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IEEE Guide for AC Motor Protection

IEEE Power and Energy Society

Sponsored by the
Power System Relaying Committee

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Abstract: Generally accepted methods of protection for ac motors are provided. The functions necessary for adequate protection of motors based on type, size, and application are identified and summarized. The protective requirements of all motors in every situation is not purported to be detailed in this guide.

Keywords: ac motor protection, adjustable-speed drive motor protection, IEEE C37.96™, induction motor protection, microprocessor-based motor protection, motor, motor bus transfer, rotating machinery protection, synchronous motor protection, wound rotor motor protection

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Introduction

This introduction is not part of IEEE Std C37.96-2012™-2012, IEEE Guide for AC Motor Protection.

The following changes have been made in this revision of the AC Motor Protection Guide:

Clause 3, a glossary of component and terminology definitions, has been added.

Clause 4.4 has been added and Clause 6.3 has been enhanced to comprehensively discuss ASD protection.

Clause 5 has been modified to include information on failure mechanisms of motors.

Clause 5.2 has been enhanced to provide information insulation class in motor that is relevant to protection.

Clause 5.2.8 has been enhanced to include discussion on reduced voltage starting and high inertia motor protection.

Clause 5.4.3 has been added to discuss considerations for application low ratio CTs.

Clause 5.8 has been enhanced to add information on how to apply surge capacitors (protection) to motors.

Clause 6.4 has been added to discuss issues with motor bus transfers.

Clause 6.5 has been added for discussion of placement considerations of power factor correction capacitors relative to motor relay sensing CT.

Clause 7.2.10.3 has been enhanced to add coordination/application considerations for when fuses and relays overlap for motor protection such as motors protected by fused contactors.

Clause 7.2.10.8 has enhanced discussion on motor ground fault protection.

Clause 7.2.11 has been added to discuss breaker protection for small motors.

Clause 8 has been enhanced to include a section (8.2) to understand several motor data such as cooling time constants needed to set modern microprocessor relays.

Annex A.2 has been added to provide relevant tutorial type material for understanding motor dynamics relevant to relay settings such as motor acceleration time, accelerating torque, and impact of voltage on motor torque.

Annex A.3 has added a motor modern microprocessor relay setting example.

Contents

IEEE Guide for AC Motor Protection

1. Scope

This application guide presents generally accepted methods of protection for ac motors. It identifies and summarizes the functions necessary for adequate protection of motors based on type, size, and application. The recommendations in this guide are based on typical installations. Information relating to protection requirements, including microprocessor based protection systems, applications, and setting philosophy is provided to enable the reader to determine required protective functions for motor installations. Relay protection of squirrel-cage, wound-rotor induction motors, and synchronous motors is presented herein. This guide also summarizes the uses of relays and devices, individually and in combination, so the user may select the necessary equipment, to obtain adequate motor protection. This guide is concerned primarily with the protection of three-phase, integral horsepower motors and adjustable-speed drives where specifically indicated. This guide does not purport to detail the protective requirements of all motors in every situation. What it does provide is enough information and guidance to implement adequate protection for most applications.

2. Normative references

The following referenced documents are indispensable for the application of this document (i.e., they must be understood and used, so each referenced document is cited in text and its relationship to this document is explained). For dated references, only the edition cited applies. For undated references, the latest edition of the referenced document (including any amendments or corrigenda) applies.