

# Self-excited Synchronous Machine with High Torque Capability at Zero Speed

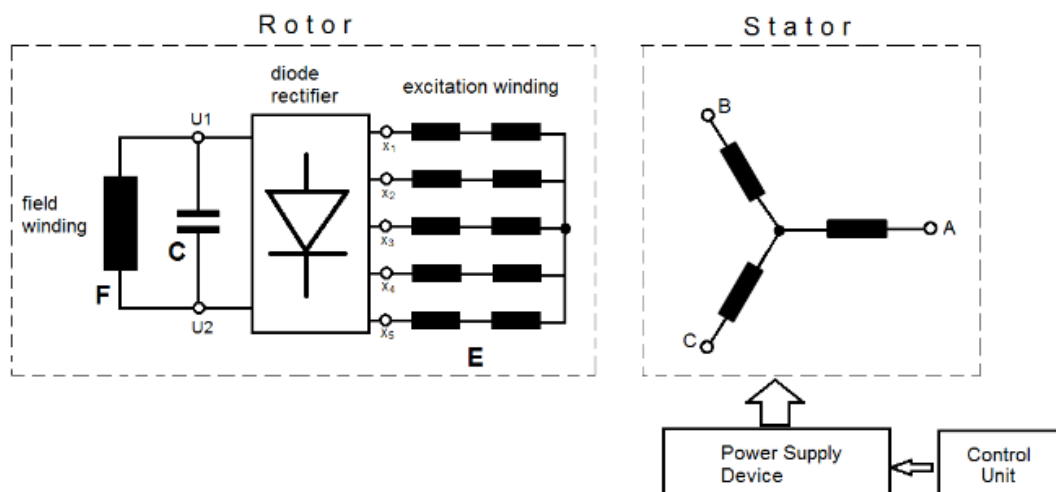
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**Abstract** - This paper presents an advanced self-excited synchronous machine design with high torque capability already at zero and lower operation speed. The stator winding is composed of a novel multiphase fractional slot concentrated winding (FSCW) which has the ability to generate various magneto motive force (MMF) waves and to control their amplitudes and frequencies independently. While, the rotor contains two winding sets, and a multiphase diode rectifier connected between them. At zero and lower operation speed, the rotor excitation is performed via harmonic currents, while for higher speeds using MMF winding harmonics. As results, the proposed machine can operate with high torque capability over the complete speed range. The functionality of the new machine has been proved with finite elements for different load conditions

**Keywords**— Tooth concentrated winding, MMF harmonics, magnetic flux-barrier, permanent magnet synchronous machines, finite element method.



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