

# Manufacturer/Supplier Guidance For BSOG Zero Emission Bus 22p/km Claims

Document prepared by Zemo Partnership



**Zemo  
Partnership**  
Accelerating Transport to Zero Emissions

# Guidance for ZEB Manufacturers /Suppliers



This slide deck sets out the steps required of ZEB OEMs/ suppliers to achieve the ZEB accreditation for vehicles and enable operators to claim the 22p/km of Zero Emission Bus incentive

Vehicle Manufacturers/ Suppliers will need to provide operators with the following documentation to enable a successful BSOG ZEB claim:

1. **A Zero Emission Bus Test Certificate** – specific to ZEB model
2. **A ZEB Vehicle Summary Sheet** – specific to each individual bus

# Accreditation of a Zero Emission Bus



- **To achieve ZEB accreditation and certification, vehicles must:**
  - have no combustion engines on-board (including diesel heaters),
  - produce no regulated emissions from the tailpipe(s),
  - achieve a 50% well-to-wheel greenhouse gas saving compared to a conventional Euro VI diesel over the UK Bus Cycle.
- **ZEB test procedure is exactly the same as ULEB test procedure**
- **Models that are certified as ULEBs and meet the ZEB definition above automatically issued with ZEB Certificates following consultation with vehicle supplier.**
- **If you are seeking ZEB accreditation, please engage with Zemo ahead of test date to ensure all test parameters are agreed.**

# Zero Emission Bus Test Certificate

OEMs will provide operators with ZEB certificate



- Certificates are awarded on a model by model basis e.g. E200EV, StreetDeck Electroliner, BZL, eCity Gold etc.
- Demonstrates **energy efficiency** and **GHG performance** over UK Bus Cycle including Inner Urban, Outer Urban & Rural phases
- Details total & useable battery capacity, hydrogen fuel storage, AC/DC charging, top speed and more.
- Published on Zemo website – signed by Zemo and Manufacturer
- ZEB Certificates also used to support bids for capital grant schemes like ZEBRA and ScotZEB.

Zero Emission Bus Certification ID: ZEB-ADL-E200-2022									
Zero Emission Bus Certificate									
Customer: Alexander Dennis					DYNAMOMETER SETTINGS				
Customer Address	Cannon House, Brimswood Pl, Stonehouse, Lancs				Telematic Capability	Yes		Test Weight	12777 kg
Test Purpose	Zero Emission Bus Testing				Maximum Speed (km/h)	50 km/h		Top Speed	217.80 km/h
Vehicle Manufacturer	Alexander Dennis				Seated Capacity	34		Max. Gross Weight	12000 kg
Vehicle Model Name	E200 EV Gen 3				Passenger Capacity	65		Max. Payload	10000 kg
Powertrain Technology	Battery Electric				Declared Vehicle Weight (kg)	12246		Equivalent test passenger	17
Powertrain Configuration	Rear Motor				GVW Check	19250		Measured Vehicle Weight (kg)	11793
Zero Emission Rating	Heat Pump				GVW Check	OK			
Battery Specification					Hydrogen Specification				
Battery Manufacturer	BYD				Plug Type	AC Type 2 / CCS 2		Fuel Cell Manufacturer	N/A
Battery Chemistry	LFP				Max Charge Capacity (kWh)	Up to 102kWh		Fuel Cell Power Rating (kW)	N/A
Battery Installed Capacity (kWh)	248				Charge Compatibility	AC or DC		Hydrogen Storage Capacity (kg)	N/A
Battery Usable Capacity (kWh)	232				Charge Rate from 20-80% SOC	2.4 hours		Hydrogen Storage Pressure (bar)	N/A
Declared fuel, properties and source plus carbon conversion factors									
Wt-to-Wheel Factor	Electricity	0.92	g CO <sub>2</sub> e / MJ	Fuel Producer	UK market standard	WTT efficiency	DBRIS Conversion 2021		
Wt-to-Wheel Factor	Hydrogen	N/A	g CO <sub>2</sub> e / MJ	Capacity of Tank (kg)	N/A	Fuel Type / Delivery	UK Grid Electricity		
Energy Density	Hydrogen	120	MJ / kg	Transport Distance of Hydrogen (km)	N/A	Hydrogen Production 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 <sub>2</sub> (g/km)	CH <sub>4</sub> (g/km <sup>3</sup> )	N <sub>2</sub> O (g/km <sup>3</sup> )	Vehicle Energy Consumption (kWh/100km)	Grid Electrical Energy Consumption (kWh/100km)
Outer Urban	N/A	N/A	N/A	N/A	N/A	N/A	N/A	7.78	153.84
Inner Urban	N/A	N/A	N/A	N/A	N/A	N/A	N/A	4.12	211.28
Rural	N/A	N/A	N/A	N/A	N/A	N/A	N/A	4.92	211.95
UK Average	N/A	N/A	N/A	N/A	N/A	N/A	N/A	1.90	80.62
UK BUS Average	N/A	N/A	N/A	N/A	N/A	N/A	N/A	18.42	143.40
Zero Emissions (Z.E.) Range, Energy consumption and charging efficiency									
Test Charger Used	22 kW				Total measured energy consumed on vehicle (kWh)	13.70		Max ZE Range at 100% SOC (km)	290
Hydrogen Energy Over Test (kWh)	N/A				Measured grid energy during charging (kWh)	N/A		Max ZE Range at 80% SOC (km)	232
Hydrogen Delivered to Vehicle (kg)	N/A				Grid-to-Wheel efficiency (%)	79%		Test Distance (Traveled) (km)	65
* Grid to Wheel efficiency represents the total energy losses between the grid, charger, drivetrain and the wheels of the bus.									
Calculated total Well-to-Wheel GHG CO <sub>2</sub> equivalent emissions									
Test Phase	Fuel Energy (MJ/km)	Fuel WTT-GHG Emissions (g CO <sub>2</sub> e / km)	Electrical Energy (MJ / km)	Electricity WTT-GHG Emissions (g CO <sub>2</sub> e / km)	Date Generated by (On behalf of Test Facility): Date				
Outer Urban	N/A	N/A	5.54	448.15	Date Approved by: Date				
Inner Urban	N/A	N/A	1.90	153.84					
Rural	N/A	N/A	2.22	225.22					
UK Average	N/A	N/A	6.11	494.10					
UK BUS Average	N/A	N/A	6.16	417.75					
Zero Emission Bus Certificate Summary									
Test Vehicle					Average Euro VI Diesel Equivalent				
GHG Well-to-Wheel					417.7	g CO <sub>2</sub> e / km	Average Diesel Equivalent		
WTT CO <sub>2</sub> per passenger km (at Max Pass Capacity)					0.4	g CO <sub>2</sub> e / km	1992		
WTT CO <sub>2</sub> per passenger km (at Max Pass Capacity)					0.4	g CO <sub>2</sub> e / km	19.8		
Overall Zero Emission Bus Performance									
WTT GHG saving					674.6	g CO <sub>2</sub> e / km	Maximum Theoretical Zero Emission Range (km)		
% WTT GHG saving					62%	g CO <sub>2</sub> e / km	Vehicle Energy Consumption (kWh / 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: Emission results marked in red are below selection levels.									
LIC - London Bus Cycle - Inner & Outer Urban phases of UKBC only.									
Charge efficiency could not be measured, a value from UKBC tested previously has been used.									
Target Temperature at PC (°C)									
Average Temperature across testing (°C)									
Test Parameters: M100019554 (07-2020-10), M100019554 (07-2020-10), M100019554 (07-2020-10), M100019554 (07-2020-10)									
Certificate approved by: On behalf of bus manufacturer									
Certificate Approved by: On behalf of Zemo Partnership									

# ZEB Vehicle Summary Sheet



OEMs will also need to fill out a vehicle summary sheet **specific to each bus registered.**

- Vehicle Suppliers must fill out **Vehicle Summary Sheet** for each individual bus sold e.g. Vehicle Registration No., Chassis number, Year of Registration.
- Zemo will generate ZEB Vehicle Summary Sheet once model has been certified.
- Vehicle Summary Sheet will be published on Zemo website for easy access alongside ZEB test certificate.
- Vehicle Summary Sheet requires two signatures from two different Supplier/OEM representatives to ensure validity of claim.
- This process follows similar process to BSOG LCEB claims

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Zero Emission Bus Vehicle Summary Sheet

This is to certify that:

Vehicle Registration		Year of Registration	
Vehicle Chassis Number		Propulsion Technology	Battery Electric
Vehicle Manufacturer	Alexander-Dennis	Euro Standard	N/A
Vehicle Model	E200 EV Gen. 3	Total Passenger Capacity	65

is able to achieve meet the Zemo Partnership Zero Emission Bus definition based on the vehicle's stated passenger capacity.

Vehicle Model Test Performance – taken from Zero Emission Bus Certificate

Zero Emission Bus Certificate ID	ZEB-ADL-E200-2022	Maximum Theoretical Zero Emission Range (km)	290 km
Well-to-Wheel greenhouse gas emissions (g CO <sub>2e</sub> /km)	417.7 g CO <sub>2e</sub> /km	Greenhouse gas savings vs diesel baseline (%)	62%

Zemo Partnership updates certificates annually where appropriate in line with changes to carbon intensities of fuel & energy sources. These emission factors are taken from the government conversion factors for company carbon reporting where available or calculated by Zemo Partnership in absence of an official government figure.

A vehicle of the same type as described above underwent an independently witnessed emissions test as follows:

Test Centre	UTAC Millbrook Proving Ground	Date of Test	07.11.2019
Range of Passenger Capacity (+/- 5 passengers)	60-70 PAX	Propulsion Technology	Battery Electric
Vehicle Manufacturer	Alexander-Dennis	Euro Standard	N/A
Vehicle Model	E200 EV Gen. 3	Total Passenger Capacity	65

# Download documents from Zemo website

Download documents here – [Certificates Hub \(zemo.org.uk\)](https://zemo.org.uk)



**Certificates Hub**

Welcome to the Certificates Hub. On this page you'll find the full range of zero and low emission certified buses, coaches and minibuses, accredited by Zemo Partnership. Please use the + buttons on the right to expand each of the following sections for further information on vehicle testing and accreditation schemes.


- Why do we test and accredit buses?
- Zero Emission Bus (ZEB) Accreditation Scheme
- Ultra-Low Emission Bus (ULEB) Accreditation Scheme
- Low Emission Bus (LEB) Accreditation Scheme

Use the filter bar below to sort and view Zemo Partnership certified vehicles.

Certificates were last updated on 1st April 2023.

Manufacturer: -- All -- Certificate type: -- All -- Technology: -- All -- Vehicle type: -- All --

**Alexander Dennis Enviro100EV 236 kWh**




Vehicle Technology: Battery Electric  
Passenger Capacity: 45  
Installed Battery Capacity: 236 kWh  
Vehicle Energy Consumption: 0.66 kWh / km  
Estimated Zero Emission Range: Up to 315 km

Certificate

Read more

**Alexander Dennis Enviro100EV 354 kWh**




Vehicle Technology: Battery Electric  
Passenger Capacity: 40  
Installed Battery Capacity: 354 kWh  
Vehicle Energy Consumption: 0.69 kWh / km  
Estimated Zero Emission Range: Up to 452 km

Certificate

Read more

**Alexander Dennis Enviro200EV**




Vehicle Technology: Battery Electric  
Passenger Capacity: 65  
Installed Battery Capacity: 348 kWh  
Vehicle Energy Consumption: 1.10 kWh / km  
Estimated Zero Emission Range: Up to 290 km

Certificate

BSOG Summary Sheet

Read more

**Alexander Dennis Enviro200EV**



Zero Emissions

Vehicle Technology: Battery Electric  
Passenger Capacity: 65  
Installed Battery Capacity: 348 kWh  
Vehicle Energy Consumption: 1.10 kWh / km  
Estimated Zero Emission Range: Up to 290 km

Certificate

BSOG Summary Sheet

Read more

**Download ZEB Certificate**

**Download BSOG Summary Sheet**

# Outline Process for Vehicle Suppliers/OEMs



1. Engage with Zemo Partnership about ZEB certification – [secretariat@zemo.org.uk](mailto:secretariat@zemo.org.uk)
2. Test ZEB model over UK Bus Cycle
3. ZEB Test Certificate generated, signed and published on Zemo website.
4. ZEB Vehicle Summary Sheet published on Zemo website.
5. Vehicle Supplier/OEM fills out ZEB Vehicle Summary Sheets for individual buses sold.
6. OEM supplies ZEB Test Certificate and ZEB Vehicle Summary Sheets to operator.
7. Operator follows DfT procedure for ZEB BSOG 22p/km claim based on vkms operated.