IEEE Guide for Batteries for Uninterruptible Power Supply Systems

IEEE Power Engineering Society

Sponsored by the
Stationary Battery Committee

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Abstract: Various battery systems are discussed so that the user can make informed decisions on selection, installation design, installation, maintenance, and testing of stationary standby batteries used in uninterruptible power supply (UPS) systems. This guide describes how the UPS battery charging and converter components can relate to the selection of the battery systems. Design requirements of the UPS components are beyond the scope of this document. Battery back-up systems for dc-output rectifiers are also beyond the scope of this document. .
Keywords: battery system, Ni-Cd batteries (Ni-Cd), uninterruptible power supply, UPS, valve-regulated leadacid (VRLA), vented lead-acid batteries (VLA)

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Introduction

This introduction is not part of IEEE Std 1184-2006, IEEE Guide for Batteries for Uninterruptible Power Supply Systems.

Our society's increasing dependence on computerized information has resulted in the expanded use of uninterruptible power systems (UPS) to ensure the integrity of essential power systems. These systems require that stored energy be available to maintain operation. Although rotating inertia has at times been used to store this energy, batteries remain the preferred method of energy storage for this purpose. An array of battery designs and extensive technologies are available to the user.

This guide is intended to inform the user of the various battery technologies available and some of the design points to be considered when selecting a battery for UPS applications. Some of the battery design options that result in volumetric efficiency may also result in reduced life. This guide can help the user to become aware of which designs and operating procedures can result in optimum battery life. This guide is intended to be used along with IEEE Std 485™, IEEE Recommended Practice for Sizing Lead-Acid Batteries for Stationary Applications; IEEE Std 484™, IEEE Recommended Practice for Installation Design and Installation of Vented Lead-Acid Batteries for Stationary Applications; IEEE Std 450™, IEEE Recommended Practice for Maintenance, Testing, and Replacement of Vented Lead-Acid Batteries for Stationary Applications; and IEEE Std 1106™, IEEE Recommended Practice for Installation, Maintenance, Testing, and Replacement of Vented Nickel-Cadmium Batteries for Stationary Applications.

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1. Overview

1.1 Scope

This guide discusses various battery systems so that the user can make informed decisions on selection, installation design, installation, maintenance, and testing of stationary standby batteries used in uninterruptible power supply (UPS) systems. This guide describes how the UPS battery charging and converter components can relate to the selection of the battery systems. Design requirements of the UPS components are beyond the scope of this document. Battery back-up systems for dc-output rectifiers are also beyond the scope of this document. While this document applies to all UPS systems, it may be impractical to implement some of its guidance and recommendations with small, self-contained systems, such as products intended to back up individual personal computers.

This guide divides the available technologies into the following three main categories:

— Vented lead-acid batteries (VLA)

— Valve-regulated lead acid (VRLA)

— Ni-Cd batteries (Ni-Cd)

For each category, the technology and the design of the battery are described in order to facilitate user selection. The specific advantages for particular applications are also listed.

1.2 Purpose

This guide is intended to assist those involved with battery systems for uninterruptible power supply systems. Proper design, installation, and maintenance will enable the user to manage the battery system for optimum operation and results.