

IEEE Recommended Practice for Specifying Electric Submersible Pump Cable—Ethylene-Propylene Rubber Insulation

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Sponsor
**Petroleum and Chemical Industry Committee
of the
IEEE Industry Applications Society**

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Abstract: Minimum requirements for the construction, manufacturing, purchasing, and application of electric submersible pump (ESP) cable are presented. The cable is round or flat, with ethylene-propylene rubber insulation, nitrile jacket, and armor, and is rated for voltages not exceeding 3 kV or 5 kV and for ambient temperatures not exceeding 284 °F. Conductors, insulation, barrier (optional), assembly and jacket, armor, requirements for testing by the manufacturer, and cable ampacity are covered.

Keywords: test equipment, dc hi-pot test methods, test voltages.

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Foreword

(This foreword is not a part of IEEE Std 1018-1991, IEEE Recommended Practice for Specifying Electric Submersible Pump Cable—Ethylene-Propylene Rubber Insulation.)

This recommended practice, under the jurisdiction of the Petroleum and Chemical Industry Committee of the IEEE Industry Applications Society, presents minimum requirements for the construction, manufacturing, purchasing, and application of electric submersible pump cable. The configuration of the cable is either round or flat, with ethylene-propylene rubber insulation, nitrile jacket, and armor.

Anyone desiring to use this recommended practice may do so. It is presented as minimum criteria for construction of this class of submersible cable. It is not intended to restrict innovation or to limit development of improvements in cable design. Every effort has been made to assure the accuracy and reliability of the data contained herein; however, the committee makes no representation, warranty, or guarantee in connection with the publication of this specification and hereby expressly disclaims any liability or responsibility for loss or damage resulting from its use, for any violation of any federal, state, or municipal regulation with which it may conflict, or for the infringement of any patent resulting from the use of this document.

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IEEE Recommended Practice for Specifying Electric Submersible Pump Cable— Ethylene-Propylene Rubber Insulation

1. Scope

This recommended practice establishes requirements for three-conductor round-and-flat-type oil-well cables used in supplying three-phase ac electric power to submersible pump motors. The major cable components are: copper conductors, ethylene-propylene diene monomer (EPDM) insulation, nitrile jacket, and galvanized armor. Cables meeting the requirements of the recommended practice shall be rated for voltages not exceeding 3 kV or 5 kV and for conductor temperatures not exceeding 284 °F. Use of cable above rated temperature can cause premature deterioration of the insulation and jacketing. Voltage ratings are nominal phase-to-phase ratings.

Cable purchased under the recommendation of this document, unless otherwise specified herein, should meet the requirements of ASTM B3-1990 [5]¹, ASTM B8-1991 [6], ASTM B33-1991 [7], ASTM B189-1990 [8], ASTM B496-1992 [9], and ICEA S-68-516 [10], where applicable.

This recommended practice recognizes the common practice of continuing to operate the pump's electrical system after a phase has faulted to ground and that some power distribution systems are even designed with one corner of the delta system grounded. The purpose of this recommended practice is not to condone or disapprove such practice, but the user should be aware that such operation produces a higher than normal phase-to-ground voltage across the insulation jacket dielectric of the two ungrounded conductors. Due to the disruption of the normally balanced three-phase field, such operation produces stresses through the insulation/jacket dielectric, which shortens cable life. ICEA S-68-516 [10] recommends a 173% insulation level for grounded-phase operation, but this is often impractical for downhole oil well cable; therefore, this specifying standard recommends insulation thicknesses based on a normal three-phase energized delta or wye system, with no phase grounded.

¹Numbers in brackets correspond to those of the references listed in Section 2.