

Zero Emission Bus Certificate

Customer: Switch Mobility Ltd				DYNAMOMETER SETTINGS		
Customer Address:	Hurricane Way South, Sherburn in Elmet, LS25 6PT	Telematics Capability	Yes	Test Weight	9290	kg
Test Purpose:	Zero Emission Bus Testing	Maximum Speed (km/h)	80 km/h	F°	-208.26	N
Vehicle Manufacturer:	Switch Mobility Ltd	Seated Capacity	29	F ¹	-0.1802	N/kmh
Vehicle Model Name:	Metrocitiy EV	Passenger Capacity	60	F ²	0.17004	N/kmh ²
Powertrain Technology:	Battery Electric	Declared Unladen Weight (kg)	7800	Equivalent test passengers	15	passengers
Powertrain Configuration:	Direct Drive	Gross Weight (kg)	13000	Measured Unladen Weight	8270	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	Kriesel	Plug Type	CCS2 & AC Type 2	Fuel Cell Manufacturer	N/A	
Battery Chemistry	NMC	Max Charge Capability (kW)	Up to 84kW / 44 kW	Fuel Cell Power Rating (kW)	N/A	
Battery Installed Capacity (kWh)	226	Charger Compatibility	DC / AC	Hydrogen Storage Capacity (kg)	N/A	
Battery Usable Capacity (kWh)*	208	Charge time from 20-80% SOC**	2-5 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	80.92	g CO ₂ e / MJ	Fuel Provider	UK market standard	WTT evidence	DBEIS Conversion 2021
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	N/A	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	6.57	1.01	123.41
Inner Urban	N/A	N/A	N/A	N/A	N/A	N/A	N/A	3.41	1.36	165.60
Rural	N/A	N/A	N/A	N/A	N/A	N/A	N/A	5.60	0.75	91.78
LBC Average	N/A	N/A	N/A	N/A	N/A	N/A	N/A	9.98	1.11	135.17
UK BUS Average	N/A	N/A	N/A	N/A	N/A	N/A	N/A	15.58	0.95	115.54

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

Test Charger Used	22 kW	Total measured energy consumed on vehicle (kWh)¹	96.00	Max ZE Range at 100% SOC (km)	219
Hydrogen Energy Over Test (kWh)	N/A	Measured grid energy during charging (kWh)	117.00	Max ZE Range at 80% SOC (km)	175
Hydrogen Delivered to Vehicle (kg)	N/A	Grid-to-Wheel efficiency (%)²	82%	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	4.44	359.52
Inner Urban	N/A	N/A	5.96	482.40
Rural	N/A	N/A	3.30	267.35
LBC Average	N/A	N/A	4.87	393.77
UK BUS Average	N/A	N/A	4.16	336.57

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	336.6 g CO ₂ e / km	Average Diesel GHG Emissions Equivalent	1045 g CO ₂ e / km
WTW CO₂ per passenger km (@ Max Pass Capacity)	5.6 g CO ₂ e/pass km	WTW CO₂ per passenger km (@ Max Pass Capacity)	17.4 g CO ₂ e/pass km
Overall Zero Emission Bus Performance			
WTW GHG saving	708.6 g CO ₂ e / km	Maximum Theoretical Zero Emission Range (km)	219.2
% WTW GHG saving	68% g CO ₂ e / km	Vehicle Energy Consumption (kWh/ km)	0.95
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. Tests 2 & 3 were not consecutive due to test in between containing a missed hill during the test, rendering it invalid.	Heating Requirement	Cell	Lower Saloon	Upper Saloon
	Target Temperatures ±2 (°C) :	10	17	17
	Average Temperatures across testing (°C)	10.00	19.43	N/A

Test Numbers: 20220831_1114_2xUKBC, 20220831_1621_2xUKBC

Certificate approved by:

On behalf of Bus manufacturer

Certificate Approved by:

On behalf of DfT / Zemo Partnership

Dan Hayes 29.11.22







ZEB_Certificate_Switch_Mobility_Metrocity_EV_October_2022_Zemo_Signed

Final Audit Report

2022-11-29

Created:	2022-11-29
By:	Zemo Partnership (admin@zemo.org.uk)
Status:	Signed
Transaction ID:	CBJCHBCAABAAM6Udw_WCCNPBf3Pq796DKUK3INYMSesd

"ZEB_Certificate_Switch_Mobility_Metrocity_EV_October_2022_Zemo_Signed" History

-  Document created by Zemo Partnership (admin@zemo.org.uk)
2022-11-29 - 2:26:49 PM GMT- IP address: 185.38.115.54
-  Document emailed to tom.cox@switchmobility.tech for signature
2022-11-29 - 2:27:19 PM GMT
-  Email viewed by tom.cox@switchmobility.tech
2022-11-29 - 3:00:01 PM GMT- IP address: 148.252.223.164
-  Signer tom.cox@switchmobility.tech entered name at signing as Tom Cox
2022-11-29 - 3:01:03 PM GMT- IP address: 148.252.223.164
-  Document e-signed by Tom Cox (tom.cox@switchmobility.tech)
Signature Date: 2022-11-29 - 3:01:05 PM GMT - Time Source: server- IP address: 148.252.223.164
-  Agreement completed.
2022-11-29 - 3:01:05 PM GMT