



Zero Emission Bus Certification ID:

ZEB-Yutong-U11DD-422kWh-2023

Approved Test facility

N/A

## Simulated Zero Emission Bus Certificate

<b>Customer:</b> Pelican Bus and Coach				<b>DYNAMOMETER SETTINGS</b>	
<b>Customer Address:</b>	Wakefield Europort, Alofts lane, Wakefield	<b>Telematics Capability</b>	Yes	Test Weight	N/A kg
<b>Test Purpose:</b>	Zero Emission Bus Testing	<b>Maximum Speed (km/h)</b>	80 km/h	F°	N/A N
<b>Vehicle Manufacturer:</b>	Yutong	<b>Seated Capacity</b>	70	F <sup>1</sup>	N/A N/kmh
<b>Vehicle Model Name:</b>	U11DD (422kWh)	<b>Passenger Capacity</b>	80	F <sup>2</sup>	N/A N/kmh <sup>2</sup>
<b>Powertrain Technology:</b>	Battery Electric	<b>Declared Unladen Weight (kg)</b>	13750	<b>Equivalent test passengers</b>	N/A passengers
<b>Powertrain Configuration:</b>	Direct Drive	<b>Gross Weight (kg)</b>	19200	<b>Measured Unladen Weight</b>	N/A kg
<b>Zero Emission Heating:</b>	Electric Cooling and Heating A/C	<b>GVW Check</b>	OK	<b>Number of consecutive tests completed</b>	N/A Tests
<b>Battery Specification</b>		<b>Charging and Refuelling Capability</b>		<b>Hydrogen Specification</b>	
<b>Battery Manufacturer</b>	CATL	<b>Plug Type</b>	CCS2	<b>Fuel Cell Manufacturer</b>	N/A
<b>Battery Chemistry</b>	LFP	<b>Max Charge Capability (kW)</b>	Up to 150kW	<b>Fuel Cell Power Rating (kW)</b>	N/A
<b>Battery Installed Capacity (kWh)</b>	422	<b>Charge Compatibility</b>	DC	<b>Hydrogen Storage Capacity (kg)</b>	N/A
<b>Battery Usable Capacity (kWh)*</b>	371	<b>Charge time from 20-80% SOC**</b>	1.5 - 2 Hours	<b>Hydrogen Storage Pressure (bar)</b>	N/A

\* Recommended manufacturer guideline, subject to warranty

\*\* Based on manufacturer estimate

### Declared fuel, properties and source plus carbon conversion factors

<b>Well-to-Tank Factor: Electricity</b>	72.65	g CO <sub>2e</sub> / MJ	<b>Fuel Provider</b>	UK market standard	<b>WTT evidence</b>	DBEIS Conversion 2022
<b>Well-to-Tank Factor: Hydrogen</b>	N/A	g CO <sub>2e</sub> / MJ	<b>Capacity of Tanker (kg)</b>	N/A	<b>Fuel Type / Pathway</b>	UK Grid Electricity
<b>Energy Density Hydrogen</b>	N/A	MJ / kg	<b>Transport Distance of Hydrogen (km)</b>	N/A	<b>Energy Source</b>	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)*	N <sub>2</sub> 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	4.85	0.75	81.06
Inner Urban	N/A	N/A	N/A	N/A	N/A	N/A	N/A	1.97	0.79	85.68
Rural	N/A	N/A	N/A	N/A	N/A	N/A	N/A	5.21	0.71	77.51
LBC Average	N/A	N/A	N/A	N/A	N/A	N/A	N/A	6.92	0.76	82.34
<b>UK BUS Average</b>	N/A	N/A	N/A	N/A	N/A	N/A	N/A	12.02	0.74	80.18

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

<b>Test Charger Used</b>	N/A	<b>Total measured energy consumed on vehicle (kWh)<sup>1</sup></b>	N/A	<b>Max ZE Range at 100% SOC (km)</b>	503
<b>Hydrogen Energy Over Test (kWh)</b>	N/A	<b>Measured grid energy during charging (kWh)</b>	N/A	<b>Max ZE Range at 80% SOC (km)</b>	403
<b>Hydrogen Delivered to Vehicle (kg)</b>	N/A	<b>Grid-to-Wheel efficiency (%)<sup>2</sup></b>	92%	<b>Test Distance Travelled (km)</b>	N/A

<sup>1</sup> Total measured energy may include energy used during the 23 minute warmup, this is needed for charge efficiency calculation.<sup>2</sup> Grid to Wheel efficiency represents the total energy losses between the grid and the wheels of the bus.

### Calculated total Well-to-Wheel GHG CO<sub>2</sub> equivalent emissions over test

Test Phase	Fuel Energy (MJ / km)	Fuel WTT*GHG Emissions (g CO <sub>2e</sub> / km)	Electrical Energy (MJ / km)	Electricity WTT* GHG Emissions (g CO <sub>2e</sub> / km)
Outer Urban	N/A	N/A	2.92	212.00
Inner Urban	N/A	N/A	3.08	224.09
Rural	N/A	N/A	2.79	202.73
LBC Average	N/A	N/A	2.96	215.36
<b>UK BUS Average</b>	N/A	N/A	2.89	209.70

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	
<b>Greenhouse Gas Emissions: Well-to-Wheel</b>	209.7 g CO <sub>2e</sub> / km	<b>Average Diesel GHG Emissions Equivalent</b>	1234 g CO <sub>2e</sub> / km
<b>WTW CO<sub>2</sub> per passenger km (@ Max Pass Capacity)</b>	2.6 g CO <sub>2e</sub> /pass km	<b>WTW CO<sub>2</sub> per passenger km (@ Max Pass Capacity)</b>	15.4 g CO <sub>2e</sub> /pass km
<b>Overall Zero Emission Bus Performance</b>			
<b>WTW GHG saving</b>	1023.9 g CO <sub>2e</sub> / km	<b>Maximum Theoretical Zero Emission Range (km)</b>	503.4
<b>% WTW GHG saving</b>	83% g CO <sub>2e</sub> / km	<b>Vehicle Energy Consumption (kWh/ km)</b>	0.74
<b>Approved as Zero Emission Bus? (50% GHG saving or more)</b>		<b>YES</b>	

\* 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 data collected directly from vehicle power analyzer in environmental simulation experiment system (drum test bed contained within controlled laboratory with ambient temperature set to 10°C). 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. Simulated certificate will become invalid. Charger efficiency based on existing certified Yutong E9 and E10 / E12.

Test Numbers:	N/A	Heating Requirement	Cell	Lower Saloon	Upper Saloon
<b>Certificate approved by:</b>	On behalf of Bus manufacturer	<b>Target Temperatures ±2 (°C) :</b>	10	17	17
<b>Certificate Approved by:</b>	On behalf of DfT / Zemo Partnership	<b>Average Temperatures across testing (°C)</b>	N/A	N/A	N/A
			Tim Griffen		
			31.08.2023		



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<b>Customer Address:</b>	Wakefield Europort, Alofts lane, Wakefield	<b>Telematics Capability</b>	Yes	<b>Test Weight</b>	N/A	kg
<b>Test Purpose:</b>	Zero Emission Bus Testing	<b>Maximum Speed (km/h)</b>	80 km/h	<b>F<sup>0</sup></b>	N/A	N
<b>Vehicle Manufacturer:</b>	Yutong	<b>Seated Capacity</b>	70	<b>F<sup>1</sup></b>	N/A	N/kmh
<b>Vehicle Model Name:</b>	U11DD (422kWh)	<b>Passenger Capacity</b>	80	<b>F<sup>2</sup></b>	N/A	N/kmh <sup>2</sup>
<b>Powertrain Technology:</b>	Battery Electric	<b>Declared Unladen Weight (kg)</b>	13750	<b>Equivalent test passengers</b>	N/A	passengers
<b>Powertrain Configuration:</b>	Direct Drive	<b>Gross Weight (kg)</b>	19200	<b>Measured Unladen Weight</b>	N/A	kg
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<b>Well-to-Tank Factor: Hydrogen</b>	N/A	<b>g CO<sub>2</sub>e / MJ</b>	<b>Capacity of Tanker (kg)</b>	N/A	<b>Fuel Type / Pathway</b>	UK Grid Electricity
<b>Energy Density Hydrogen</b>	N/A	<b>MJ / kg</b>	<b>Transport Distance of Hydrogen (km)</b>	N/A	<b>Energy Source</b>	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)*	N <sub>2</sub> O (g/km)*	Total Energy Consumption (kWh)	Vehicle Energy Consumption (kWh/km)	Grid Electrical Energy Consumption (kWh/ 100km)
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	<b>Maximum Theoretical Zero Emission Range (km)</b>
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	<b>Vehicle Energy Consumption (kWh/ km)</b>
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Test Numbers: N/A

Certificate approved by:  
On behalf of Bus manufacturerI. Downie  
21/8/23Certificate Approved by:  
On behalf of DfT / Zemo PartnershipTim Griffen  
31.08.2023

Heating Requirement	Cell	Lower Saloon	Upper Saloon
<b>Target Temperatures ±2 (°C) :</b>	10	17	17
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