

Application note

Electrical Safety and Availability in 800 V DC AI Factory Power Architectures

Background

AI factories and hyperscale data centres are facing a fundamental architectural change. In order to reliably supply rack power densities from 800 kW to over 1 MW per rack, manufacturers and operators are increasingly relying on 800 V DC power distribution.

Compared to a 400 V AC power supply, this has significant advantages in terms of efficiency, copper usage and scalability, but at the same time requires new protection concepts for electrical safety. Classic protection concepts from AC or 48 V DC networks are no longer sufficient for this.

Objective

The aim is to enable a highly available, scalable and OCP-compliant 800 V DC power distribution system that:

- ensures uninterrupted operation in the event of the first earth fault,
- continuously monitors insulation conditions,
- detects electrical risks at an early stage before critical fault currents occur,
- and supports operators in the safe upscaling of AI factories.



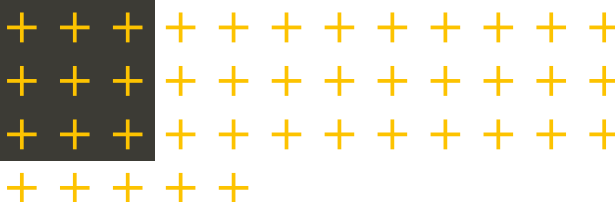
Solution

In data centres, shutdown is always the last resort. In OCP and NVIDIA-inspired HVDC architectures, an initial earth fault must not lead to shutdown. Early detection of insulation deterioration is therefore crucial for uninterrupted operation and, beyond that, for protection against thermal effects.

Bender addresses these requirements with an **insulation monitoring solution specially designed for 800 V DC IT systems.**

Insulation monitoring devices from Bender

- continuously monitor the insulation resistance between active conductors and earth,
- are designed for high leakage capacities, as are typical for AI factories with thousands of power supplies,
- detect creeping insulation deterioration at an early stage, before dangerously high fault currents occur.



Outcomes

The use of Bender insulation monitoring in 800 V DC AI factories enables:

- Early detection of insulation problems before they become critical
- Stable operation even with megawatt racks and high load dynamics
- Reduction of fire, personal injury and equipment protection risks
- Uniform safety concepts across multiple AI factory modules

Key Advantages

- **Enhanced Safety**
Continuous monitoring for fault currents ensures that insulation faults in 800 V DC power supply systems are detected at an early stage. Insulation monitoring provides comprehensive protection against overheating, equipment damage and fires – even in large-scale, high-capacity AI data centres.
- **Reduced Downtime**
By detecting electrical anomalies long before a shutdown occurs, Bender solutions enable planned maintenance. This ensures high availability for mission-critical AI workloads and prevents cascading failures in highly coupled GPU clusters.
- **Less Effort**
Automated monitoring significantly reduces the burden of manual inspections, documentation and audits.



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Conclusion

An 800 V DC power supply is the backbone of future AI infrastructures. With monitoring technology from Bender, data centres can exploit their full potential. Continuous insulation monitoring is therefore not optional, but a fundamental safety requirement.

Data centre solutions

Bender offers a wide range of solutions for data centres. As an expert in developing smart, safer, and more sustainable energy solutions that protect critical industries worldwide, Bender delivers pioneering solutions that optimise productivity, reliability, and efficiency.



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