



ATI and Klaric Offer Non-Intrusive High-Voltage DAQ Solution

As the automotive industry rapidly moves to high-voltage electrified powertrain solutions, having an accurate, non-intrusive, and easy-to-install high-voltage instrumentation solution that allows vehicle OEMs, Tier 1 suppliers, and motorsport teams to record and analyze the performance of their electrified powertrains easily and accurately is a key requirement.

About Klaric

Klaric GmbH & Co. KG from Stuttgart has specialized in the development of measurement and testing technology for mobile and stationary applications in vehicles or in test benches for 30 years. They are specialists for precise measurement of currents, voltages and temperatures in a wide range of environments.

How ATI/Klaric Products Help Enhance High-Voltage Electrified Powertrain Developement

Klaric GmbH's range of high-voltage data acquisition modules paired with their custom breakout cables/boxes perfectly complements ATI's VISION software to provide such a high-voltage data acquisition package. So to provide a practical, real-world case study of the capabilities of Klaric's hardware and ATI's software solutions, ATI's UK office decided to instrument its standard production Ford Mustang Mach-E demonstration vehicle to capture the voltage and current flowing between the HV battery and the rear-mounted inverter/motor setup.

ATI UK's Mustang Mach-E is a rear-wheel drive extended-range model and thus contains a single inverter and motor generator unit supplied by BorgWarner. Because internal bus bars connect the inverter to the motor on the Mach-E, ATI opted not to instrument the vehicle with a 3-phase breakout cable to measure individual phases of the motor. However, one advantage of the Klaric HV DAQ modules is that they can work with both AC and DC systems with probe connections for both wire-in and bus-bar systems, if access permits, so for other user-cases this option is perfectly viable.





CASE STUDY High-Voltage DAQ



The requirements for the instrumentation of ATI's Mustang Mach-E were simple:

- 1. Install a combination probe to measure both current and voltage supplied to/from the motor/generator unit
- 2. Ensure that this installation be fully reversible and have no effect on any of the OEM parts installed on the vehicle

The solution was to install a Klaric high-voltage breakout cable to replace the OEM cabling leading from the battery pack to the inverter. Ensuring compatibility with the current OEM setup is easy with custom Klaric breakout boxes as everything can be specified to fit the individual vehicle user case. From connector specifications, wire gauges and current/voltage ratings the entire Klaric breakout cable can be modified to suit the requirements at hand.

In the case of ATI UK's Mach-E, the easiest solution was to directly modify an OEM spare cable because these are available from Ford as part of its 'crate-motor' program. Once this cable was modified by Klaric this allowed for the fully reversible, non-intrusive and safe measurement setup to be installed by ATI UK.



The Klaric breakout cable enabled an easy and safe installation using the following procedure:

- 1. ATI UK accessed the vehicle service disconnect to isolate the HV system.
- 2. Using the correctly rated HV Personal Protection Equipment ATI staff ensured that the HV system was isolated using voltage test equipment.
- 3. Then the original HV OEM cabling was disconnected between the HV battery pack and the inverter and stored for future re-use.
- 4. The replacement Klaric breakout cable was plugged into the original OEM connectors.
- 5. Once the cable connectors have been securely seated and locked, the vehicle was re-energized via disarming the service disconnect.



CASE STUDY High-Voltage DAQ





For demonstration purposes, the HV probe connection to the Klaric Quad 2 module (which effectively acts as a signal conditioning box) was routed through the chassis rails of the Mach-E and into the frunk.





CASE STUDY High-Voltage DAQ





Rated up to 1500V, the Klaric QUAD2 module offers 8 measurement channels which can be configured to output data at up to 8kHz from dedicated voltage, current, combination current/ voltage or thermocouple probes. With outputs over industry standard CAN BUS or via XCP on Ethernet, in this instance the QUAD2 module was connected to a laptop PC via CAN through a Kvaser U-100 interface, where the real-time HV data is recorded by ATI's VISION Measurement and Calibration tool and displayed in the VISION Data Analyzer software package.

Future

Klaric is in the process of rolling out a new MULTI-HV product line. Designed for safe measurement of current, voltage and temperature in the high-voltage electrical system, the Klaric HV solutions are ideal for measuring and testing tasks in test benches, systems and vehicles. The MULTI-HV line maintains the same functionality of the KLARI-HV line, but users benefit from a smaller formfactor.

Please Note: The MULTI-HV solutions are recommended for all new applications. Due to the ongoing part shortages Klaric has made the difficult decision to end of life (EOL) all "KLARI HV" solutions.

For further information visit: https://www.accuratetechnologies.com/Products/Klaric https://www.accuratetechnologies.com/Applications/electric-vehicle-testing



Contact ATI Sales at : sales@accuratetechnologies.com

US +00 (1) 248 848 9200 / **China** +86 138 1023 6357 / **France** +33 (0) 1 72 76 26 10 / **Germany** +49 (0) 89 9700 7121 **India** +91 80 41 69 42 18 / **Japan** +81-3-6276-8950 / **Sweden** +46 (0) 31 773 7140 / **UK** +44 (0) 1767 652 340