Special Session on

Fault Diagnosis and Fault-Tolerant Operation in Multiphase Electric Drives

Organized and co-chaired by:

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Abstract

Multiphase electric drives have gained significant attention in recent years due to their inherent advantages in reliability, power density, and fault-tolerant capabilities, making them highly suitable for safety-critical and high-performance applications such as electric transportation, aerospace systems, offshore platforms, renewable energy generation, and industrial automation. Their increased phase count provides additional degrees of freedom in terms of control, torque ripple minimization, power sharing, thermal distribution, and harmonic reduction. Furthermore, the growing demand for electrification and the expansion of advanced power electronics have accelerated the deployment of multiphase machines in both research and industry. As these systems continue to expand in scope and complexity, ensuring their reliable and uninterrupted operation has become increasingly important.

Within this context, fault diagnosis and fault-tolerant control of multiphase electric drives have emerged as essential research domains. Despite their intrinsic robustness, multiphase systems are still exposed to a range of electrical, mechanical, and sensor-related faults—such as open-circuit and short-circuit faults in power converters, inter-turn and phase faults in machines, encoder failures, and thermal and aging-related degradations—that can compromise performance, efficiency, and safety. Effective fault detection, isolation, and identification (FDI) strategies are therefore critical to maintaining system availability and preventing catastrophic failures. At the same time, fault-tolerant control and reconfiguration strategies are needed to guarantee continuity of operation, ensure graceful degradation, and maintain acceptable performance levels under faulted conditions. Recent advances in signal processing, optimization, model-based and data-driven methods, high-frequency injection, artificial intelligence, new inverter and converter topologies, and fault-resilient control algorithms have created

promising pathways toward more intelligent, adaptive, and resilient multiphase drive systems.

The aim of this Special Session is to gather high-quality research contributions that address recent innovations, theoretical developments, practical implementation strategies, and emerging trends in the field of fault diagnosis and fault-tolerant drives for multiphase electric machines. The session seeks to bring together researchers and practitioners from academia and industry to share advances in advanced monitoring techniques, real-time diagnostic tools, robust control architectures, condition-based maintenance, and resilient power electronic and machine design. Contributions covering analytical, numerical, and experimental investigations are encouraged, along with case studies that demonstrate real-world feasibility and industrial relevance. By showcasing a diverse set of approaches, this Special Session is expected to stimulate discussion on remaining challenges, identify future research directions, and foster collaboration across the multidisciplinary fields associated with multiphase electric drives.

Topics of interest include, but are not limited to:

- Modeling, simulation, and experimental validation of multiphase systems in healthy and faulty modes.
- Fault diagnosis and detection techniques for multiphase electric machines in steady state and/or transient conditions.
- Fault-tolerant control strategies for multiphase electric drives.
- Advanced multiphase electric machine design and optimization.
- Power density enhancement techniques for multiphase machines.

Important dates

- Full Paper Submission: February 1, 2026
- Full Paper Notification: May 1, 2026
- Final Paper Upload: June 1, 2026

Submission of papers

Paper submission follows the rules of regular papers. All the instructions for paper submission are included in the conference website:
https://icem2026.ubi.pt/submission.html