

Simulated Zero Emission Bus Certificate

Customer: Alexander Dennis				DYNAMOMETER SETTINGS			
Customer Address: Cameron House, Priorswood Pl, Skelmersdale, Lancs	Telematics Capability	Yes	Test Weight	9862	kg		
Test Purpose: Zero Emission Bus Testing	Maximum Speed (km/h)	97 km/h	F°	N/A	N		
Vehicle Manufacturer: Alexander Dennis	Seated Capacity	25	F ¹	N/A	N/kmh		
Vehicle Model Name: Enviro100EV	Passenger Capacity	40	F ²	N/A	N/kmh ²		
Powertrain Technology: Battery Electric	Declared Unladen Weight (kg)	8903	Equivalent test passengers	13	passengers		
Powertrain Configuration: Direct Drive	Gross Weight (kg)	12000	Measured Unladen Weight	N/A	kg		
Zero Emission Heating: Heat Pump	GVW Check	OK	Number of consecutive tests completed	N/A	Tests		
Battery Specification		Charging and Refuelling Capability		Hydrogen Specification			
Battery Manufacturer: Impact Clean Power Technology	Plug Type	CCS2 & OppCharge	Fuel Cell Manufacturer		N/A		
Battery Chemistry: NMC	Max Charge Capability (kW)	Up to 150kW/300 kW	Fuel Cell Power Rating (kW)		N/A		
Battery Installed Capacity (kWh): 354	Charger Compatibility	DC	Hydrogen Storage Capacity (kg)		N/A		
Battery Usable Capacity (kWh)*: 312	Charge time from 20-80% SOC**	2-4 hours	Hydrogen Storage Pressure (bar)		N/A		

* Recommended manufacturer guideline, subject to warranty

** Based on manufacturer estimate

Declared fuel, properties and source plus carbon conversion factors

Well-to-Tank Factor: Electricity	80.92	g CO ₂ e / MJ	Fuel Provider	UK market standard	WTT evidence	DBEIS Conversion 2021
Well-to-Tank Factor: Hydrogen	N/A	g CO ₂ e / MJ	Capacity of Tanker (kg)	N/A	Fuel Type / Pathway	UK Grid Electricity
Energy Density: Hydrogen	120	MJ / kg	Transport Distance of Hydrogen (km)	N/A	Energy Source	UK Grid

Emissions and Energy consumption results from approved test facility - Average 4 tests

Test Phase	HC (g/km)	CO (g/km)	NOx (g/km)	PM (g/km)	CO ₂ (g/km)	CH ₄ (g/km)*	N ₂ O (g/km)*	Total Energy Consumption (kWh)	Vehicle Energy Consumption (kWh/km)	Grid Electrical Energy Consumption (kWh/ 100km)
Outer Urban	N/A	N/A	N/A	N/A	N/A	N/A	N/A	4.70	0.72	90.00
Inner Urban	N/A	N/A	N/A	N/A	N/A	N/A	N/A	2.40	0.98	122.50
Rural	N/A	N/A	N/A	N/A	N/A	N/A	N/A	4.30	0.58	72.50
LBC Average	N/A	N/A	N/A	N/A	N/A	N/A	N/A	7.10	0.79	98.75
UK BUS Average	N/A	N/A	N/A	N/A	N/A	N/A	N/A	11.40	0.69	86.25

Zero Emissions (Z.E.) Range: Energy consumption and charging efficiency

Test Charger Used	22 kW	Total measured energy consumed on vehicle (kWh) ¹	N/A	Max ZE Range at 100% SOC (km)	451
Hydrogen Energy Over Test (kWh)	N/A	Measured grid energy during charging (kWh)	N/A	Max ZE Range at 80% SOC (km)	361
Hydrogen Delivered to Vehicle (kg)	N/A	Grid-to-Wheel efficiency (%) ²	80%	Test Distance Travelled (km)	N/A

¹ Total measured energy may include energy used during the 23 minute warmup, this is needed for charge efficiency calculation.

² Grid to Wheel efficiency represents the total energy losses between the grid and the wheels of the bus.

Calculated total Well-to-Wheel GHG CO₂ equivalent emissions over test

Test Phase	Fuel Energy (MJ /km)	Fuel WTT*GHG Emissions (g CO ₂ e / km)	Electrical Energy (MJ / km)	Electricity WTT* GHG Emissions (g CO ₂ e / km)
Outer Urban	N/A	N/A	3.24	262.18
Inner Urban	N/A	N/A	4.41	356.86
Rural	N/A	N/A	2.61	211.20
LBC Average	N/A	N/A	3.56	287.67
UK BUS Average	N/A	N/A	3.11	251.26

Data Generated by (On behalf of Test facility): _____ Date: _____

Data Approved by: _____ Date: _____

Zero Emission Bus Certificate Summary

Test Vehicle	Average Euro VI Diesel Equivalent	
Greenhouse Gas Emissions: Well-to-Wheel	251.3	g CO ₂ e / km
WTW CO ₂ per passenger km (@ Max Pass Capacity)	6.3	g CO ₂ e/pass km
Overall Zero Emission Bus Performance		
WTW GHG saving	605.5	g CO ₂ e / km
% WTW GHG saving	71%	g CO ₂ e / km
Approved as Zero Emission Bus? (50% GHG saving or more)		YES

* WTT : Well-to-Tank

** TTW : Tank-to-Wheel

*** WTW : Well-to Wheel

COMMENTS: LBC = London Bus Cycle - Inner & Outer Urban phases of UKBC only. Certificate generated using simulated data from AVL Cruise M multi-physics simulation tool. Simulated certificate valid until 31/12/23 - following receipt of purchase order number for physical chassis dynamometer test. Results to be replaced from valid UKBC tests. Certificate will become invalid. Charger efficiency based on existing certified ADL E400EV and E200EV.

Heating Requirement	Cell	Lower Saloon	Upper Saloon
Target Temperatures ±2 (°C) :	10	17	17
Average Temperatures across testing (°C)	N/A	N/A	N/A

Test Numbers:

Certificate approved by:
On behalf of Bus manufacturer

Certificate Approved by:
On behalf of DfT / Zemo Partnership Daniel Hayes 23.01.23

ZEB_Simulated_Certificate_ADL_E100_EV_354 kWh_November_22_V2_Zemo_Signed

Final Audit Report

2023-01-23

Created:	2023-01-23
By:	Zemo Partnership (admin@zemo.org.uk)
Status:	Signed
Transaction ID:	CBJCHBCAABAAI6FaQTImR9mAexrRIgBF9qtENybai3Re

"ZEB_Simulated_Certificate_ADL_E100_EV_354kWh_November_22_V2_Zemo_Signed" History

-  Document created by Zemo Partnership (admin@zemo.org.uk)
2023-01-23 - 2:44:06 PM GMT- IP address: 81.170.24.16
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