E-Mobility & EV Powertrain HV Test

Source up to 2 A at 1.5 kV into inverter, converter and motor test rigs, with a floating output for potential-free architectures and a 5 kV class for isolation and withstand checks.

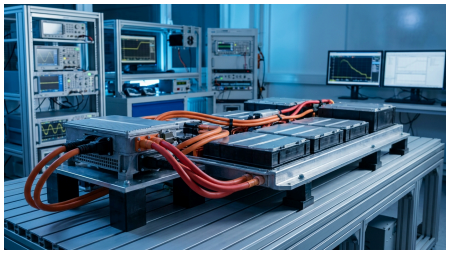


Illustration: a battery pack and inverter on a powertrain test bench, with the orange high-voltage cabling such rigs use.

APPLICATION BRIEF · HVX-SERIES HIGH VOLTAGE POWER SUPPLIES · dc-62022201

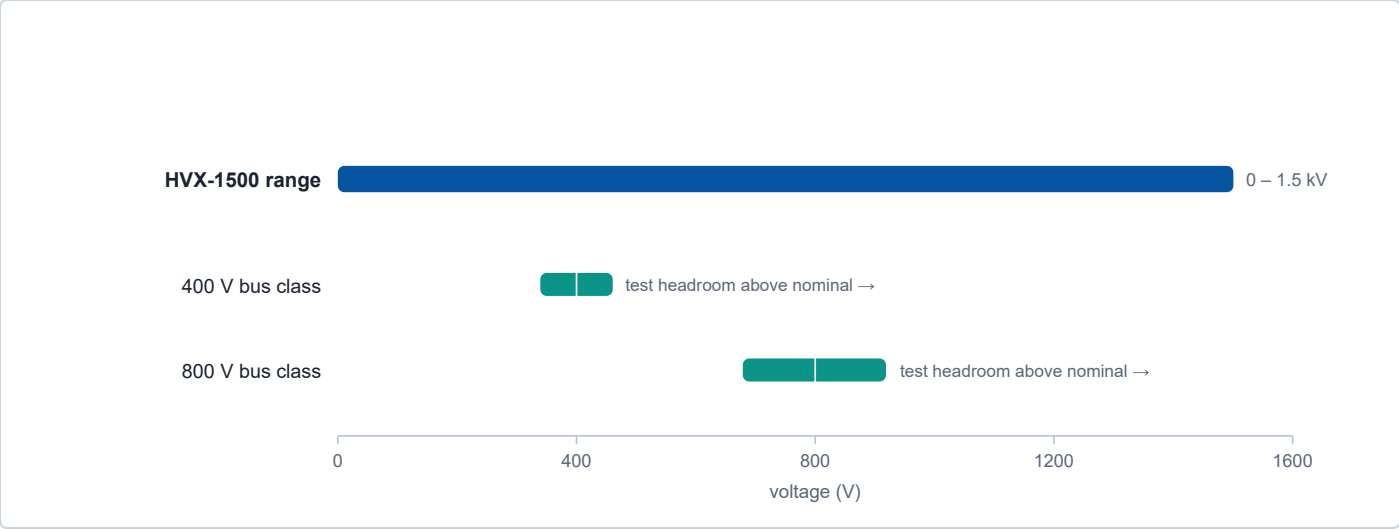
E-Mobility & EV Powertrain HV Test



The electrified powertrain runs on a high-voltage bus that did not exist in the combustion era. Traction batteries, inverters, DC-DC converters, on-board chargers, and motors all share a rail at a nominal 400 V or 800 V, and the next generation pushes higher. Every one of those components has to be tested for the conditions it sees in service: full bus voltage, the currents that real load draws, and the isolation that keeps that energy away from the chassis and the occupant.

Two demands make this work distinct from ordinary high-voltage test. The first is current. Running an inverter, a DC-DC converter or an on-board charger at its 800 V input draws amperes even at partial load, and the supply has to source that current while holding its set point. The HVX-Series is a source: it supplies current into the device under test and does not absorb it, so a battery emulator that must sink regenerative or charging current is a different class of equipment. The second is grounding. Much of EV test is done on floating architectures, where the high-voltage bus is deliberately isolated from earth, and the supply has to match that topology. A hard earth-referenced rail in a potential-free rig either defeats the isolation measurement or trips protection.

On top of that, the work is repetitive and automated. Powertrain and battery test runs across many units, follows scripted sequences, and logs everything. The supply is one node in a larger rig, and it has to take commands and report state without an operator standing over it.



DERIVED **Figure 1.** The HVX-1500's 0 to 1.5 kV range against the two common EV bus classes. Testing happens above the nominal rail, and the 1.5 kV class leaves headroom over an 800 V class rail; withstand levels above 1.5 kV use the 5 kV class.

How the BNC HVX-Series line solves it

The BNC HVX-Series fits this combination of voltage, current and topology. At the 1.5 kV class it delivers up to 2000 mA, which holds the bus voltage while an inverter or converter under test draws up to 3 kW. The supply is fully digitally regulated, so it keeps that set point under load: load regulation stays at or under 0.05 percent of nominal across a 10 to 90 percent step, and it recovers to within 0.1 percent of nominal in under 1 millisecond after a 0 to 100 percent load change, so a transient on the load does not pull the rail off target for long.

For potential-free rigs, the HVX-1500-1400 FLO and HVX-1500-2000 FLO have a **floating output** with no internal earth tie, so the supply does not force a ground reference on an isolated high-voltage architecture. State the potential the floating output must ride on, relative to earth, when specifying the unit, so the configuration matches the rig's insulation. Where a test plan instead needs a defined earth reference or both polarities, reversible earth-referenced models cover that case.

The supply is built for automation. Ethernet and RS232 are on board with a standard SCPI command set, the front panel keeps a time-tagged event log, and configurable code protection guards the setup between shifts. Drop it into a benchtop rig or rack it in a 2U slot beside the rest of the powertrain test stack.

Which HVX-Series models and options fit

For e-mobility work the 1.5 kV high-current class is the workhorse, with the floating variant chosen wherever the rig is potential-free.

Table 1.

Need	Recommended HVX-Series model	Rating
Potential-free powertrain rig	HVX-1500-2000 FLO	1.5 kV, 2000 mA, floating
Floating setups to 1.4 A	HVX-1500-1400 FLO	1.5 kV, 1400 mA, floating
Earth-referenced / dual-polarity bench	HVX-1500-2000	1.5 kV, 2000 mA, reversible
Component isolation above 1.5 kV	HVX-5000-600	5 kV, 600 mA, reversible

Two options matter here. **Ramp Control** brings the bus up at a defined gradient rather than a hard step, which is safer for energized battery and inverter setups and gives a repeatable rise across every unit in a production validation run. **Arc Detection** watches for flashover across isolation barriers and can shut the output off when it sees one, which protects the device under test and records the point where insulation gave way. For isolation and dielectric withstand checks on individual components rated above 1.5 kV, step up to the 5 kV class while keeping the same option set.

Recommended configuration

For an inverter, converter or motor test rig built on a floating high-voltage architecture, the **HVX-1500-2000 FLO** is the anchor. It sources up to 2000 mA at any bus voltage to 1.5 kV and presents a potential-free output to the isolated topology; where the rig also has to absorb current from the device, a bidirectional battery emulator takes that role beside it. Add **Ramp Control** for a defined, repeatable bus rise and **Arc Detection** with output shut-off to protect the device under test. Drive it over Ethernet with SCPI and fold it into the rig sequencer.

If the same cell also performs isolation or withstand checks on discrete components, add a **HVX-5000-600** in the reversible configuration so the bench covers both the bus-level work at 1.5 kV and the higher-voltage component checks. Rack both 2U units together and run them from the same automation layer.

Talk to an application engineer

Berkeley Nucleonics can help you match a HVX-Series model and option set to your e-mobility test rig. Call **800-234-7858** or email info@berkeleynucleonics.com.

For a quick question, chat with an engineer at berkeleynucleonics.com.

Ask now → Chat with our assistant and get an answer in seconds.

Berkeley Nucleonics Corp.
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Application Brief
HVX-Series High Voltage Power Supplies | dc-62022201