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IEEE Recommended Practice for 1 kV to 35 kV Medium-Voltage DC Power Systems on Ships

IEEE Industry Applications Society

Sponsored by the
Petroleum & Chemical Industry Committee

and the

IEEE Power Electronics Society

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Standards Committee

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IEEE Std 1709™-2018
(Revision of IEEE Std 1709-2010)

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Abstract: Guidelines to specify, procure, design, manufacture and develop manuals, safety procedures, practices and procedures for effective maintenance of medium-voltage direct current (MVDC) electrical power systems are discussed in this recommended practice. Recommendations are made for analytical methods, preferred interconnection interfaces and performance characteristics for reliable integration of MVDC electrical components into the ship MVDC electrical power systems.

Keywords: IEEE 1709™, integrated power systems, marine electrical-power systems, medium-voltage direct current, MVDC, PEBB, power electronic building blocks, power electronics

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Introduction

This introduction is not part of IEEE Std 1709-2018, IEEE Recommended Practice for 1 kV to 35 kV Medium-Voltage DC Power Systems on Ships.

The purpose of this recommended practice is to provide recommendations that can be used by medium-voltage dc (MVDC) Power systems stakeholders and designers for applying contemporary technologies to generate, convert, and distribute shipboard MVDC electrical power with desired reliability, survivability, and power quality.

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IEEE Recommended Practice for 1 kV to 35 kV Medium-Voltage DC Power Systems on Ships

1. Overview

This recommended practice addresses specific aspects of shipboard medium-voltage dc (MVDC) power systems and defines recommended practice for applying contemporary technologies to convert and distribute shipboard electrical power with adequate reliability, survivability, and power quality. It is not intended in any way to impede development of new or improved techniques.

Target users for this recommended practice are evaluators and designers of electrical power systems for commercial marine and military applications, commercial and military ship end-users, shipbuilders, port operators, classification societies, machinery and equipment manufacturers, research institutes, and universities.

1.1 Scope

This recommended practice provides analytical methods, preferred interconnection interfaces, performance characteristics and testing for applying 1 kV to 35 kV MVDC power distribution and dc power-delivery systems on ships.

1.2 Purpose

The purpose of this recommended practice is to define requirements on proper interfaces, sizing, life cycle cost, efficiency and risk reduction of MVDC power systems implementation. It complements the family of IEEE 45 standards (IEEE Recommended Practice for Electric Installations on Shipboard).

1.3 Power electronics in MVDC power systems

Recent successes in the development of fast switching medium-voltage power semiconductors made it possible to realize the following:

— Simplifying connection and disconnection of different types and ratings of power generation and electrical energy storage devices.

— Limiting and managing fault currents and enabling reconfiguration.

— Eliminating reactive voltage drop.