

Zero Emission Bus Certificate

Customer: Wrightbus				DYNAMOMETER SETTINGS	
Customer Address:	201 Galgorm Rd, Ballymena, County Antrim, BT42 1SA	Telematics Capability	Yes	Test Weight	15000 kg
Test Purpose:	Zero Emission Bus Testing	Maximum Speed (km/h)	80 km/h	F⁰	-450.71 N
Vehicle Manufacturer:	Wrightbus	Seated Capacity	64	F¹	-4.0638 N/kmh
Vehicle Model Name:	Streetdeck Electroliner AT434	Passenger Capacity	98	F²	0.09788 N/kmh ²
Powertrain Technology	Battery Electric	Declared Unladen Weight (kg)	12749	Equivalent test passengers	32 passengers
Powertrain Configuration	Direct Drive	Gross Weight (kg)	19500	Measured Unladen Weight	13149 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)	340	Charger Compatibility	DC	Hydrogen Storage Capacity (kg)	N/A
Battery Usable Capacity (kWh)*	272	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 _{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	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	4.55	0.70	81.40
Inner Urban	N/A	N/A	N/A	N/A	N/A	N/A	N/A	2.42	0.96	111.63
Rural	N/A	N/A	N/A	N/A	N/A	N/A	N/A	4.23	0.57	66.28
LBC Average	N/A	N/A	N/A	N/A	N/A	N/A	N/A	6.97	0.78	90.70
UK BUS Average	N/A	N/A	N/A	N/A	N/A	N/A	N/A	11.20	0.68	79.07

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

Test Charger Used	40kW	Total measured energy consumed on vehicle (kWh)¹	48.00	Max ZE Range at 100% SOC (km)	400
Hydrogen Energy Over Test (kWh)	N/A	Measured grid energy during charging (kWh)	110.00	Max ZE Range at 80% SOC (km)	320
Hydrogen Delivered to Vehicle (kg)	N/A	Grid-to-Wheel efficiency (%)²	86%	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 _{2e} / km)	Electrical Energy (MJ / km)	Electricity WTT* GHG Emissions (g CO _{2e} / km)
Outer Urban	N/A	N/A	2.93	212.88
Inner Urban	N/A	N/A	4.02	291.95
Rural	N/A	N/A	2.39	173.35
LBC Average	N/A	N/A	3.27	237.21
UK BUS Average	N/A	N/A	2.85	206.80

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	206.8 g CO _{2e} / km	Average Diesel GHG Emissions Equivalent	1403 g CO _{2e} / km
WTW CO₂ per passenger km (@ Max Pass Capacity)	2.1 g CO _{2e} /pass km	WTW CO₂ per passenger km (@ Max Pass Capacity)	14.3 g CO _{2e} /pass km
Overall Zero Emission Bus Performance			
WTW GHG saving	1196.4 g CO _{2e} / km	Maximum Theoretical Zero Emission Range (km)	400.0
% WTW GHG saving	85% g CO _{2e} / 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:	Heating Requirement		
	Cell	Lower Saloon	Upper Saloon
	Target Temperatures ±2 (°C) :	10	17
Average Temperatures across testing (°C)	10.01	18.00	16.40

Test Numbers: 20220413_0851_2xUKBC, 20220413_1056_2xUKBC

Certificate approved by:
On behalf of Bus manufacturer
Brian Maybin
29.03.2023

Certificate Approved by:
On behalf of DTT / Zemo Partnership
Tim Griffen
21.03.2023