

Zero Emission Bus Certificate

Customer: Pelican Bus and Coach				DYNAMOMETER SETTINGS	
Customer Address: Wakefield Europort, Alofts Lane, Wakefield	Telematics Capability	Yes	Test Weight	15110	kg
Test Purpose: Zero Emission Bus Testing	Maximum Speed (km/h)	80 km/h	F ⁰	-335.26	N
Vehicle Manufacturer: Yutong	Seated Capacity	37	F ¹	-2.5310	N/kmh
Vehicle Model Name: E12 / E10	Passenger Capacity	70	F ²	0.15277	N/kmh ²
Powertrain Technology: Battery Electric	Declared Unladen Weight (kg)	13750	Equivalent test passengers	18.5	
Powertrain Configuration: Direct Drive	Gross Weight (kg)	19500	Measured Unladen Weight (kg)	13852	
Zero Emission Heating: PTC Heaters	GVW Check	OK	Number of consecutive tests completed	4	
Battery Specification		Charging and Refuelling Capability		Hydrogen Specification	
Battery Manufacturer	CATL	Plug Type	DC CCS 2 (x2)	Fuel Cell Manufacturer	N/A
Battery Chemistry	LFP	Max Charge Capability (kW)	Up to 240kW	Fuel Cell Power Rating (kW)	N/A
Battery Installed Capacity (kWh)	422	Charger Compatibility	DC	Hydrogen Storage Capacity (kg)	N/A
Battery Usable Capacity (kWh)*	371	Charge time from 20-80% SOC	1.5 - 4 hours	Hydrogen Storage Pressure (bar)	N/A

* Recommended manufacturer guideline, subject to warranty

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	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 ₂ (g/km)	CH ₄ (g/km)*	N ₂ O (g/km)*	Vehicle 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	5.86	0.91	99.11
Inner Urban	N/A	N/A	N/A	N/A	N/A	N/A	N/A	2.54	1.01	110.37
Rural	N/A	N/A	N/A	N/A	N/A	N/A	N/A	5.26	0.71	77.54
LBC Average	N/A	N/A	N/A	N/A	N/A	N/A	N/A	8.40	0.94	102.26
UK BUS Average	N/A	N/A	N/A	N/A	N/A	N/A	N/A	13.65	0.84	91.07

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

Test Charger Used	22 kW	Total measured energy consumed on vehicle (kWh) ¹	55.00	Max ZE Range at 100% SOC (km)	443
Hydrogen Energy Over Test (kWh)	N/A	Measured grid energy during charging (kWh)	60.00	Max ZE Range at 80% SOC (km)	355
Hydrogen Delivered to Vehicle (kg)	N/A	Grid-to-Wheel efficiency (%) ²	92%	Test Distance Travelled (km)	65

¹ Total measured energy includes 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					Data Generated by (On behalf of Test facility):	Date:
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)	Data Approved by:	Date:
Outer Urban	N/A	N/A	3.57	259.21		
Inner Urban	N/A	N/A	3.97	288.66		
Rural	N/A	N/A	2.79	202.79		
LBC Average	N/A	N/A	3.68	267.45		
UK BUS Average	N/A	N/A	3.28	238.19		

Zero Emission Bus Certificate Summary

Test Vehicle		Average Euro VI Diesel Equivalent	
GHG Well-to-Wheel	238.2 g CO _{2e} / km	Average Diesel Equivalent	1139 g CO _{2e} / km
WTW CO ₂ per passenger km (@ Max Pass Capacity)	3.4 g CO _{2e} /pass km	WTW CO ₂ per passenger km (@ Max Pass Capacity)	16.3 g CO _{2e} /pass km
Overall Zero Emission Bus Performance			
WTW GHG saving	901.2 g CO _{2e} / km	Maximum Theoretical Zero Emission Range (km)	443.2
% WTW GHG saving	79% g CO _{2e} / km	Vehicle Energy Consumption (kWh/ km)	0.84
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. Certificate applies to E10 model, in addition to E12.

	Cell	Lower Saloon	Upper Saloon
Target Temperatures ±2 (°C) :	10	17	N/A
Average Temperatures across testing (°C)	9.98	19.67	N/A

Test Numbers: 20220311_1522, 20220311_1655, 20220311_1812, 20220311_1921

Certificate approved by:

On behalf of Bus manufacturer

Certificate Approved by:

On behalf of DfT / Zemo Partnership

Tim Griffen

21.03.2023