



Solving Data Center Power Challenges with Legacy Architectures

Rack-mountable 800V DC Power for AI-ready Data Centers



OZPCS-RS40

See how Trystar's RS40 delivers clean bus grade 800V DC power optimized for modern data center electronics.

Background:

AI, GPU acceleration, and high density compute are redefining data center power requirements. As rack power densities climb, traditional AC distribution architectures are increasingly inefficient, complex, and potentially disruptive to sensitive workloads. Multiple conversion stages introduce energy losses, additional failure points, and power quality risks/challenges that are amplified in AI environments where even brief disturbances can invalidate expensive computations.

To address these constraints, data center operators are accelerating adoption of **high voltage DC (HVDC) distribution**, particularly **800V DC**, which simplifies power paths, improves efficiency, and delivers higher quality power closer to the load. Positioned as a **rack mountable 800V DC Source**, the **Trystar RS40** enables this transition by delivering clean bus grade DC power optimized for next generation data center electronics.

Customer Challenge:

Modern data centers face a convergence of power challenges that legacy architectures struggle to resolve:

- Escalating rack densities driven by AI and GPU workloads push beyond the practical limits of traditional AC distribution.
- AC Distribution architecture typically around ~92%, generate excess heat, increase operating costs, and reduce overall system reliability.
- Power quality sensitivity of AI workloads, where even milliseconds long disturbances can interrupt or corrupt long running, high value computations.
- Operational pressure to improve PUE, reduce energy waste, and increase uptime while supporting future scalability.

These challenges are driving demand for simplified, high efficiency power architectures that protect workloads while reducing complexity.

The Solution:

The Trystar RS40 functions as a rack mountable, clean bus grade 800V DC converter, delivering regulated and filtered DC power suitable for direct consumption by modern servers and AI accelerators.

Installed at the rack or row level, the RS40:

- Accepts upstream facility power, such as a 3ph 480VAC feed
- Converts and regulates output to stable, clean 800V DC
- Feeds DC distribution systems including DC PDUs, busways, or native DC input servers

Key Advantages:

Higher Efficiency

By eliminating unnecessary AC → DC → DC conversion stages, the RS40 achieves approximately **~98% conversion efficiency**, compared to ~92% for AC Distribution. This reduces energy losses, lowers heat generation, improves PUE, and decreases operating costs at scale.

Improved Reliability

A simplified power path with fewer components reduces thermal and electrical stress, resulting in higher system level reliability and improved MTBF compared to continuously operating double conversion systems.

Superior Power Quality

Clean, regulated 800V DC output minimizes electrical noise and transient exposure, protecting sensitive AI and GPU electronics from disturbances commonly introduced by complex AC power paths.

Optional Ride Through Capability

The RS40 architecture can be enhanced with an integrated **supercapacitor (or pseudo supercap) sub rack**, providing milliseconds to seconds of DC ride through energy storage. This capability bridges short duration disturbances, preserves AI computational state, and reduces dependence on full UPS response times.

Benefits:

Deploying the Trystar OZPCS-RS40 as a rack level 800V DC Source delivers clear, measurable value:

- **Efficiency:** ~98% conversion efficiency versus ~92% for AC Distribution
- **Reliability:** Fewer stages and components increase MTBF and reduce failure points
- **Power Quality:** Clean, regulated 800V DC protects sensitive AI and GPU workloads
- **AI Protection:** Optional ride through prevents costly compute loss during brief disturbances
- **Scalability:** Modular, rack mountable architecture supports high density and future ready deployments

Solution Diagram:



