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Nota di contenuto	Cover -- Title Page -- Copyright Page -- Contents -- Introduction -- Chapter 1. Accurate Electrical Fault Detection in the Permanent Magnet Synchronous Generator and in the Diode Bridge Rectifier of a Wind Energy Conversion System -- 1.1. Introduction -- 1.2. Description of the system under study and the used fault detection method -- 1.3. Fundamental notions of the symmetrical components -- 1.4. Development of the analytical expressions of the NSV in the case of the different considered faults -- 1.4.1. Analytical expression of 2 V in the case of simultaneous faults -- 1.4.2. Analytical expression of 2 V in the case of ITSCF in the PMSG -- 1.4.3. Analytical expression of 2 V in the case of OCDF in the rectifier -- 1.5. Analytical study of the indicators of the different faults -- 1.5.1. Analytical study in the case of ITSCF -- 1.5.2. Analytical study in the case of OCDF in the rectifier -- 1.5.3. Analytical study in the case of SF -- 1.6. Experimental validation of the proposed fault indicators -- 1.6.1. Description of the tests process -- 1.6.2. Experimental results in the case of healthy operation -- 1.6.3. Experimental results in the case of ITSCF in the PMSG -- 1.6.4. Experimental results in the case of an OCDF fault in the rectifier --

1.6.5. Experimental results in the case of SF in the system considered -- 1.7. Description of the method proposed -- 1.8. Conclusion -- 1.9. References -- Chapter 2. Control and Diagnosis of Faults in Multiphase Permanent Magnet Synchronous Generators for High-Power Wind Turbines -- 2.1. Introduction -- 2.2. Wind energy conversion systems -- 2.3. Multiphase electric drives on WECS -- 2.4. Model of a six-phase PMSG drive -- 2.4.1. Natural reference frame -- 2.4.2. Synchronous reference frame -- 2.5. Control strategies -- 2.5.1. Introduction -- 2.5.2. Field-oriented control -- 2.5.3. Direct torque control. 2.5.4. Finite control set model predictive control -- 2.6. Fault diagnosis in multiphase drives -- 2.6.1. Introduction -- 2.6.2. Interturn short-circuit faults -- 2.6.3. High-resistance connections and open-phase faults -- 2.6.4. Permanent magnet faults -- 2.6.5. Current sensor faults -- 2.6.6. Speed sensor faults -- 2.7. Conclusion -- 2.8. References -- Chapter 3. Gearbox Fault Monitoring Using Induction Machine Electrical Signals -- 3.1. Introduction -- 3.2. Motor stator current signature approach -- 3.2.1. Air gap magnetic flux density-based approach -- 3.2.2. Magnetizing current approach -- 3.3. Wound rotor current signature approach -- 3.4. Experimental results -- 3.4.1. MCSA for geared motor fault diagnosis -- 3.4.2. MCSA for WT gearbox -- 3.4.3. WT generator current processing -- 3.4.4. Current transformations for geared motor fault diagnosis -- 3.5. Conclusion -- 3.6. Acknowledgments -- 3.7. References -- Chapter 4. Control of a Wind Distributed Generator for Auxiliary Services Under Grid Faults -- 4.1. Introduction -- 4.2. Description of the renewable distributed generator -- 4.3. Control of the distributed generator -- 4.3.1. Control of the wind generator -- 4.3.2. Control of the hybrid storage system -- 4.3.3. Control of the DC bus voltage -- 4.4. Power management algorithm -- 4.4.1. Specifications -- 4.4.2. Determination of inputs/outputs -- 4.4.3. Determination of membership functions -- 4.4.4. Inference engine for energy management -- 4.5. Detection and control of the grid faults -- 4.5.1. Fuzzy logic islanding detection -- 4.5.2. Fuzzy droop control technique for the adjustment of the grid frequency and voltage -- 4.6. Simulation results -- 4.6.1. Control and power management of the distributed generator -- 4.6.2. Detection and correction of the grid voltage and frequency variations at the PCC -- 4.7. Conclusion -- 4.8. References. Chapter 5. Fault-Tolerant Control of Sensors and Actuators Applied to Wind Energy Systems -- 5.1. Introduction -- 5.2. Objective -- 5.3. RFFTC of WES with DFIG -- 5.3.1. TS fuzzy model with parameter uncertainties and fuzzy observer -- 5.3.2. Proposed RFFTC based on FPIEO and FDOS -- 5.3.3. Proposed RFFTC stability and robustness analysis -- 5.3.4. WES with DFIG application -- 5.3.5. Simulations and results -- 5.4. RFSFTC of WES with DFIG subject to sensor and actuator faults -- 5.4.1. TS fuzzy plant model with actuator faults, sensor faults and parameter uncertainties -- 5.4.2. Proposed RFSFTC algorithm based on FPIEO and FDOS -- 5.4.3. Derivation of the stability and robustness conditions -- 5.4.4. WES with DFIG application and simulations and results -- 5.5. RDFFTC of hybrid wind-diesel storage system subject to actuator and sensor faults -- 5.5.1. Fuzzy observer scheme for the uncertain system with sensor and actuator faults -- 5.5.2. Proposed RDFFTC, reference model and stability analysis -- 5.5.3. HWDSS application and simulations and results -- 5.6. Conclusion -- 5.7. References -- List of Authors -- Index -- EULA.

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## Sommario/riassunto

This book provides a comprehensive examination of electrical and mechanical fault diagnosis in wind energy conversion systems. Edited by Monia Ben Khader Bouzid and Gérard Champenois, it delves into the detection and analysis of faults in components such as permanent

magnet synchronous generators and diode bridge rectifiers. The book also explores control and diagnosis strategies for multiphase systems, including high-power wind turbines, and discusses methodologies for fault monitoring using induction machine electrical signals. Aimed at engineers and researchers in the field of renewable energy, it combines theoretical insights with practical validation, emphasizing the development of reliable fault indicators and control strategies in wind energy technologies.

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