

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



**Zemo  
Partnership**  
Accelerating Transport to Zero Emissions

Document prepared by Zemo Partnership

# 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



- If you are seeking ZEB accreditation, **please engage with Zemo ahead of test** date to ensure all test parameters are agreed.
- **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.**

# Zero Emission Bus Test Certificate



- Specific to a ZEB model 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 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.

Zemo Partnership		Zero Emission Bus Certification ID: ZEB-ADL-E200-2022		Approved Test facility		UTAC CERAM MILLBROOK			
<b>Zero Emission Bus Certificate</b>									
Customer: Alexander Dennis				DYNAMOMETER SETTINGS					
Customer Address: Cannon House, Parkwood Rd, Balmuccia, Leam	Telematics Capability: Yes	Test Weight: 12777	kg						
Test Purpose: Zero Emission Bus Testing	Maximum Speed (km/h): 50	km/h	ft	217.80	ft				
Vehicle Manufacturer: Alexander Dennis	Seated Capacity: 34	ft	-8.2617		N/mph				
Vehicle Model Name: E200 EV Gen 3	Passenger Capacity: 85	ft	0.20415		N/mph*				
Powertrain Technology: Battery Electric	Declared Unladen Weight (kg): 12246	ft	-0.001853		N/mph*				
Powertrain Configuration: Hub Motors	Gross Weight (kg): 10500	GVW Check		Equivalent test passengers: 17					
Zero Emission Heating: Heat Pump	GVW Check: OK			Measured Unladen Weight (kg): 11793					
Battery Specification				Charging and Refuelling Capability					
Battery Manufacturer: BYD	Plug Type: AC Type 2 / CCS 2	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 Rate from 20-80% SOC: 2-4 hours	Hydrogen Storage Pressure (bar): N/A							
<b>Declared fuel, properties and source plus carbon conversion factors</b>									
Well-to-Tank Factor: Electricity	88.92	g CO2e / MJ	Fuel Provider: WTT evidence	UK market standard	DIBIS Conversion 2021				
Well-to-Tank Factor: Hydrogen	N/A	g CO2e / 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	Hydrogen Production Energy Source	UK Grid				
<b>Emissions and Energy consumption results from approved test facility - Average 4 tests</b>									
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>1</sup>	N <sub>2</sub> O (g/km) <sup>1</sup>	Vehicle Energy Consumption (kWh)	Grid Electrical Energy Consumption (kWh/100km)
Outer Urban	N/A	N/A	N/A	N/A	N/A	N/A	N/A	7.78	155.84
Inner Urban	N/A	N/A	N/A	N/A	N/A	N/A	N/A	4.12	211.25
Rural	N/A	N/A	N/A	N/A	N/A	N/A	N/A	8.02	111.89
URBC Average	N/A	N/A	N/A	N/A	N/A	N/A	N/A	11.90	189.82
UK BUS Average	N/A	N/A	N/A	N/A	N/A	N/A	N/A	18.42	143.48
<b>Zero Emissions (Z.E.) Range: Energy consumption and charging efficiency</b>									
Test Charger Used	22 kW	Total measured energy consumed on vehicle (kWh):	12.70	Max ZE Range at 100% SOC (km):	260				
Hydrogen Energy Over Test (kWh)	N/A	Measured grid energy during charging (kWh):	7.9%	Max ZE Range at 80% SOC (km):	232				
Hydrogen Delivered to Vehicle (kg)	N/A	Grid-to-Wheel efficiency (%):	79%	Test Distance Travelled (km):	85				
* Total measured energy includes energy used during the 23 minute warmup, this is needed for charge efficiency calculation.									
* Grid to Wheel efficiency represents the total energy losses between the grid, charger, drivetrain and the wheels of the bus.									
<b>Calculated total Well-to-Wheel GHG CO<sub>2</sub> equivalent emissions</b>									
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	448.18	Date Approved by:			Date:	
Inner Urban	N/A	N/A	7.80	615.39					
Rural	N/A	N/A	4.00	325.17					
URBC Average	N/A	N/A	6.11	494.75					
UK BUS Average	N/A	N/A	5.16	417.75					
<b>Zero Emission Bus Certificate Summary</b>									
<b>Test Vehicle</b>				<b>Average Euro VI Diesel Equivalent</b>					
GHG Well-to-Wheel	417.7	g CO2e / km	Average Diesel Equivalent	199.2	g CO2e / km				
WTTW CO2 per passenger km (at Max Pass Capacity)	6.4	g CO2e/pass	WTTW CO2 per passenger km (at Max Pass Capacity)	16.8	g CO2e/pass				
<b>Overall Zero Emission Bus Performance</b>									
WTTW GHG saving		674.6	g CO2e / km	Maximum Theoretical Zero Emission Range (km)		290.2			
% WTTW GHG saving		62%	g CO2e / km	Vehicle Energy consumption (kWh / km)		1.4			
Approved as Zero Emission Bus? (50% GHG saving or more)				YES					
* WTTW: Well-to-Tank ** FTW: Tank-to-Wheel *** WTTW: Well-to-Wheel									
COMMENTS: Emission results marked in red are below detection levels.									
URBC = London Bus Cycle - Inner & Outer Urban phases of URBC only.									
Charge efficiency could not be measured, a value from HDG tested previously has been used.									
Electrical and Air density on for testing.									
Target Temperatures (± °C):									
Cool		18		Lower Saloon		Upper Saloon			
Average Temperature across testing (°C)		9.40		16.50		N/A			
Test Numbers: MLD01990 (27-Nov-19), MLD01995 (07-Nov-19), MLD01990 (27-Nov-19), MLD01990 (27-Nov-19)									
Certificate approved by: On behalf of Bus manufacturer				Certificate Approved by: On behalf of DfT / Zemo Partnership					

# ZEB Vehicle Summary Sheet



## 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>2</sub> e /km)	417.7 g CO <sub>2</sub> e/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.

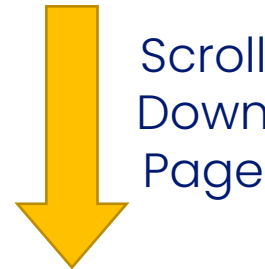
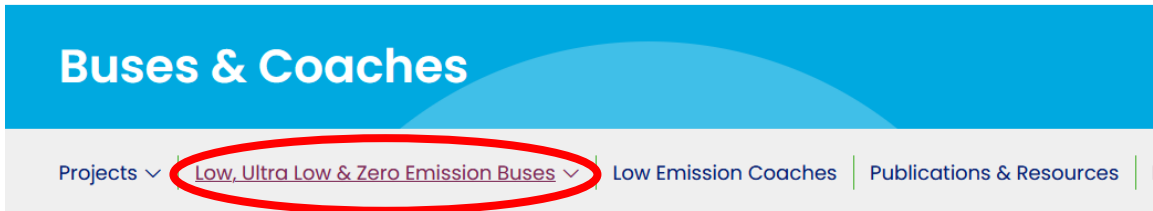
A vehicle of the same type as described above underwent an independently witnessed emissions test as follows:

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

- 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

# Download documents from Zemo website

<https://www.zemo.org.uk/work-with-us/buses-coaches.htm>



You are here: [Home](#) > [Work With Us](#) > [Buses & Coaches](#) > [Low, Ultra Low & Zero Emission Buses](#) > Zero Emission Bus Certifi

## Zero Emission Bus Certificates

This page displays the Zero Emission Bus certificates for models that qualify for capital grant funding in the UK, such as the [ZEBRA](#) or [ScotZEB](#) schemes, as well as the [Zero Emission Bus BSOG](#) uplift in England.

ZEB accreditation is required to ensure public money supports proven technologies that will perform in-service. Certificates enable local authorities and bus operators to understand the expected performance ahead of time and compare different suppliers and technologies.

To achieve accreditation and certification, vehicles must:

### Pelican Yutong

E10/E12



Status: ZEB status achieved

Technology: Battery Electric

Passenger capacity: 70

Fuel: Average UK Grid Electricity for 2021

WTW greenhouse gas emissions: 265.3 g CO<sub>2</sub>e/km

WTW saving compared to Euro VI diesel equivalent: 77%

Battery capacity: 422 kWh

Zero emissions range: Up to 438 km / 270 miles

WTW CO<sub>2</sub>e per passenger km: 3.8 g CO<sub>2</sub>e / pass km

Download ZEB certificate and vehicle summary sheet below

[Download certificate](#)

[Download summary sheet](#)

[Email](#) [Website](#)

# 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.