Heavy-Duty DC/DC Converters

The Role in Off-Highway Electrification

White Paper

Off-highway electrification is accelerating — but converters originally designed for passenger cars cannot withstand constant vibration, dust or salinity. The result is failures, downtime and higher lifecycle costs. This white paper explores why heavy-duty DC/DC converters are becoming strategic components for OEMs and Tier1 suppliers, how the move towards higher tensions is reshaping vehicle design, and why the next generation will demand intelligence and advanced technologies to stay competitive.

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WHITE PAPER

Prepared by Guilera SA – Engineering & Product Management Team (Barcelona, September 2025)

1 Executive Summary

Electrification in off-highway vehicles has accelerated rapidly. Tractors, excavators, logistics and marine systems now rely on electric or hybrid powertrains. This shift has created a critical requirement: converting high-tension traction batteries into stable low-tension power for auxiliary systems. Without reliable DC/DC converters, electrification projects cannot succeed.

Unlike conventional converters designed for passenger cars, Guilera's solutions are engineered for heavy-duty applications – converters that deliver consistent performance under vibration, thermal stress, EMC disturbances, and outdoor exposure. With more than 40 years of expertise in DC/DC design, Guilera has evolved from low-tension Class A to 96 V nominal solutions in Class B1, with a roadmap toward higher tension domains. The company is also preparing the transition to intelligent converters with CAN and LIN connectivity for diagnostics and predictive maintenance.

Global and European market growth validates this direction. OEMs and Tier1 suppliers increasingly seek European partners who can combine heavy-duty product design, co-development capability, innovation, and local manufacturing. Guilera, Made in Barcelona-Spain, delivers this combination with transparency and long-term support.

2 European sovereignty in technology – Made in Barcelona-Spain

Founded in 1953 and headquartered in Barcelona, Guilera has more than 70 years of history in electronics and over 40 years dedicated to DC/DC technology. The company has evolved from a component supplier to a trusted technology partner for OEMs and Tier1 suppliers across Europe. Every converter is designed, manufactured, and tested in Barcelona-Spain, ensuring traceability, supply chain security, and alignment with European and international standards.

Guilera factory in Molins de Rei, Barcelona

3 Heavy-duty design for hostile environments

Off-highway vehicles face challenges far beyond those of passenger cars: vibration, humidity, dust, salinity, thermal stress, and electromagnetic disturbances. Conventional automotive converters are not engineered to withstand such conditions over time, leading to premature failures and costly downtime.

Guilera's converters stand out for their "heavy-dutyness": IP67 encapsulation, multi-layer protection, surface treatment against humidity and salinity, and derating curves that outperform conventional solutions at high temperatures. These features ensure consistent results in exposed environments such as agricultural fields, construction sites, and marine applications.

4 Market trends in DC/DC converters

The DC/DC converter market is expanding rapidly. Global sales are projected to grow significantly, with European demand in industrial mobility outpacing the global average at 26–27% CAGR. This reinforces the strategic importance of converters: they are no longer commodity boxes but central enablers of reliable electrification. OEMs and Tier1 suppliers require partners that combine technical expertise, co-development capacity, heavy-duty product design, and local manufacturing.

5 Applications where reliability matters

Guilera converters are used across agriculture, construction, logistics, marine, and emergency fleets. In each of these sectors, downtime is unacceptable. By integrating heavy-duty principles into every design, Guilera ensures stable performance under the harshest operating conditions.

Guilera-equipped off-highway vehicle in operation

6 From heavy-duty to intelligence: the next step

Heavy-duty addresses today's challenges, but the future of DC/DC technology lies in intelligence. OEMs increasingly require converters that are not only robust but also connected – capable of monitoring, reporting, and adapting in real time.

Guilera is preparing this transition by leveraging its expertise in STM32-based controllers, already applied in traction systems. Upcoming generations of DC/DC converters will integrate CAN and LIN communication, enabling real-time data transmission on tension, current, temperature, and faults, as well as predictive maintenance.

7 Partnering with Guilera

This paper shows that heavy-duty and intelligence in DC/DC converters are not optional features but essential enablers for the next generation of off-highway electrification.

Guilera's trajectory – from heavy-duty design to intelligent power management – illustrates how a European SME can combine legacy expertise and innovation to provide OEMs and Tier1 suppliers with sovereign, reliable solutions.

Made in Barcelona-Spain, Guilera converters deliver performance, sovereignty, and long-term partnership for global customers seeking innovation and stability.

Guilera DC/DC automatic production line

8 Executive Takeaways

• Heavy-duty as baseline: IP67, multi-layer protection, and superior derating ensure resilience in hostile environments.

• Proven trajectory: from Class A to 96 V nominal in Class B1, with a roadmap toward higher tensions.

• Intelligence on the horizon: CAN/LIN integration for real-time monitoring, diagnostics, and predictive maintenance.

• Market validation: CAGR of 26–27% in Europe reinforces the need for sovereign, local suppliers.

• Made in Barcelona-Spain: European manufacturing for OEMs and Tier1 suppliers seeking innovation and traceability.

• Co-development approach: Guilera works alongside OEMs and Tier1 from concept to production, ensuring alignment with project goals.

9 Annexes

9.1 Market and Research Sources

Grand View Research (2023–2030): $10.79 B → $22.37 B, CAGR 11.4%

Fortune Business Insights (2024–2032): $12.21 B → $28.47 B

Global Market Insights (2024–2034): $8.3 B → $14.7 B, CAGR 6.1%

Expert Market Research (2024–2034): $13.48 B → $36.59 B, CAGR 10.5%

Note: CAGR (Compound Annual Growth Rate) represents the mean annual growth rate over a period of time, assuming compounding. It provides a normalized measure to compare growth across different studies.

- Análisis Estratégico del Mercado de Convertidores DC-DC para la Movilidad Eléctrica Industrial en Europa (Guilera internal analysis, 2029 outlook).

- Informe de Investigación Estratégica: Adición de Inteligencia a Convertidores DC-DC para el Mercado Off-Highway Industrial (Guilera proprietary research).

9.2 Standards and Regulatory Framework

- ISO 6469-3:2021 – Electrically propelled road vehicles, tension classes A, B1, B2.

- UNECE Regulation No. 10 – Electromagnetic compatibility requirements.

- IEC 60529 – Degrees of protection (IP Code).

- SAE J1939 – CAN higher-layer protocol for heavy-duty and off-highway vehicles.

- ISO 17987 – Local Interconnect Network (LIN) protocol.

- UNECE Regulation No. 100 – Safety requirements for traction batteries and electric powertrains.