

Zero Emission Bus Certificate

Customer:	Wrightbus			DYNAMOMETER SETTINGS		
Customer Address:	201 Galgorm Rd, Ballymena, County Antrim, BT42 1SA	Telematics Capability	Yes	Test Weight	14898	kg
Test Purpose:	Zero Emission Bus Testing	Maximum Speed (km/h)	80 km/h	F°	709.15	N
Vehicle Manufacturer:	Wrightbus	Seated Capacity	39	F ¹	15.5601	N/kmh
Vehicle Model Name:	GB Kite Electroliner AU062	Passenger Capacity	90	F ²	0.00040	N/kmh ²
Powertrain Technology	Battery Electric	Declared Unladen Weight (kg)	13293	Equivalent test passengers	24.75	passengers
Powertrain Configuration	Direct Drive	Gross Weight (kg)	19500	Measured Unladen Weight	13660	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	Forsee Power	Plug Type	CCS2 & OppCharge	Fuel Cell Manufacturer		N/A
Battery Chemistry	NMC	Max Charge Capability (kW)	Up to 150kW/360 kW	Fuel Cell Power Rating (kW)		N/A
Battery Installed Capacity (kWh)	454	Charger Compatibility	DC	Hydrogen Storage Capacity (kg)		N/A
Battery Usable Capacity (kWh)*	363	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 ₂ e / MJ	Fuel Provider	UK market standard	WTT evidence	DBEIS Conversion 2022
Well-to-Tank Factor:	Hydrogen	N/A	g CO ₂ e / 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	4.50	0.68	76.09
Inner Urban	N/A	N/A	N/A	N/A	N/A	N/A	N/A	2.39	0.94	104.08
Rural	N/A	N/A	N/A	N/A	N/A	N/A	N/A	4.32	0.58	64.38
LBC Average	N/A	N/A	N/A	N/A	N/A	N/A	N/A	6.89	0.76	83.93
UK BUS Average	N/A	N/A	N/A	N/A	N/A	N/A	N/A	11.21	0.68	75.13

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

Test Charger Used	40kW	Total measured energy consumed on vehicle (kWh) ¹	45.00	Max ZE Range at 100% SOC (km)	537
Hydrogen Energy Over Test (kWh)	N/A	Measured grid energy during charging (kWh)	126.00	Max ZE Range at 80% SOC (km)	430
Hydrogen Delivered to Vehicle (kg)	N/A	Grid-to-Wheel efficiency (%) ²	90%	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 ₂ e / km)	Electrical Energy (MJ / km)	Electricity WTT* GHG Emissions (g CO ₂ e / km)
Outer Urban	N/A	N/A	2.74	199.00
Inner Urban	N/A	N/A	3.75	272.21
Rural	N/A	N/A	2.32	168.38
LBC Average	N/A	N/A	3.02	219.50
UK BUS Average	N/A	N/A	2.70	196.51

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	196.5	g CO ₂ e / km	Average Diesel GHG Emissions Equivalent	1328 g CO ₂ e / km
WTW CO ₂ per passenger km (@ Max Pass Capacity)	2.2	g CO ₂ e/pass km	WTW CO ₂ per passenger km (@ Max Pass Capacity)	14.8 g CO ₂ e/pass km

Overall Zero Emission Bus Performance

WTW GHG saving	1131.3	g CO ₂ e / km	Maximum Theoretical Zero Emission Range (km)	537.1
% WTW GHG saving	85%	g CO ₂ e / km	Vehicle Energy Consumption (kWh/ km)	0.68

Approved as Zero Emission Bus? (50% GHG saving or more)

YES

* WTT : Well-to-Tank

** TTW : Tank-to-Wheel

*** WTW : Well-to Wheel

COMMENTS: Customer requested UTAC fit a bracket restricting the flow of coolant in the system to the middle saloon heater, as per production intent. Charge efficiency carried over from GB Kite Electroliner - 340kWh certificate.

Heating Requirement	Cell	Lower Saloon	Upper Saloon
Target Temperatures ±2 (°C) :	10	17	17
Average Temperatures across testing (°C)	9.98	16.39	N/A

Test Numbers: 20230420_0815_2xUKBC, 20230420_1027_2xUKBC

 Certificate approved by: Brian Maybin
 On behalf of Bus manufacturer 09.05.2023

 Certificate Approved by:
 On behalf of DfT / Zemo Partnership 05.05.2023