



UEVAMERICA
U.S. DEPARTMENT OF ENERGY
ADVANCED VEHICLE TESTING ACTIVITY



**1999 Ford THINK City
Urban Electric Vehicle**

VEHICLE SPECIFICATIONS¹

VEHICLE FEATURES

Base Vehicle: 1999 Ford THINK City
VIN: YYCDA11A0WAAA1018
Seatbelt Positions: Two
Standard Features:
CARB Certified as a ZEV
AM/FM CD
Front Wheel Drive
Single Speed Transmission
Front Disc/Rear Drum Brakes
Regenerative Braking
Heated Front & Rear Windshields
Passenger Compartment Pre-heat
State-Of-Charge Meter
Back-up Alarm
Low Rolling Resistance Tires
Thermoplastic Body Panels
Daytime Running Lights
Driver Air Bag
ABS Plastic Roof

BATTERY

Manufacturer: SAFT
Type: Nickel Cadmium (NiCd)
Number of Modules: 19
Weight of Modules: 12.9 kg
Weight of Pack(s): 245 kg
Pack(s) Location: Under Seats
Nominal Module Voltage: 6 VDC
Nominal System Voltage: 114 VDC
Nominal Capacity (C/3): 100 Ah

WEIGHTS

Design Curb Weight: 2112 lbs
Delivered Curb Weight: 2043 lbs
Distribution F/R: 55/45 %
GVWR: 2563 lbs
GAWR F/R: 1334/1289 lbs
Payload: 451 lbs
Performance Goal: 400 lbs

DIMENSIONS

Wheelbase: 77.8 inches
Track F/R: 54.9/52.5 inches
Length: 117.0 inches
Width: 62.2 inches
Height: 60.8 inches
Ground Clearance: **4.3 inches**
Performance Goal: 5.0 inches

CHARGER

Location: On Board
Type: Conductive
Input Voltages: 240 VAC - Single Phase

TIRES

Tire Mfg: Continental
Tire Model: ContEcoContact EP
Tire Size: 155/70/R13
Tire Pressure F/R: 35/35 psi

DRIVE MOTOR

Output: 27 kW
Type: AC Induction

**PERFORMANCE
STATISTICS**

Acceleration 0-30 mph

At 100% SOC: 7.8 seconds
At 50% SOC: 8.3 seconds
Performance Goal: 8.5 seconds

Maximum Speed @ 50% SOC

At 1/4 Mile: 49.9 mph
In 1 Mile: 54.6 mph
Performance Goal: 45 mph in one mile

Constant Speed Range @ 35 mph

Range: 65.5 miles
Energy Used: 8.8 kWh
Average Power: 4.6 kW
Efficiency: 134.7 Wh-DC/mile
Specific Energy: 36.0 Wh/kg
Performance Goal: 30 miles

Range at Maximum Speed

Range: 40.5 miles
Energy Used: 8.7 kWh
Average Power: 9.5 kW
Efficiency: 215.2 Wh-DC/mile
Specific Energy: 35.6 Wh/kg

Driving Cycle Range

Range per SAE J1634: 30.2 miles
Energy Used: 7.6 kWh
Average Power: 5.2 kW
Efficiency: 251.2 Wh-DC/mile
Specific Energy: 31.0 Wh/kg
Performance Goal: 30 miles

Braking From 45 mph

Controlled Dry: 110.3 feet
Controlled Wet: 120.8 feet
Panic Wet: 123.7 feet
Course Deviation: 0.0 feet

Handling

Average Time: 60.2 seconds
Average Dodge Neon Time: 54.6 seconds

Gradeability (Calculated)

Maximum Speed @ 3%: 48.7 mph
Maximum Speed @ 6%: 40.3 mph
Maximum Grade: 33.6 %

Charging Efficiency²:

Efficiency: 465 Wh-AC/mi
Energy Cost: @ \$0.10/kWh: \$0.047/mi

Charger

Max Ground Current: <0.01 mA
Max Battery Leakage : <0.01 MIU
Max DC Charge Current: 20.2 A
Max AC Charge Current: 10.9 A
Peak Demand: 2440 W
Time to Recharge: 7.15 hours
Performance Goal: 12 hours

TEST NOTES:

1. This vehicle does not comply with Federal Motor Vehicle Safety Standards applicable on the date of manufacture
2. Based on Drive Cycle Range

This vehicle meets all HEV America Minimum Requirements (except #1) listed on back of this sheet
Values in red indicate the Performance Goal was not met. All Power and Energy Values are DC unless otherwise specified.

This vehicle meets the following UEVAmerica minimum requirements:

- (1) Vehicles shall comply with Federal Motor Vehicle Safety Standards applicable on the date of manufacture and such compliance shall be certified by the manufacturer in accordance with 49 CFR 567. If the vehicle is a converted vehicle, both the OEM, and Converter Manufacturer Certification labels, shall be visible per the requirements of 49 CFR 567. Suppliers shall provide a completed copy of Appendix A and Appendix B, providing vehicle specifications indicating the method of compliance with each required section of 49 CFR 571. If certification includes exemption, the exemption number issued by the National Highway Transportation Safety Administration (NHTSA), the date of its publication in the Federal Register and the page number(s) of the Federal Register acknowledging issuance of the exemption shall be provided along with Appendix B. Exemptions for any reason other than non-applicability shall not be allowed.
- (2) Suppliers shall supply Material Safety Data Sheets (MSDS) for all batteries the vehicle is equipped with, including auxiliary batteries
- (3) Suppliers shall provide information on their selected battery manufacturer's recycling plan including how it has been implemented.
- (4) All vehicles shall comply with the FCC requirements for unintentional emitted electromagnetic radiation, as identified in 47 CFR 15, Subpart B, "Unintentional Radiators."
- (5) Vehicles shall have a minimum payload of 400 pounds.
- (6) For conversions, OEM GVWR shall not be increased. For conversion vehicles, Suppliers shall specify the OEMs gross vehicle weight rating (GVWR).
- (7) For conversions, OEM Gross Vehicle Axle Weight Ratings (GAWR) shall not be increased. Suppliers shall provide axle weights for the vehicle as delivered, and at full rated payload.
- (8) Speedometers shall be provided and shall have an accuracy of at least $\pm 5\%$ at 45 mph. Odometers shall be provided as standard equipment or as an option and shall have an accuracy of at least $\pm 5\%$.
- (9) Tires shall be subject to the following requirements:
 - Tires provided with the vehicle shall be the standard tire for the vehicle being proposed.
 - Tires shall correspond to the requirements of the placard installed in accordance with 49 CFR 571.109 and 110, or 119 and 120, as applicable.
 - Suppliers shall specify manufacturer, model and size of the standard tire.
 - Tires sizes and inflation pressures shall be in accordance with the requirements of the placard.
 - At no time shall the tire's inflation pressure exceed the maximum pressure imprinted upon that tire's sidewall.
 - The tire shall be operable across the entire operation/load range of that vehicle.
 - Replacement tires shall be commercially available.
 - Tires provided as original equipment shall not have warranty restrictions in excess of those of the tire's manufacturer, unless the vehicle Supplier is the sole warrantor for the tires.
 - If the vehicle may be equipped with more than one standard tire, this information shall be provided for each type/manufacturer of each standard tire.
- (10) Seating capacity shall be a minimum of 1 driver. Suppliers shall specify seating capacity (available seat belt positions) for their vehicle. If the 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.
- (11) For conversion vehicles, the OEM passenger space shall not be intruded upon by the battery, battery box or other conversion materials. All vehicles shall comply with the requirements of 49 CFR 571.305
- (12) The vehicle speed shall be limited below maximum speed for reverse travel.
- (13) 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.
- (14) The controller/inverter shall control the minimum traction battery discharge voltage to prevent degradation of battery life and abrupt loss of controller/inverter function, and should limit the maximum regeneration voltage to prevent external gassing of the batteries.
- (15) If different, customer available and battery available DOD ratings shall both be provided.
- (16) Batteries shall comply with the requirements of SAE J1718 APR97.

Propulsion batteries shall meet the requirements of NEC 625 and UL-2202 for charging in enclosed spaces without a vent fan. The vehicle shall be labeled as not requiring ventilation for charging (or have the appropriate classification label from a UL-recognized Testing Laboratory). Vented batteries shall not be used.
- (17) Batteries and/or battery enclosures shall meet the requirements of SAE J1766 FEB96 and shall be designed and constructed in such a way that batteries and electrolyte will not intrude into the passenger compartment during or following FMVSS frontal barrier, rear barrier and side impact collisions, and roll-over requirements of 49 CFR 571.301. The test vehicles shall also comply with the requirement of proposed 49 CFR 571.305. Suppliers shall provide verification of conformance to these requirements.
- (18) Concentrations of explosive gases shall not be allowed to exceed 25% of the LEL (Lower Explosive Limit) in the battery box. Suppliers shall describe how battery boxes will be vented, to allow any battery gases to escape safely to atmosphere during and following normal or abnormal charging and operation of the vehicle. Suppliers shall provide a verification of conformance to SAE J1718 APR97 on Battery Gas Evolution.
- (19) Suppliers shall verify that the method(s) of charging the propulsion batteries and the charging algorithm(s) do not impact the battery supplier's warranty available to the end-user
- (20) Supplier's shall provide a detailed description of the BMS operation. The description of the driver interface shall be consistent with that provided in the owner's manual.
- (21) 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 J1127, J1128, et al.). Access to any high voltage components shall require the removal of at least one bolt, screw, or latch. Devices considered to be high voltage components shall be clearly marked as HIGH VOLTAGE. Additionally, cable and wire marking shall consist of orange wire and/or orange sleeving as identified in SAE-J1127 MAR88.
- (22) Propulsion power shall be isolated from the vehicle chassis such that leakage current does not exceed 0.5 MIU. 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. Furthermore, for impact conditions, the vehicles shall also comply with the requirement of proposed 49 CFR 571.305. Suppliers shall provide verification of conformance to these requirements.
- (23) Vehicles shall be equipped with an automatic disconnect for the main propulsion batteries. This disconnect shall operate to isolate the propulsion circuits any time the chassis becomes energized from contact with the propulsion battery or its associated circuits. This disconnect shall be capable of interrupting maximum rated controller/inverter current. The Supplier shall describe the automatic disconnect provided for the main propulsion batteries.

A manual service disconnect shall also be required. A decal or other label denoting the location of the device shall be affixed to the inside of the vehicle such that it is visible to individuals located outside the vehicle. It (the disconnect) shall include the following capabilities:

 - Have manual action to break the connection
 - The disconnection is physically verifiable
 - The disconnection does not create exposed conductors capable of becoming energized while exposed.

Alternately, the key switch may be used to satisfy the operability portion of the manual service disconnect requirement, if it interrupts all control power going to the controller and the main battery contactor(s).
- (24) The vehicle shall be prevented from being driven with the key turned on and the drive selector in the "DRIVE" or "REVERSE" position while the vehicle's charge cord is attached. Additionally, the following interlocks shall be present:
 - The controller shall not initially energize to move the vehicle with the gear selector in any position other than "PARK" or "NEUTRAL;"
 - The start key shall be removable only when the "ignition switch" is in the "OFF" position, with the drive selector in "PARK;"
 - With a pre-existing accelerator input, the controller shall not energize or excite such that the vehicle can move under its own power from this condition.
- (25) The vehicle shall include a state of charge indicator for the main propulsion batteries. Indications should be accurate to within 5% of full scale throughout its useable range.
- (26) Vehicles shall be supplied with a battery charger capable of recharging the main propulsion battery to a state of full charge from any possible state of discharge in less than twelve (12) hours at temperatures noted in Section 5.5.

The charger shall be fully automatic, determining when "end of charge" conditions are met and transitioning into a mode that maintains the main propulsion battery at a full state of charge while not overcharging it, if continuously left on charge.
- (27) Chargers shall have the capability of accepting input voltages of 120 or 208/ 240V single phase 60 Hertz alternating current service, with a tolerance of 10% of rated voltage. On-board personnel protection systems, which may include ground fault circuit interrupters (GFCI), shall be in accordance with the provisions of UL Standard 2202, June 1999.
- (28) Chargers shall have a true power factor of .95 or greater and a harmonic distortion of the current of less than 20%, when operating at full rated load.
- (29) Regardless of the charger type used, the charger shall conform to the requirements of UL Standard 2202, June 1999.
- (30) The installation of options shall not relieve Suppliers of meeting other "shall" requirements.
- (31) If fuel fired heaters are used, they shall meet the requirements of Section 1.2. Further, heater fuel containments shall meet the requirements of 49 CFR 571.301.
- (32) If a 120V charger is supplied, this charger shall comply with the requirements of Section 7.2 for isolation and Section 8.2 for personnel protection.
- (33) Vehicles shall be accompanied by non-proprietary manuals for parts, service, operation and maintenance, interconnection wiring diagrams and schematics.

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