temperature Rating (°F/°C) | Abrasion Resistance | Resistance to Brines | Resistance to Hydrocarbons |
|--------------------------------|------------------------------------|---------------------|----------------------|----------------------------|
| Nylon 11 (Rilsan 11) | 275 (135) | 5 | 3 | 5 |
| Polypropylene impact copolymer | 302 (150) | 3 | 5 | 3 |
| Santoprene 203-50 | 302 (150) | 3 | 5 | 3 |
| Kynar PVDF or Hylar PVDF | 302 (150) | 4 | 4 | 5 |
| ECTFE 350 | 302 (150) | 5 | 5 | 5 |
| ETFE | 302 (150) | 4 | 5 | 5 |

Recommended guidelines: 5 = Excellent, 1 = Poor