CASE STUDY

HORIBAMIRA

POSITIVE PROBLEM SOLVING

WITH THE COMPETITION TO EXTEND EV RANGE HEATING UP BETWEEN MANUFACTURERS, HORIBA MIRA REQUIRED A DC SOURCE TO ADVANCE THEIR THERMAL TEST CAPABILITIES.

As EV design becomes more refined, thermal management needs to be considered at every turn. This includes controlling heat loads from core components such as batteries, motors, and inverters. In cold environments, up to 40% of an electric vehicle's energy is consumed by cabin heating and battery thermal regulation. This limits driving distance and fuels range anxiety, so remains a key focus for manufacturers.

HORIBA MIRA is a world leader in mobility engineering and testing. They have created a platform that dramatically reduces the expense and time required for thermal evaluation.

The Vehicle Thermal Energy Optimisation Suite (VTEOS) is a miniature wind tunnel for early stage testing. It enables component level evaluation long before a full prototype vehicle is available.

Many modern automotive components operate at higher voltages with faster switching frequencies. This allows for smaller, lighter, and more efficient devices - which in turn increase EV range. However, the high frequencies can cause instability issues for DC sources powering the component tests.

Sam Hooper, Head of Climatic Facilities, explained, "Our existing DC power supply was an older IGBT based design. This would frequently trip out when testing newer HV components with high switching frequencies. We decided to move to a modern silicon carbide design in the G5-SOURCE.

"The G5-SOURCE's response times of less than 50µs allow us to reliably supply components with highly dynamic demands. Programmable internal resistance and the ability to switch in additional capacitance ensures unwanted switching frequencies are filtered. This results in a stable, uninterrupted supply."

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DRIVING DOWN COST

The VTEOS allows manufacturers to submit their components for evaluation much earlier in the vehicle development programme. HORIBA MIRA engineers' assemble, instrument and install the components onto a modular trolley system.

A custom control strategy replicates the operational behaviour of the final vehicle. Heat loads are applied via condenser air flow (temperature and humidity), temperature controlled coolant, and evaporator recirculated air. This setup allows for comprehensive assessment of component performance and compatibility across a range of driving scenarios. It also facilitates development of control logic and validation of warranty conditions.

The VTEOS enables development of thermal systems at a fraction of the cost when compared to full scale climatic wind tunnel testing. It is also crucial for validating simulation models early in the design cycle. This reduces the reliance on physical testing, lowering costs even further.

When asked why the G5-SOURCE was chosen, Sam Hooper added, "Safety is paramount at HORIBA MIRA. The G5-SOURCE's integrated safety relay provides shutdown safety to Performance Level c. This provides us with a robust ability to detect and react to hazardous situations, which was important when integrating the unit into our existing emergency stop setup."

"It's simple to set up using the intuitive GUI, which we can operate remotely from the comfort of the control room. Additionally the autoranging output allows testing at maximum power, even when operating down to a third of the unit's 1000V nominal voltage. This covers the power requirements of our customers' components, with headroom for future increases."

Initially established as MIRA in 1946, the company was initially formed to consolidate post-war automotive research efforts in the UK. Quickly becoming a cornerstone of vehicle testing and development, they helped pioneer crash testing, wind tunnel research, and powertrain innovation.

In 2015, the company was acquired by the Japanese firm HORIBA Ltd. This integrated MIRA's extensive application based knowledge and engineering expertise with HORIBA's strengths in measurement and analysis technologies.

Today, HORIBA MIRA operates at the forefront of next generation mobility testing. Their expertise includes autonomous vehicles, electrification, connectivity, and ultra low emissions among other areas.

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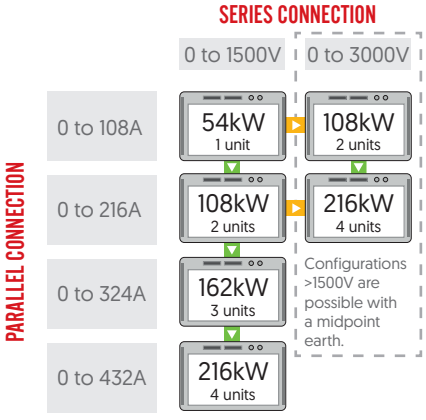

4× 54KW/1500V MODULE MASTER/SLAVE CONFIGURATIONS

ABOUT THE G5 SERIES

The G5-SOURCE (power supply) is part of a modern range of DC power systems, which includes G5-RSS (bidirectional sink/source) and G5-REGEN variants (DC load). Units have industry leading response times, with current steps <50µs. Perfect for powering dynamic devices, such as high speed drives.

Two current ranges provide users with high accuracy, when conducting low power research using the same system. The G5 series' ultra fast dynamics with switchable capacitance allows for accurate emulation of batteries and capacitors.

By utilising the embedded function generator, a current ripple at up to 10kHz can be set. The programmable ripple simulates electrical noise, which can occur in circuits which contain both AC and DC components. Such as in electric vehicles.

A host of control methods include CANmp, which allows up to 100 messages of the CAN protocol to be customised. Analogue and fibre optic interfaces operate up to 48kHz, ideal when used in P-HIL systems. An Aurora protocol is available to support fast integration into platforms such as Opal-RT and Typhoon.

For users who implement drive cycles and battery waveforms via LabVIEW, Python or alternative superposed control system - an API is provided.

Modules are available with nominals from 9kW to 54kW, at 60V to 1500V. Up to 60 units can be arranged in master/slave configurations. Outputs up to 3000V are possible into the megawatt range. Multi-module systems based around a midpoint earth create a +/- voltage output.

To discuss how ETPS can drive your testing forward, contact us today.

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