

Scalable SiC based rectifiers



PRODUCT FEATURES



High efficiency

- Low switching losses
- Improved power conversion efficiency



Small footprint

- Compact design
- Lower CAPEX



Grid stability

- Very low THDi
- Reactive power for voltage support
- Fault Ride Through (FRT)
- Weak grid support

Challenges in hydrogen production

Hydrogen production through electrolysis is a promising method to generate clean hydrogen fuel, especially when powered by renewable energy sources. However, this process still faces several challenges, particularly in terms of efficiency, cost and scalability.

At Prodrive, we've developed Hydra, a SiC (Silicon Carbide) MOSFET-based rectifier that delivers high efficiency and fast response times for improved grid stability and smooth integration of renewable energy sources. Its compact design is ideal for electrolyzer systems, and the modular architecture enables easy scalability - from MW racks to multi MW turnkey solutions.

Company background

With over 30 years of power conversion expertise, Prodrive delivers innovative solutions tailored to the energy and infrastructure market, with global footprint in the Netherlands, the United States, China, South Korea and Japan.

Hydra rectifier

SiC MOSFET based rectifiers

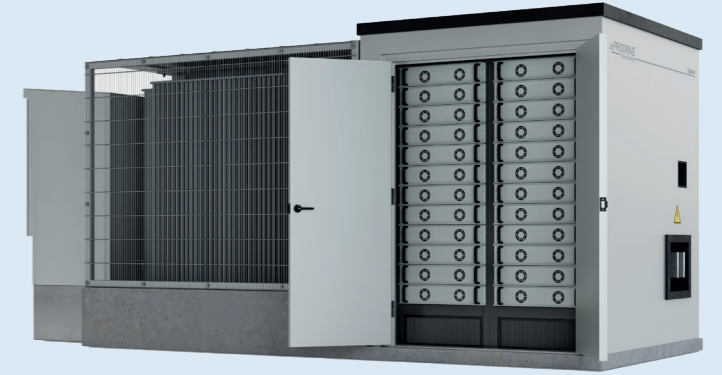
Hydra is the next generation of rectifiers for electrolyzers based on SiC MOSFET topology. Compared to traditional IGBT or thyristor rectifiers, Hydra brings higher efficiency across the entire load, fast response times, smaller footprint due to lower losses and reducing components required for compensation as well as superior grid and stack compatibility.



Typhon turnkey solution

20ft solution with MV switchgear, transformer and Hydra rectifier

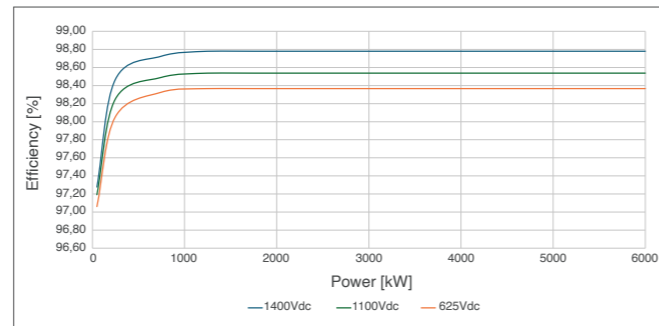
Typhon provides an integrated turnkey solution with MV switchgear (RMU), power distribution transformer and Hydra rectifier all in a 20' container footprint. Typhon ensures seamless integration with renewable sources featuring a compact, space-saving design. Additionally, our modular design allows high reliability and scalability in various levels from MW racks to multi-MW turnkey solutions.



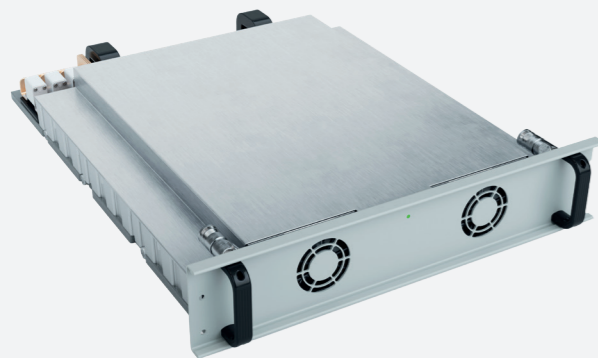
Hydra brings high euro efficiency of 98.6% (peak efficiency up to 98.7%) due to its SiC MOSFET topology which is capable of operating at higher switching frequencies compared to other rectifiers. The faster switching capabilities enables the design of smaller passive components such as inductors and capacitors, which reduces both system size and weight while maintaining high efficiency.

Additionally, lower conduction losses in the system reduces the need for large heatsinks and minimize power wastage as heat improves the overall efficiency.

Hydra rectifier efficiency



250kW HyPE module



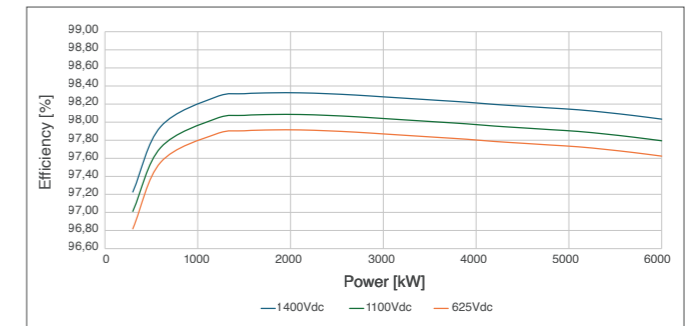
Hydra is a liquid-cooled rack system built with 250 kW HyPE (Hydra Power Electronics) modules. Each Hydra unit supports up to 24 modules, delivering up to 6 MW. Its modular design enables quick module replacement, minimizes downtime, and allows flexible scaling to match power requirements. Multiple Hydra rectifiers can be combined to support stack sizes of up to 24 MW (EOL). Hydra remains operational if a HyPE module fails, eliminating single-point failures and allowing continued operation at full or reduced power until replacement.

Individual modules can also be adjusted to deliver multiple outputs to serve multiple electrolyzers per system. This allows customers to have individual control on multiple electrolyzers optimizing the overall electrolyzer performance.

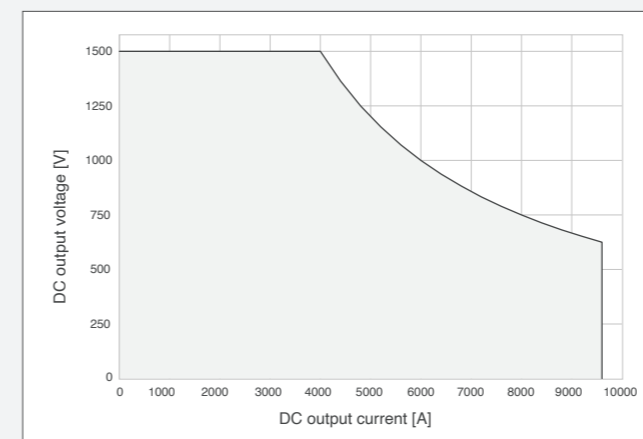
Even when factoring in the total system including the transformer the overall efficiency remains remarkably high with euro efficiency of 98.1% (peak efficiency up to 98.3%) This is due to the heart of the Typhon's superior performance, which lies in our advanced SiC MOSFET-based rectifier, Hydra.

By combining cutting-edge power electronics with integrated power distribution, the Typhon delivers a turnkey solution where "total system efficiency" is never compromised.

Typhon efficiency



Hydra & Typhon IV diagram



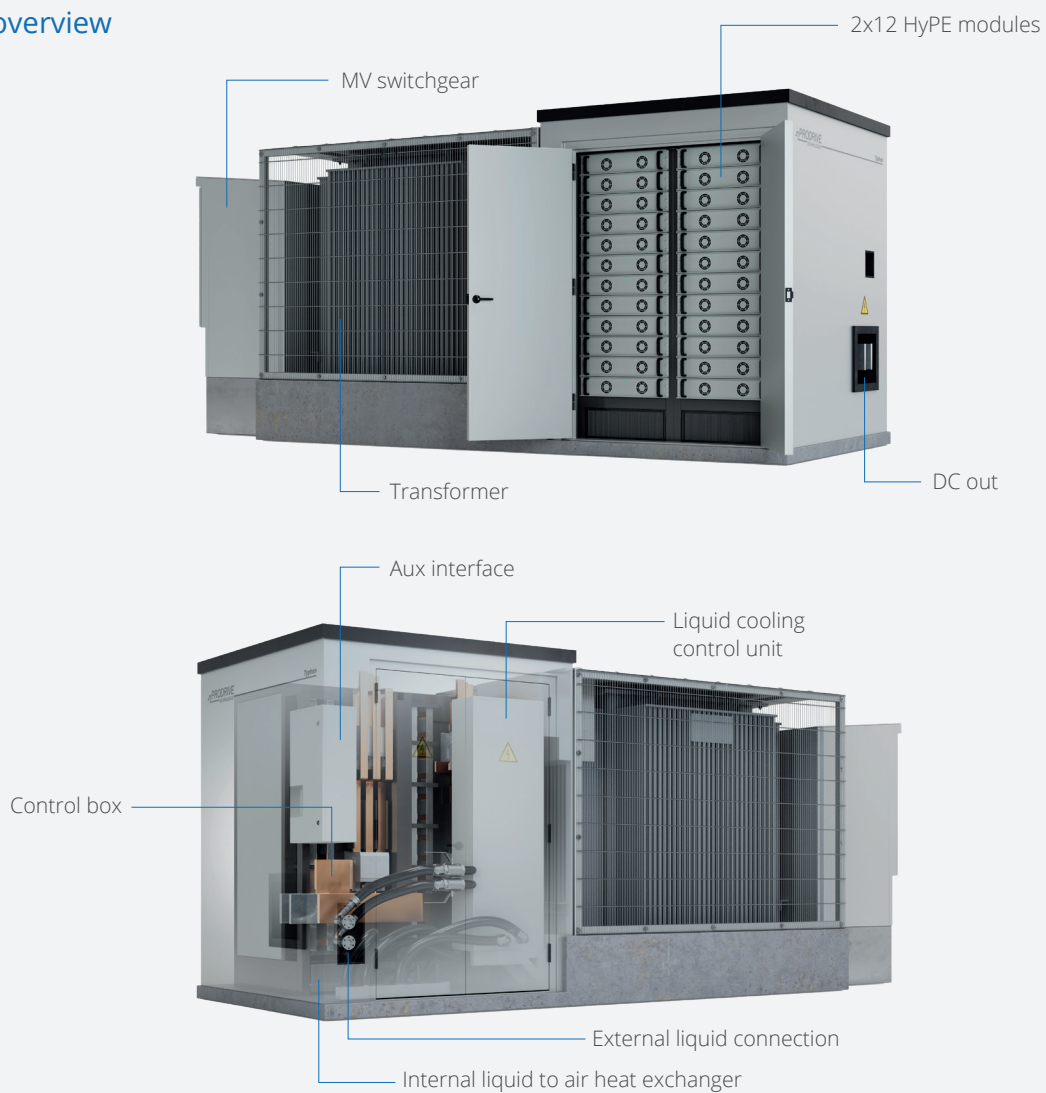
The Hydra & Typhon ensures exceptional power quality with THDi < 1% which allows integration into GW scale projects. They also offer proactive voltage support to facilitate grid compliance with features such as reactive power generation for voltage support, Fault Ride Through (FRT) and weak grid support.

Its wide voltage range of 0 - 1500Vdc facilitates smooth integration of future stack upgrades, potentially at higher DC voltages, without additional investments in power electronics or auxiliary filtering systems making it a future-proof solution for evolving demands of the hydrogen industry.

20ft Typhon specification

Power	6MW / 6.6MVA
Input MV voltage range	6 - 36kV
Technology	SiC MOSFET
Output DC voltage range	0 - 1500Vdc
Output DC current range	0 - 9600Adc
Peak efficiency	98.3%
Euro efficiency	98.1%
Typhon combined power	Up to 24MW
THDi	<1%
Cooling method	Water-cooled
Environmental condition	IP54/outdoor
Standards	IEC (other standards on request)

Typhon overview



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