

Formula 1

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Formula 2

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Formula 3

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Detailed Explanation

IEEE Std 115-2019 provides a comprehensive framework for conducting both type and routine tests on synchronous machines rated above 100 kW. It covers direct-current (DC) resistance measurements, open-circuit and short-circuit characteristic (OCC/SCC) tests, zero-power-factor (ZPF) saturation tests, decay tests for time constants, and calorimetric or input-output loss determinations. A core objective is to derive accurate equivalent circuit parameters—including armature reaction, leakage and magnetizing reactances, field and damper winding time constants, and stray-load losses—which are essential for power system modeling, protection coordination, and transient stability analysis. The standard also addresses safety protocols, instrumentation accuracy requirements, correction factors for temperature and frequency, and uncertainty quantification in measurements. Its methodology supports compliance with grid codes (e.g., IEEE 1547, NERC standards) and enables precise integration of synchronous machines into modern power systems with increasing inverter-based generation, where machine inertia and fault ride-through behavior must be rigorously characterized.

Key Components

#	Component
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1	Open-Circuit Characteristic (OCC) Test
2	Short-Circuit Characteristic (SCC) Test
3	Zero-Power-Factor (ZPF) Saturation Test

Applications

#	Application
1	Power system stability modeling and simulation (e.g., in PSS/E, MATLAB/Simulink, ETAP)
2	Generator commissioning and acceptance testing at power plants
3	Design validation and performance certification for synchronous machine manufacturers

Related Concepts

#	Concept
1	Synchronous Machine Modeling
2	Transient Stability Analysis
3	IEEE Std 111-2021 (Test Procedures for Polyphase Induction Motors)

Tags

synchronous machine, power system testing, IEEE standard

IEEE Std 115-2019: Test Procedures for Synchronous Machines