



HCVA Minimum Professional Standard (MPS)

Electric Vehicle Conversions

PLEASE NOTE: High voltage Electric Traction Systems can be dangerous, and may cause serious harm if proper precautions are not followed. It is your responsibility to train and equip yourself and your staff properly to perform any task, and to ensure your insurances cover activities undertaken.

Your Health and Safety policy and Emergency / First Aid Procedures must be updated to cover aspects unique to Electrical Traction Systems.

This document is for best practice guidance only.



INTENTIONALLY LEFT BLANK



HCVA Minimum Professional Standard (MPS)

Electric Vehicle Conversions

The purpose of this document and the standards listed within are to set a minimum acceptable standard for the UK Electric Vehicle conversion industry, specifically as it relates to the conversion of pre-existing and historic vehicles. Companies who abide by the MPS manufacture electric conversion kits or carry out conversions and modifications to a safe quality standard in line with those set out in ECE.r100.01 and also meet any other standards applicable to the local market where products and vehicles are being produced for export. The MPS is also intended to give confidence to insurance companies and the UK Government and its agencies in the high standard of electric conversions carried out by HCVA members.

In addition to the standards listed below, the companies carrying out this work must also abide by the following standards:

- Technicians carrying out the conversions are qualified at least to IMI Level 3 or equivalent, but ideally Level 4.
- The conversion company should have a professional, well-maintained workshop and have suitable PPE and safety equipment appropriate to an electric conversion company and adhere to safe storage rules for lithium batteries.
- Companies must hold a minimum of £5,000,000 public liability insurance.

The Code of Practice and technical standards listed below must be met for all HCVA members effective from date of publication:

1. Every conversion must be compliant with ECE.r100.01 standards.
2. Change of fuel type should be notified to the DVLA using form V62 and submitted along with the compliance certificate for the vehicle's registration document (V5C) to be updated. A copy of the compliance certificate must be provided to the customer.
3. Should second-hand components associated with the traction system be used, the conversion company is responsible for testing to ensure safe and suitable operation of the component, such that they can provide a defined warranty for their operational suitability.
4. Automotive-grade parts must be used, of a standard appropriate for UK road use or meet standards of the local market where a vehicle is being produced for export.
5. Every battery pack must have an accessible and identified physical automotive grade Master Service Disconnect (MSD) to ensure the vehicles High Voltage (HV) system can be safely isolated.



6. All conversions should include safety systems such as Battery Management System (BMS), ground fault monitoring, cell temperature monitoring and over/under voltage, any of which must have the ability to isolate the high voltage system.
7. The BMS/Vehicle Control Unit (VCU) must have the ability to detect a welded contactor and act appropriately.
8. A dashboard warning light or other similar indication should notify a fault condition with the HV system, including isolation fault, cell under/over-voltage, pack under/over-voltage, cell over temperature, HVIL issue and welded contactors during start up.
9. High Voltage (HV) and Low Voltage (LV) cabling must be supported and clamped by suitable cable management clamps. Uninsulated metal clamps are not acceptable, and any cables mounted to the structure using cable ties alone must be demonstrated to be sufficient for the location in question.
10. HV cables should be routed in a safe manner, with a 25mm static clearance away from moving items like prop shafts, suspension etc. Mounting of cables in wheel arches, under the floorpan or within the confines of an active prop tunnel should be avoided wherever possible. Any HV cable routes under the car should be protected from road debris within a suitable cable tray, taking into account their level of exposure.
11. Bend radius for any HV cabling should be in line with cable manufacturers specifications or the below if not available:
 - min. 3 x cable diameter for static installation
 - min. 6 x cable diameter for dynamic installation
12. Any LV and/or HV cabling passing through a bulkhead must use either compression glands, suitable bulkhead connectors, or suitably robust grommets.
13. Every converted vehicle must use orange screened double insulated HV automotive grade ISO19642 cable that is specifically for use in electric vehicles.
14. All HV plugs/sockets should be of a type and design for specific use in Electric Vehicles, including High Voltage Interlock Loop (HVIL) feature. If a component uses non HVIL connectors the connector must be situated within an enclosure only accessible with tools and outside the passenger compartment.
15. Unless suitable engineering analysis is provided, mounting of traction battery enclosures should use the existing mounting points and structure of the original vehicle. Any vehicle chassis frame/tub/skin mounts which



are to be utilised should be carefully examined. If required, these mounts should be modified to accommodate any additional loading and suitable analysis provided.

Unless suitable engineering analysis is provided, traction battery enclosure surfaces/faces which are not inside the wheelbase and/or could be subject to direct impacts, should be of at least 2mm thick S275 (or equivalent) or 4mm 5253 (or equivalent). Alternatively, additional protection plates may be added which meet or exceed the above material specifications.

Traction battery enclosures should be design intent to IP54 above the wade line and IP67 below it. They should utilise a PRV (Pressure Relief Valve) placed in a location that it can vent externally, and not into the passenger compartment.

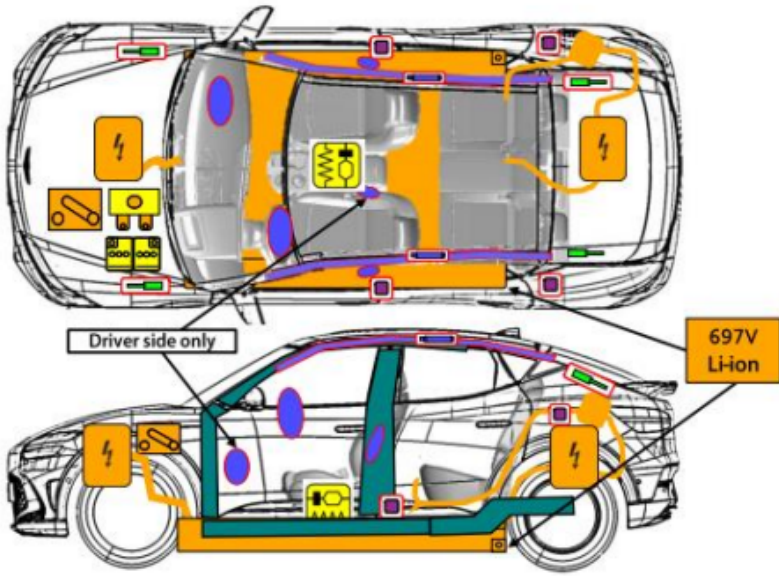
16. The vehicle must not be able to go into drive mode should the charging cable still be connected to the charge socket.
17. Isolation Monitoring must be present in every conversion
18. No part of the conversion should be closer to the ground than any original component without suitable protection e.g. skid plate.
19. Any HV cables or components within the passenger cell and otherwise accessible to fingers must be covered by a solid barrier that cannot be removed without the use of tools.
20. All high voltage enclosures should be metal or approved HV plastic/composite.
21. All HV components and their enclosures must display a high voltage warning sticker. In line with R100.1 requirements
22. Vehicles must have the ability for the HV system to switch off in the event of an accident via inertia switch or similar.
23. Sufficient earthing should be used on all electrical components including motors, battery boxes, chargers, dc/dc and air conditioning units in case of a ground fault.
24. If thermal management is required for HV components, including motors, battery packs, chargers etc then a suitable antifreeze/corrosion inhibitor must be used.
25. Fuses must be correctly rated to the pack voltage and current.



26. A test certificate must be signed and presented with each conversion to the customer to confirm the above standards have been met and tested for their vehicle. A manual shall be presented to the owner, which highlights safety critical information including the location of the MSD. The manual must include a diagram of the HV system in the format of the below, which shows the location of the main HV components and HV cable routings, in a similar format to the illustration below.

It is recommended that this information is logged with a Crash Recovery System provider who can share this information with emergency services in case of an incident involving the vehicle.

27. Any Battery Management System (BMS) used should undergo full functional testing prior to customer hand over. Results of any testing should be fully documented and must include functional testing of all safety critical features for each vehicle. Periodic firmware upgrade is recommended to ensure vehicles comply with latest safety features.
28. The installer should consider producing a laminated guide to remain in the vehicle showing safe recovery and towing procedures in the event that the owner is incapacitated or not present.

		Genesis GV60 SUV, 5 doors From November 2021							
									
									
	Airbag		Stored gas inflator		Seat belt pretensioner		SRS control unit		Pedestrian protection active system
	Automatic rollover protection system		Gas strut / Preloaded spring		High strength zone		Zone requiring special attention		High voltage component
	Battery low-voltage		Ultra-capacitor, low voltage		Fuel tank		Gas tank		Safety value
	Battery pack, high-voltage		High voltage power cable		High voltage device that disconnects high voltage		Fuse box disabling high voltage		High voltage ultra capacitor