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电工理论与新技术

恒定干扰磁场下电磁继电器静态特性的有限元分析

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摘要： 电磁继电器作为控制元件被广泛应用于各种电子设备和系统。保证电磁继电器之间及其与系统中其它组件之间的电磁兼容性是系统可靠运行的重要环节之一。该文针对以往电磁继电器生产厂家一直没有给出继电器产品的电磁兼容性指标问题，建立了电磁继电器在不同方向恒定磁场干扰下的矢量磁位有限元数学模型，并采用ANSYS软件分析给出了电磁继电器对空间磁干扰的最敏感方向，研究了该敏感方向下恒定干扰磁场B的大小与继电器静态特性的配合关系的影响规律，研究了干扰磁场对继电器吸合电压、释放电压以及继电器衔铁所受力矩等静态特性参数的影响。为分析和评估电磁继电器及其控制系统耐磁干扰能力，确定电磁继电器的电磁兼容性指标奠定了理论基础。

关键词： 电磁兼容性 磁干扰 静态特性 矢量磁位 有限元方法

Finite Element Analysis of Static Characteristics of Electromagnetic Relay Interfered by Static Magnetic Field

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Abstract: As the controlling components electromagnetic relays are applied widely in electronic devices and systems, and the electromagnetic compatibility (EMC) between them and other components is important to the reliability of systems. However, electromagnetic relay manufacturers can not give us the EMC characteristics previously. A finite element method (FEM) model of a clap relay under the incident uniform magnetic field from all directions was proposed, and a magnetic vector potential (MVP) method was employed to analyze the static characteristics of relay in incident uniform magnetic field. By numerical analysis with ANSYS, the most susceptive direction of the relay was characterized. Static parameters such as pick-up voltage, release voltage, and the cooperation of electromagnetic torque and spring torque on the armature were calculated, under the interference of magnetic field on that most susceptible direction. This method makes a theoretic basis for analyzing and evaluating electromagnetic immunity to the magnetic interference for electromagnetic relays and electromagnetic relay control systems, and for the manufacturers to rank EMC performance of electromagnetic relay.

Keywords: electromagnetic compatibility magnetic interference static characteristics magnetic vector potential finite element method

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