NEVAmerica
U.S. Department of Energy Advanced Vehicle Testing Activity

ZENN Motor Company
2008 ZENN 2-Passenger

VEHICLE SPECIFICATIONS

Base Vehicle: 2008 Zenn Motor Company Zenn 2-Passenger
VIN: ZFHAS15A68S001001
Seatbelt Positions: Two
Standard Features:
- Front Wheel Drive
- Front Disc and Rear Disc Brakes
- Regenerative Braking With Coast Down and Over Speed
- Three-Point Safety Belts
- Speedometer
- Odometer
- State-Of-Charge Meter
- Back-up Alarm
- On Board Battery Charger

BATTERY
Manufacturer: Discover
Type: EV31A-A Sealed Lead Acid
Number of Modules: 6
Weight of Modules: 32 kg
Weight of Pack(s): 192 kg
Pack(s) Location: Under Rear Floor and Front Hood
Nominal Module Voltage: 12V
Nominal System Voltage: 72V
Nominal Capacity (C/1): 63 Ah

TIRES
Tire Mfg: Kleber
Tire Model: Viaxer
Tire Size: P145/70R13 71T
Tire Pressure: 30 psi
Spare Installed: No

WEIGHTS
Design Curb Weight: 1200 lb
Delivered Curb Weight: 1404 lb
Distribution F/R: 53/47 %
GVWR: 1807 lb
GAWR F/R: 815/992 lb
Payload: 403 lb[2]
Performance Goal: 400 lb

DIMENSIONS
Wheelbase: 81.8 inches
Track F/R: 55.5/55.5 inches
Length: 120.8 inches
Width: 58.0 inches
Height: 55.9 inches
Ground Clearance: 7.25 inches
Performance Goal: 5.0 inches

CHARGER
Level 1:
Location: On-board
Type: Conductive
Input Voltages: 115/230 VAC

PERFORMANCE STATISTICS

Acceleration (0-20 mph) @ 332 lbs Payload
At 100% SOC: 5.3 seconds
At 50% SOC: 5.2 seconds
Performance Goal: 6.0 seconds

Maximum Speed @ 170 lbs Payload
(FMVSS 49 CFR 571.500 S5.a)
At 100%: 25.0 mph
Performance goal ≤ 25 mph

Maximum Speed @ 332 lbs Payload
At 100% SOC: Top Speed: 25.0 mph
At 50% SOC: Top Speed: 25.0 mph

Maximum Speed Range[1]
Range: 64.6 miles
Energy Used: 6.38 kWh
Average Power: 2.38 kW
Efficiency: 98.76 Wh-DC/mile
Specific Energy: 33.2 Wh/kg

Braking From 20 mph
Controlled Dry: 20.0 feet

Gradeability (Calculated)
Maximum Speed @ 3%: 24.7 mph
Maximum Speed @ 6%: 23.4 mph
Maximum Grade: 23 %

Charging Efficiency:
Efficiency: 139.3 Wh-Ac/mi
Energy Cost: @ $0.10/kWh: $0.013/mi

Level 1 Charger
Max Ground Current: <0.01 mA
Max Battery Leakage : <0.01 MIU
Max DC Charge Current: 17.9 A
Max AC Charge Current: 12.6 A
Peak AC Demand: 1.51 kW
Time to Recharge:
- To 80%: 6.7 Hours
- To 100%: 9.4 Hours
- To Complete: 14.2 Hours

Performance Goal: 100% SOC within 12 hours

TEST NOTES:
1. Vehicle was operated at maximum attainable speed until 20 mph could no longer be maintained.
2. As delivered payload was 403 Lbs.
3. Hours were calculated at time that charger indicated completion.

This vehicle meets all NEVAmerica Minimum Requirements listed on back.
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) Supplier

(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 p
- Suppliers shall specify manufacturer, model and size of the standard tire for the vehicle and for the tire provided.
- Tire size and in ation pressure for the tire provided shall be in accordance with the requirements of the placard.
- At no time shall the tire's in ation 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 ha

(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 con

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

(18) Vehi

(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 s

(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 v

(27) Suppli

(28) Mainten ned.

(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

(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. Con

(36) A manual service d

- 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 mark

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

- The control
- The master switch key shall be removable only when the switch is in the "OFF" position, and
- With a pre-exi

(38) The vehicle shall be prevented from being driven with the

(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 syste

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

(46) Vehicles shall be accom

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