

Zero Emission Bus Certificate

Customer:	Alexander Dennis			DYNAMOMETER SETTINGS		
Customer Address:	Cameron House, Priorswood Pl, Skelmersdale, Lancs	Telematics Capability	Yes	Test Weight	13457	kg
Test Purpose:	Zero Emission Bus Testing	Maximum Speed (km/h)	50 km/h	F*	271.17	N
Vehicle Manufacturer:	Alexander Dennis	Seated Capacity	34	F ¹	5.3817	N/kmh
Vehicle Model Name:	E200 EV Gen 3	Passenger Capacity	65	F ²	0.32413	N/kmh ²
Powertrain Technology	Battery Electric	Declared Unladen Weight (kg)	12246	Equivalent test passengers	17	passengers
Powertrain Configuration	Hub Motors	Gross Weight (kg)	18000	Measured Unladen Weight	11793	kg
Zero Emission Heating	Heat Pump	GVW Check	OK	Number of consecutive tests completed	4	Tests
Battery Specification		Charging and Refuelling Capability		Hydrogen Specification		
Battery Manufacturer	BYD	Plug Type	Type 2 & CCS2	Fuel Cell Manufacturer	N/A	
Battery Chemistry	LFP	Max Charge Capability (kW)	Up to 102kW	Fuel Cell Power Rating (kW)	N/A	
Battery Installed Capacity (kWh)	348	Charger Compatibility	AC or DC	Hydrogen Storage Capacity (kg)	N/A	
Battery Usable Capacity (kWh)*	330	Charge time from 20-80% SOC**	2-6 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	72.65	g CO _{2e} / MJ	Fuel Provider	UK market standard	WTT evidence	DBEIS Conversion 2022
Well-to-Tank Factor: Hydrogen	N/A	g CO _{2e} / 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	7.78	1.16	147.40
Inner Urban	N/A	N/A	N/A	N/A	N/A	N/A	N/A	4.12	1.66	209.67
Rural	N/A	N/A	N/A	N/A	N/A	N/A	N/A	6.52	0.85	107.54
LBC Average	N/A	N/A	N/A	N/A	N/A	N/A	N/A	11.90	1.32	167.03
UK BUS Average	N/A	N/A	N/A	N/A	N/A	N/A	N/A	18.42	1.10	138.76

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

Test Charger Used	22 kW	Total measured energy consumed on vehicle (kWh) ¹	72.10	Max ZE Range at 100% SOC (km)	301
Hydrogen Energy Over Test (kWh)	N/A	Measured grid energy during charging (kWh)	n/a	Max ZE Range at 80% SOC (km)	241
Hydrogen Delivered to Vehicle (kg)	N/A	Grid-to-Wheel efficiency (%) ²	79%	Test Distance Travelled (km)	65

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 _{2e} / km)	Electrical Energy (MJ / km)	Electricity WTT* GHG Emissions (g CO _{2e} / km)
Outer Urban	N/A	N/A	5.31	385.52
Inner Urban	N/A	N/A	7.55	548.36
Rural	N/A	N/A	3.87	281.26
LBC Average	N/A	N/A	6.01	436.86
UK BUS Average	N/A	N/A	5.00	362.90

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	362.9 g CO _{2e} / km	Average Diesel GHG Emissions Equivalent	1092 g CO _{2e} / km
WTW CO ₂ per passenger km (@ Max Pass Capacity)	5.6 g CO _{2e} /pass km	WTW CO ₂ per passenger km (@ Max Pass Capacity)	16.8 g CO _{2e} /pass km
Overall Zero Emission Bus Performance			
WTW GHG saving	729.4 g CO _{2e} / km	Maximum Theoretical Zero Emission Range (km)	301.0
% WTW GHG saving	67% g CO _{2e} / km	Vehicle Energy Consumption (kWh/ km)	1.1
Approved as Zero Emission Bus? (50% GHG saving or more)		YES	

* WTT : Well-to-Tank

** TTW : Tank-to-Wheel

*** WTW : Well-to Wheel

COMMENTS: Emission results marked in red are below detection levels. LBC = London Bus Cycle - Inner & Outer Urban phases of UKBC only. Charge efficiency could not be measured, a value from H293 tested previously has been used. Electrical and Air demister on for testing.

Heating Requirement	Cell	Lower Saloon	Upper Saloon
Target Temperatures ±2 (°C) :	10	17	n/a
Average Temperatures across testing (°C)	9.30	17.67	n/a

Test Numbers: ML02018952 (06.11.19), ML02018954 (06.11.19), ML02018955 (06.11.19), ML02018956 (06.11.19)

Certificate approved by:
On behalf of Bus manufacturer
Jamie Wilson
04/05/2023

Certificate Approved by:
On behalf of DfT / Zemo Partnership
Tim Griffen
21.03.2023