

Zero Emission Bus Certificate

Customer:	Mellor			DYNAMOMETER SETTINGS	
Customer Address:	Miall Street, Rochdale, Gt. Manchester, OL11 1HY	Telematics Capability	Yes	Test Weight	11314 kg
Test Purpose:	Zero Emission Bus Testing	Maximum Speed (km/h)	70 km/h	F ⁰	-244.10 N
Vehicle Manufacturer:	Mellor	Seated Capacity	31	F ¹	-1.7867 N/kmh
Vehicle Model Name:	Sigma 10, SA9S1G10J21474003	Passenger Capacity	54	F ²	0.16267 N/kmh ²
Powertrain Technology	Battery Electric	Declared Unladen Weight (kg)	10500	F ³	0.000000 N/kmh ³
Powertrain Configuration	Direct Drive	Gross Weight (kg)	16500	Equivalent test passengers	
Zero Emission Heating	PTC Heaters	GVW Check	OK	Measured Unladen Weight (kg)	
Battery Specification		Charging and Refuelling Capability		Hydrogen Specification	
Battery Manufacturer	CATL	Plug Type	DC	Fuel Cell Manufacturer	N/A
Battery Chemistry	NMC	Max Charge Capability (kW)	Up to 100kW	Fuel Cell Power Rating (kW)	N/A
Battery Installed Capacity (kWh)	260	Charger Compatibility	DC	Hydrogen Storage Capacity (kg)	N/A
Battery Usable Capacity (kWh)	210	Charge time from 20-80% SOC	2-6 hours	Hydrogen Storage Pressure (bar)	N/A

Declared fuel, properties and source plus carbon conversion factors

Well-to-Tank Factor: Electricity	80.92	g CO _{2e} / MJ	Fuel Provider	UK market standard	WTT evidence	DBEIS Conversion 2021
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)	Grid Electrical Energy Consumption (kWh/ 100km)
Outer Urban	N/A	N/A	N/A	N/A	N/A	N/A	N/A	8.62	153.03
Inner Urban	N/A	N/A	N/A	N/A	N/A	N/A	N/A	3.84	174.79
Rural	N/A	N/A	N/A	N/A	N/A	N/A	N/A	7.13	112.07
LBC Average	N/A	N/A	N/A	N/A	N/A	N/A	N/A	12.46	159.14
UK BUS Average	N/A	N/A	N/A	N/A	N/A	N/A	N/A	19.56	138.05

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

Test Charger Used	22 kW	Total measured energy consumed on vehicle (kWh)¹	78.00	Max ZE Range at 100% SOC (km)	177
Hydrogen Energy Over Test (kWh)	N/A	Measured grid energy during charging (kWh)	91.00	Max ZE Range at 80% SOC (km)	142
Hydrogen Delivered to Vehicle (kg)	N/A	Grid-to-Wheel efficiency (%)²	86%	Test Distance Travelled (km)	66

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, charger, drivetrain and the wheels of the bus.

Calculated total Well-to-Wheel GHG CO₂ equivalent emissions

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	5.51	445.80
Inner Urban	N/A	N/A	6.29	509.18
Rural	N/A	N/A	4.03	326.46
LBC Average	N/A	N/A	5.73	463.59
UK BUS Average	N/A	N/A	4.97	402.14

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	
GHG Well-to-Wheel	402.1 g CO _{2e} / km	Average Diesel Equivalent	989 g CO _{2e} / km
WTW CO₂ per passenger km (@ Max Pass Capacity)	7.4 g CO _{2e} /pass km	WTW CO₂ per passenger km (@ Max Pass Capacity)	18.3 g CO _{2e} /pass km
Overall Zero Emission Bus Performance			
WTW GHG saving	586.5 g CO _{2e} / km	Maximum Theoretical Zero Emission Range (km)	177.5
% WTW GHG saving	59% g CO _{2e} / km	Vehicle Energy Consumption (kWh/ km)	1.2
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.		Cell	Lower Saloon	Upper Saloon
LBC = London Bus Cycle - Inner & Outer Urban phases of UKBC only.		Target Temperatures ±2 (°C) :	10	17
		Average Temperatures across testing (°C)	9.96	18.76

Test Numbers: 20220315_1222, 20220315_1519, 20220315_1714, 20220315_2000			
Certificate approved by: On behalf of Bus manufacturer <i>John Randerson</i> John Randerson (May 10, 2022 12:02 GMT+1)	May 10, 2022	Certificate Approved by: On behalf of DfT / Zemo Partnership <i>Dan Hayes</i>	10.05.2022

Signature:

Email: