2013 BRP Commander Electric – VIN 0002

Advanced Vehicle Testing Activity – Baseline Testing Results

VEHICLE SPECIFICATIONS (SUPPLIED BY MANUFACTURER)

Vehicle Features

Base Vehicle: 2013 BRP Commander Electric
VIN: 2BWSAD31XDS000002
Type: NEV

Weights

Design Curb Weight: 1,874 lb
Delivered Curb Weight[1]: 1,894 lb
Distribution F/R (%): 45 / 55
GVWR: 2,998 lb
GAWR F/R: 1,296 lb / 1,852 lb
Max. Payload[2]: 800 lb
Performance Goal: ≥400 lb

Motor

Manufacturer: ABM
Model: DLGF 112200-4
Type: AC Induction
Voltage: 29 VAC
Power: 8.3 kW (Continuous), 23 kW (Peak)
Speed: 6400 rpm maximum

Dimensions

Wheelbase: 75.7 in
Track F/R: 49.5 in / 48 in
Length: 118.3 in
Width: 58.6 in
Height: 72 in
Ground Clearance: 11.5 in
Performance Goal: ≥5 in

Tires

Manufacturer: Maxxis
Model: Ceros
Size: Front: 26 in x 9 in x 14 in
Rear: 26 in x 11 in x 14 in
Pressure F/R: 18 psi / 18 psi

Battery

Manufacturer: Discover Energy Corp.
Model: EV-31A-A
Type: AGM Sealed Lead-Acid
Number of Modules: 8
Weight of Modules: 72 lb
Arrangement: Series and parallel

Battery (Continued)

Weight of Pack: 573 lb
Nominal Module Voltage: 12 V
Nominal System Voltage: 48 V
Pack Location: Front and Rear Bulkheads, Below Driver and Passenger Seats
Nominal Pack Capacity (C/1): 144 Ah
Nominal Pack Energy (C/1): 6.9 kWh

Charger

Type: AC Level 1, 110 V
Manufacturer: Delta-q Technologies
Model: QuiQ-dci 922-4852
Input voltage: 85-265 VAC
Max. current output: 18 A @ 48 V, 30 A @ 13.5 V
Max. Ground Current: < 0.01 mA
Max. Battery Leakage: < 0.01 mA

PERFORMANCE STATISTICS[3]

Acceleration 0-20 mph @ 332 lb Payload[2]

At 100% SOC[4]: 4.9 seconds

At 50% SOC: 6.0 seconds

Performance Goal@50% SOC: ≤6.0 seconds

Maximum Speed @ 170 lb Payload[2,5]

At 100% SOC: 24.5 mph

Classification Speed Limit: 25 mph

Maximum Speed @ 332 lb Payload[2]

At 100% SOC: 24.3 mph

At 50% SOC: 24.2 mph

Performance Goal@50% SOC: ≥20 mph

Maximum Speed Range[6]

Range: 36.6 miles

Performance Goal: ≥25 miles

Average Speed: 24.0 mph

Average Power: 4.7 kW

DC Energy Used: 7.2 kWh

Energy Consumption Rate: 196.7 DC Wh/mile

Braking from 20 mph[7]

At 50% SOC: 13.9 ft

At 100% SOC: 14.4 ft

Deceleration from 20 mph

At 50% SOC: 183.9 ft

At 100% SOC: 186.6 ft

Gradeability (Calculated)

Maximum Speed @ 3% Grade: 23.9 mph

Maximum Speed @ 6% Grade: 22.7 mph

Performance Goal: ≥20 mph

Maximum Grade: 22.1%

Charging Performance[8]

Max. DC Charge Current: 21.8 A

Peak AC Power Demand: 1.19 kW

DC Energy Used: 9.2 kWh

AC Energy Delivered: 10.2 kWh

Overall Trip Efficiency (DC Energy/AC Energy): 90.2%

Time to Recharge[5]:

To 80% SOC: 7.5 h

To 100% SOC: 10.4 h

To Complete: 16.3 h

Performance Goal: 100% SOC within 12 hours

TEST NOTES:

1. Denotes vehicle specification that was not supplied by the vehicle manufacturer.
2. Payload includes driver weight.
3. Performance numbers based on "Normal" vehicle mode.
4. State of charge
5. The 170-lb payload requirement is listed in the FMVSS 49 CFR 571.500 S6.3.1 standard.
6. The range test is conducted at the maximum possible speed and is terminated when the vehicle can no longer maintain 20 mph.
7. Braking conducted on a dry surface in a controlled manner.
8. Charging performance measured after conducting eight UDDS cycles to deplete the battery in a dynamometer facility.

This vehicle meets all NEV America Minimum Requirements listed on the next sheet.
Values in red indicate the Performance Goal was not met. All power and energy values are DC unless otherwise specified.

This vehicle complies with mandatory requirements of NEV America Vehicle Technical Specification, Revision 3 as follows.

(1) Vehicles shall comply with Federal Motor Vehicle Safety Standard 500 as promulgated on the date of manufacture. Such compliance shall be certified by the Supplier in accordance with 49 CFR 567.

(2) Suppliers shall provide a completed copy of Appendix A and Appendix B with their proposal providing vehicle specifications and the method of compliance, if any, with each listed section of 49 CFR 571.100.

(3) Vehicles shall be certifiable under current California Air Resources Board (CARB) regulations as vehicles that meet ZEV emission requirements and qualify for ZEV credits. If the vehicle is equipped with a fuel-fired heater, the heater shall also comply with this requirement.

(4) Suppliers shall provide Material Safety Data Sheets (MSDS) for all unique hazardous materials supplied with the vehicle.

(5) Suppliers shall provide recycling plans for batteries and other vehicle hazardous materials including how the plan has been implemented.

(6) All vehicles shall comply with the FCC requirements for unintentional emitted electromagnetic radiation, as identified in 47 CFR 15, Subpart B, "Unintentional Radiators."

(7) Vehicles shall have a minimum payload of at least 400 pounds.

(8) Suppliers shall provide the curb weight and rated payloads of their vehicles.

(9) For conversion vehicles, Suppliers shall specify the OEMs gross vehicle weight rating (GVWR) and shall not exceed such rating.

(10) For conversions, OEM Gross Vehicle Axle Weight Ratings (GAWR) shall not be increased.

(11) Suppliers shall provide axle weights for the vehicle as delivered, and at full rated payload.

(12) Odometers shall be provided and shall have an accuracy of at least ± 5%.

(13) The Supplier shall offer a standard or an optional tire conforming to the following requirements:

- Tires provided shall correspond to the requirements of the placard installed in accordance with 49 CFR 571.109, and 110, as applicable.
- Suppliers shall specify manufacturer, model and size of the standard tire for the vehicle and for the tire provided.
- Tire size and inflation pressure for the tire provided shall be in accordance with the requirements of the placard.
- At no time shall the tire's inflation pressure exceed the maximum pressure molded into that tire's sidewall.
- The tire provided shall be operable across the entire operation/load range of that vehicle.
- Replacements for the tire provided shall be commercially available to the end user in sufficient quantities to support the purchaser's needs.
- Tires provided as original equipment by the Supplier shall not have warranty restrictions in excess of those of the tire's manufacturer, unless the Supplier provides the warranty for the tires.

(14) Seating capacity shall be a minimum of 1 driver. Suppliers shall specify seating capacity (available seat belt positions) for their vehicle. If a conversion vehicle's seating capacity is changed from that specified by the OEM on their FMVSS placard, the seat(s) being added or abandoned shall be modified as required by 49 CFR 571.207, et al, and a new FMVSS placard installed as required by 49 CFR 567, 568 or 571, as applicable.

(15) For conversion vehicles, the OEM passenger space shall not be intruded upon by the batteries or other conversion materials.

(16) The controller/inverter shall limit the maximum battery discharge to prevent degradation of battery life (see Section 6.3) and abrupt loss of vehicle operability or shall indicate to the vehicle operator that the battery will be damaged by continued vehicle operation. Such limit and/or indication shall be repeatable and accurate to at least 10% battery state of charge.

(17) Regenerative braking shall not adversely impact the vehicle's service brake capability on varying road surfaces.

(18) Vehicles shall comply with the requirements of 49 CFR 571.105.S5.2.1, or alternatively, 49 CFR 571.105.S5.2.2 for parking mechanisms

(19) The vehicle top speed shall not exceed 25 mph when tested in accordance with 49 CFR 571.500.

(20) Vehicles shall be capable of completing the NEV America Handling Test NTP-004 Revision 1 and Rough Road Test NTP-005 Revision 1 including (1) driving through two (2) inches of standing water at a speed of 20 mph without damage and without battery to chassis leakage current exceeding 0.5 MIU per UL Standard 2202, and (2) standing for extended periods in extreme temperatures without damage to or failure of the vehicle or its systems. Vehicles should be capable of completing the NEV America Rough Road Test NTP-005 Revision 1 without becoming inoperable.

(21) Vehicle shall be capable of completing all NEV America tests without repairs exceeding a cumulative total of 72 hours.

(22) If vehicle batteries require active ventilation for charging, the vehicle shall be so marked.

(23) Suppliers shall indicate the depth of discharge below which the batteries should not be discharged.

(24) Suppliers shall provide a description of areas of non-compliance (if any) with the requirements of Section 6.5.

(25) Concentrations of explosive gases in the battery box shall not be allowed to exceed 25% of the LEL (Lower Explosive Limit).

(26) Suppliers shall describe how battery boxes will be vented, to prevent battery gas accumulation during and following normal charging, abnormal charging and operation of the vehicle.

(27) Suppliers shall provide a description of areas of non-compliance (if any) with the requirements of SAE J1718 on Battery Gas Evolution.

(28) Maintenance requirements for the batteries shall be described and any associated cost(s) to the consumer/end user should be clearly defined.

(29) Vehicles shall not contain exposed conductors, terminals, contact blocks or devices of any type that create the potential for personnel to be exposed to 50 volts or greater (the distinction between low-voltage and high voltage, as specified in SAE J1673 JUL96).

(30) Access to any high voltage components shall require the removal of at least one bolt, screw, cover or latch.

(31) Devices considered to be high-voltage components shall be clearly marked as HIGH VOLTAGE.

(32) Cable and wire marking shall consist of orange wire and/or orange sleeves as identified in SAE-J1673 JUL96.

(33) Propulsion power system operating at greater than 50 volts shall be isolated from the vehicle chassis such that leakage current does not exceed 0.5 MIU.

(34) Charging circuits shall be isolated from the vehicle chassis such that ground current from the grounded chassis does not exceed 5 mA at any time the vehicle is connected to an off-board power supply and shall be compatible with operation using a 5 mA GFCI.

(35) Vehicles using HIGH VOLTAGE traction systems shall be equipped with a key operated "master" switch that shall interlock controller propulsion functions and battery contactor(s), if any, to render the propulsion system inoperative. Contactor(s) used in conjunction with the master switch shall be capable of interrupting maximum rated controller/inverter current.

(36) A manual service disconnect for vehicles using a HIGH VOLTAGE traction system shall also be required. It shall have the following characteristics;

- Manual action is required to break the connection,
- The disconnection is physically verifiable,
- The disconnection does not create exposed conductors capable of becoming energized while exposed, and
- The service disconnect is marked so as to be visible from outside the vehicle with the doors (if so equipped) open and is accessible without the use of tools.

(37) The following controller/inverter interlocks shall be present:

- The controller shall not initially energize to move the vehicle with the direction selector in any position other than "PARK" or "NEUTRAL,"
- The master switch key shall be removable only when the switch is in the "OFF" position, and
- With a pre-existing accelerator input, the controller shall not energize such that the vehicle can move under its own power in this condition.

(38) The vehicle shall be prevented from being driven with the master switch key turned on and the drive selector in the drive or reverse position while the vehicle's charge cord is attached.

(39) Electrically powered windshield wipers shall be provided as standard or optional equipment.

(40) An electrically powered warning horn operable by the vehicle driver shall be provided as standard or optional equipment.

(41) Vehicles shall be equipped with an on-board or off board battery charger capable of recharging the propulsion battery to a state of full charge from any possible state of discharge in less than 12 hours.

(42) The charger shall be fully automatic, determining when "end of charge" conditions are met and transitioning into a mode that maintains the propulsion battery at a full state of charge while not overcharging it, if continuously left on charge.

(43) On-board and off board chargers shall have the capability of accepting input voltages of 120V (Level 1), 208V or 240V (Level 2) single phase 60 Hertz alternating current service, with a tolerance of ±10% of rated voltage.

(44) On-board charger personnel protection systems, which may include ground fault circuit interrupters (GFCI), shall be in accordance with the provisions of UL Standards 2202.

(45) Suppliers shall specify all optional equipment required to meet the requirements of this Vehicle Specification.

(46) Vehicles shall be accompanied by non-proprietary manuals for parts, service, operation and maintenance, interconnection wiring diagrams and schematics.

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