

双有源桥变换器电流应力优化的双重移相调制方式

王仁龙^{1,2}, 李永建^{1,2}, 李珊珊^{1,2}, 杨庆新^{1,2}

作者信息

Improved Dual Phase-shift Modulation Mode Based on Current Stress Optimization of Dual Active Bridge DC-DC Converter

WANG Renlong^{1,2}, LI Yongjian^{1,2}, LI Shanhu^{1,2}, YANG Qingxin^{1,2}

Author information

History

摘要

为了减小双有源桥DAB (dual active bridge) 变换器在双重移相DPS (dual phase-shift) 调制方式时,由于变压器原、副边电压不匹配导致电流应力增大的问题,基于DPS调制方式,在不增加新的移相控制变量的前提下,改变内外移相角间的约束关系,提出了一种电流应力优化的新型移相IDPS (improved dual phase-shift) 调节方式,分析了IDPS工作特性,建立电流与功率的数学模型,提出电流应力优化控制方法,并与传统DPS调制方式对比,分析电流应力与回流功率特性。最后搭建实验平台验证,提出的DPS调制方式与传统DPS方式相比,降低了轻载与中载时的电流应力与回流功率。

Abstract

To reduce the increasing current stress caused by the voltage mismatch between the primary and secondary sides of a dual active bridge (DAB) DC-DC converter with dual phase-shift (DPS) modulation, an improved dual phase-shift (IDPS) modulation mode based on current stress optimization is proposed in this paper, which changes the constraint relationship between the internal and external phase-shift angles without adding new phase-shift control variables. The working characteristics of IDPS modulation are analyzed, and a mathematical model of current and power is established. The optimization and control method for current stress is put forward, and the current stress and flowback power characteristics are analyzed in comparison with the traditional DPS modulation mode. Finally, an experimental platform was built, and it was verified that compared with the traditional DPS modulation mode, the proposed IDPS modulation mode can reduce the current stress and flowback power under light and medium loads.

关键词

双有源桥 / 双重移相调制 / 电流应力 / 回流功率

Key words

dual active bridge (DAB) / dual phase-shift (DPS) modulation / current stress / flowback power

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