

Report Nr. LM2208017-01

Project Nr. LM2208017

ELECTRICITY CONSUMPTION TEST ACCORDING TO THE E-SORT PROCEDURE

Client's reference:

Xiamen King Long United
Automotive Industry CO., LTD.

Represented by:

Performed by:



Aaron Huang
Test engineer
Powertrain Department

Approved by:



Iñigo de la Granja
Project Engineer
Powertrain Department

Test period: 28th June to 1st July 2022

Issue date: 8th of August

This report contains 21 pages, including this cover and 3 annex.

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1. OBJECTIVE

The purpose of this project was to realise e-SORT electrical consumption tests carried out by IDIADA in cooperation with KingLong at their facilities, following e-SORT procedure. KingLong was in charge of the test equipment (belonging to IDIADA) correctly functioning and correctly measuring and for driving the tested bus under supervision of an IDIADA's engineer. The IDIADA's engineer was responsible for realization of the whole test according to the e-SORT standard.

2. VEHICLE INFORMATION

2.1. Basic vehicle information

The table below shows the vehicle characteristics:



Test applicant	Xiamen King Long United Automotive Industry Co., Ltd.	
Manufacturer	Xiamen King Long United Automotive Industry Co., Ltd.	
Vehicle	M3	
Type	XMQ6900BWEV	
Reception date	2022-03	
Chassis nº	LA6N6EAA9NB101385	
Engine	DANA MD130B	
Gearbox	N/A	
Tyres	Hankook,265/70R19.5	
Mileage Initial / final (km)	1040	1481

The results refer exclusively to the sample tested.

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3. TEST RESULTS

3.1. E-SORT electricity consumption results

The table below shows the vehicle electricity consumption for the E-SORT protocol:

	Electricity consumption		Range	
	kWh/km		km	
Cycle SORT 1	kWh/km	0.711	km	329.0
Cycle SORT 2	kWh/km	0.627	km	373.5
Cycle SORT 3	kWh/km	0.617	km	379.4
Energy from grid to charger	kWh	249.08		
Energy from charger to vehicle battery	kWh	234.03		
Charger efficiency	%	94%		

Comments: Due to schedule limitations, the tests could not be carried out below 30 degrees Celsius as required by the eSORT protocol.

3.2. Vehicle test weight

The table below shows the vehicle weights for the E-SORT tests:

Total weight	(kg)	12440
---------------------	------	--------------

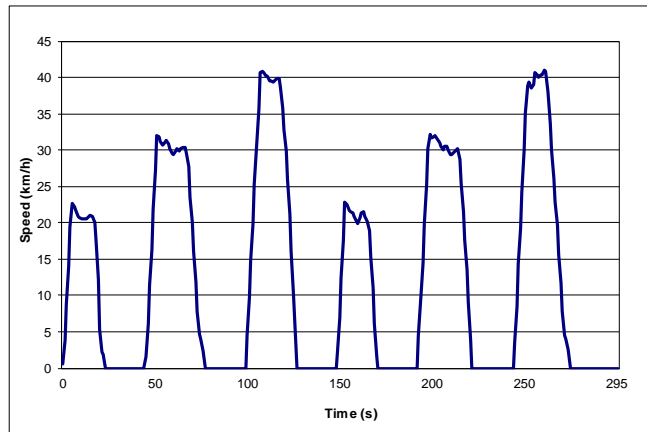
3.3. Test cycle SORT 1

The tables below show test characteristics in both directions of SORT1 cycles:

SORT 1 - Test 1

DIRECTION 1

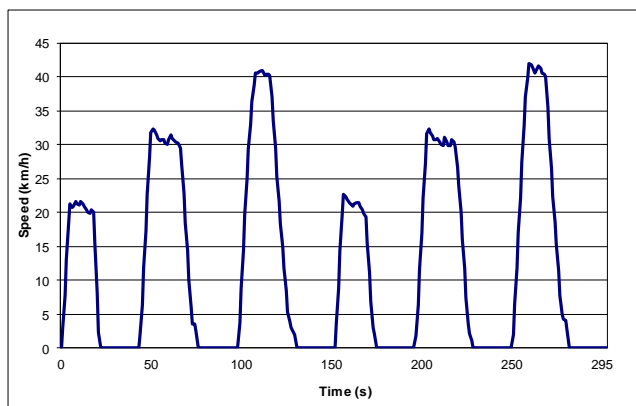
Date
2022/6/29 10:55



Total test distance	(m)	1,041.2
Total test time	(s)	297.0
Cycle speed	(km/h)	12.6
Total electricity / distance	(kWh/km)	0.767

DIRECTION 2

Date
2022/6/29 11:40



Total test distance	(m)	1,040.1
Total test time	(s)	298.0
Cycle speed	(km/h)	12.6
Total electricity / distance	(kWh/km)	0.665

Speed average	(km/h)	12.6
Electricity consumption average	(kWh/km)	0.716

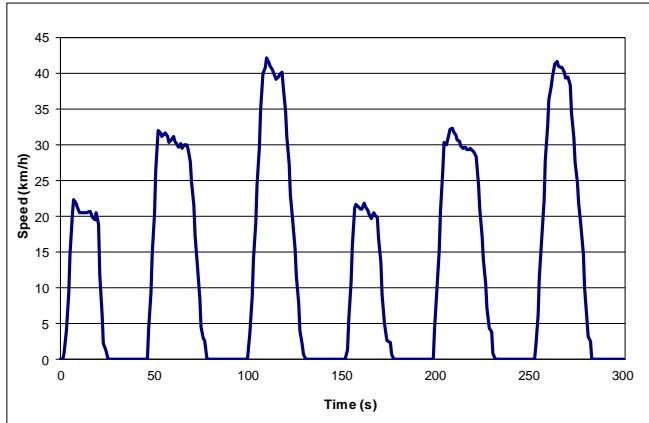
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SORT 1 - Test 2

DIRECTION 1

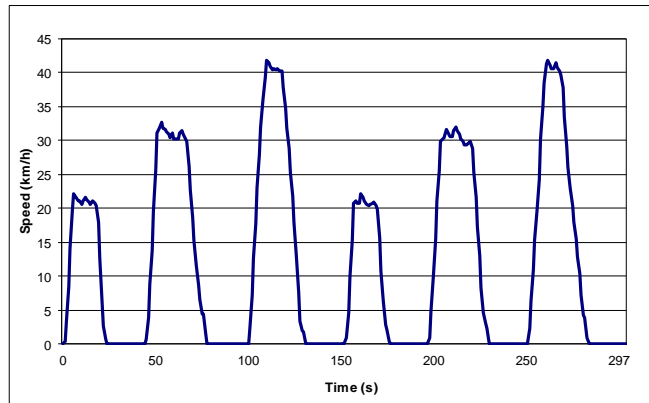
Date
2022/6/29 12:02



Total test distance	(m)	1,041.8
Total test time	(s)	302.0
Cycle speed	(km/h)	12.4
Total electricity / distance	(kWh/km)	0.756

DIRECTION 2

Date
2022/6/29 11:55



Total test distance	(m)	1,039.7
Total test time	(s)	301.0
Cycle speed	(km/h)	12.4
Total electricity / distance	(kWh/km)	0.661

Speed average	(km/h)	12.4
Electricity consumption average	(kWh/km)	0.708

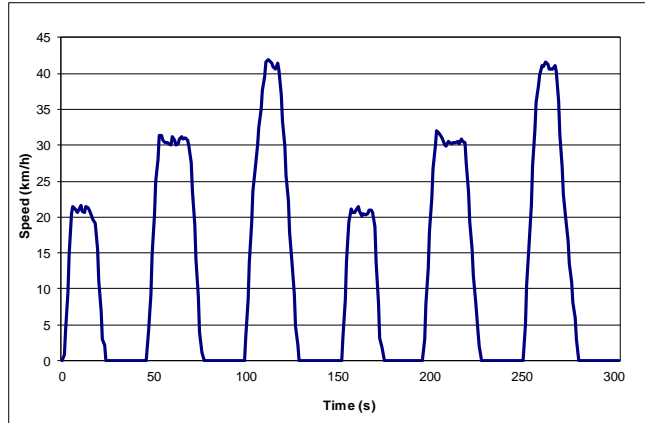
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SORT 1 - Test 3

DIRECTION 1

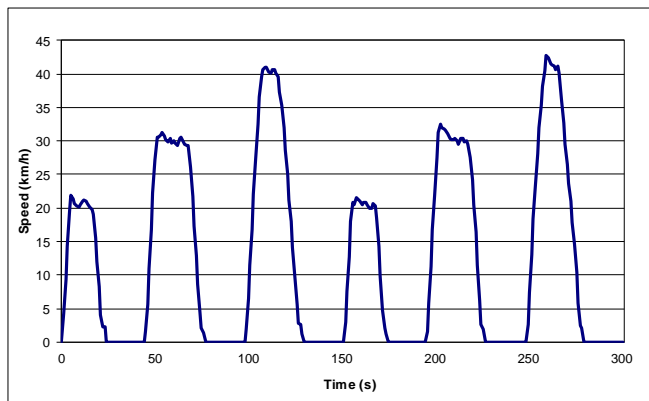
Date
2022/6/29 14:20



Total test distance	(m)	1,041.0
Total test time	(s)	303.0
Cycle speed	(km/h)	12.4
Total electricity / distance	(kWh/km)	0.765

DIRECTION 2

Date
2022/6/29 12:08



Total test distance	(m)	1,039.7
Total test time	(s)	301.0
Cycle speed	(km/h)	12.4
Total electricity / distance	(kWh/km)	0.656

Speed average	(km/h)	12.4
Electricity consumption average	(kWh/km)	0.710

Final electrical consumption SORT1.

Electricity consumption average SORT1	(kWh/km)	0.711
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The results refer exclusively to the sample tested.

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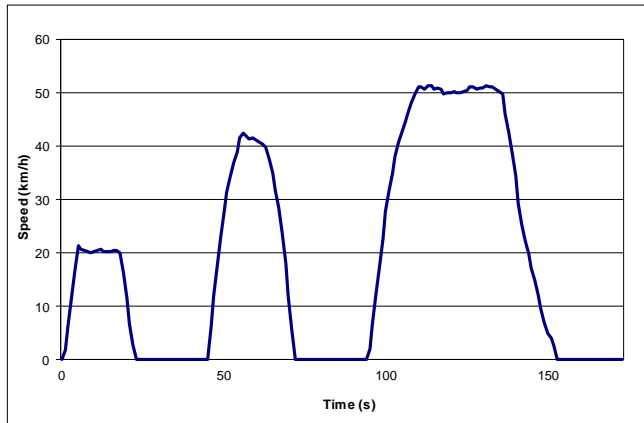
3.4. Test cycle SORT 2

The tables below show test characteristics in both directions of SORT2 cycles:

SORT 2 - Test 1

DIRECTION 1

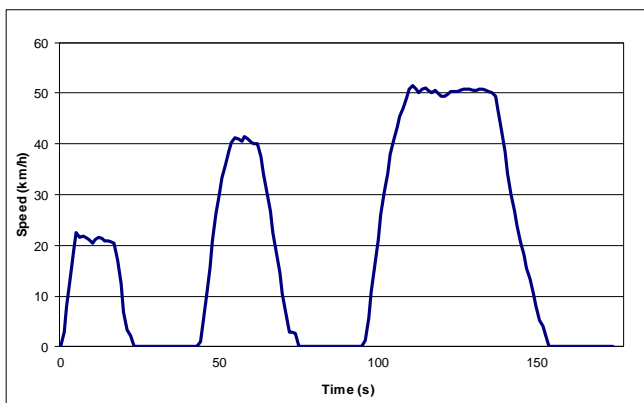
Date
2022/6/30 11:12



Total test distance	(m)	921.5
Total test time	(s)	173.0
Cycle speed	(km/h)	19.2
Total electricity / distance	(kWh/km)	0.652

DIRECTION 2

Date
2022/6/30 10:57



Total test distance	(m)	920.7
Total test time	(s)	174.0
Cycle speed	(km/h)	19.0
Total electricity / distance	(kWh/km)	0.605

Speed average	(km/h)	19.1
Electricity consumption average	(kWh/km)	0.629

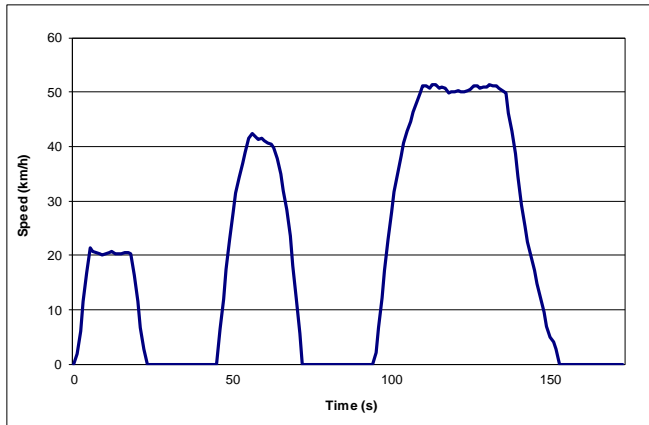
The results refer exclusively to the sample tested.

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SORT 2 - Test 2

DIRECTION 1

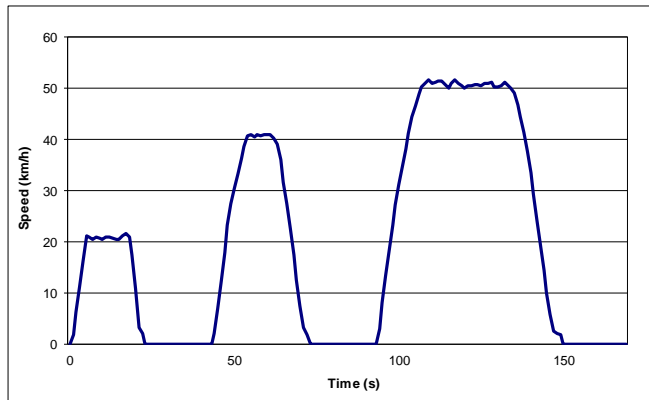
Date
2022/6/30 11:25



Total test distance	(m)	921.5
Total test time	(s)	173.0
Cycle speed	(km/h)	19.2
Total electricity / distance	(kWh/km)	0.649

DIRECTION 2

Date
2022/6/30 11:30



Total test distance	(m)	920.3
Total test time	(s)	169.0
Cycle speed	(km/h)	19.6
Total electricity / distance	(kWh/km)	0.604

Speed average	(km/h)	19.4
Electricity consumption average	(kWh/km)	0.627

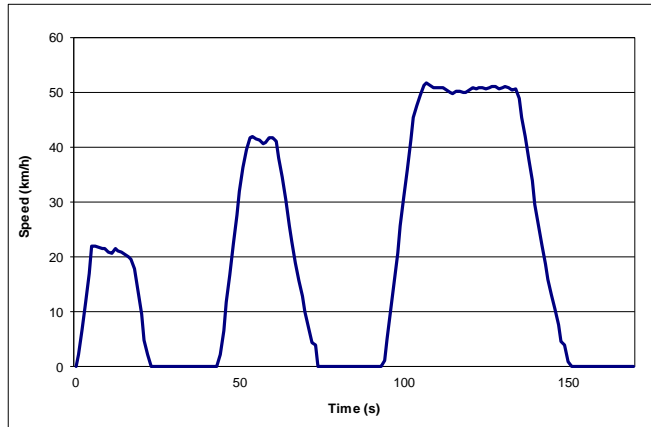
The results refer exclusively to the sample tested.

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SORT 2 - Test 3

DIRECTION 1

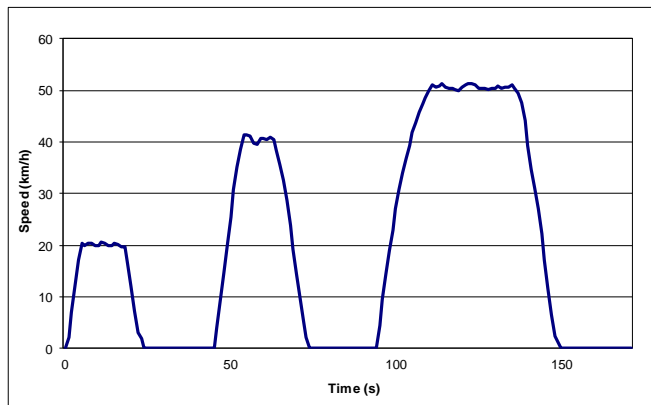
Date
2022/6/30 13:47



Total test distance	(m)	919.2
Total test time	(s)	170.0
Cycle speed	(km/h)	19.5
Total electricity / distance	(kWh/km)	0.647

DIRECTION 2

Date
2022/6/30 13:51



Total test distance	(m)	922.0
Total test time	(s)	171.0
Cycle speed	(km/h)	19.4
Total electricity / distance	(kWh/km)	0.602

Speed average	(km/h)	19.4
Electricity consumption average	(kWh/km)	0.624

Final electrical consumption SORT2

Electricity consumption average SORT2	(kWh/km)	0.627
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The results refer exclusively to the sample tested.

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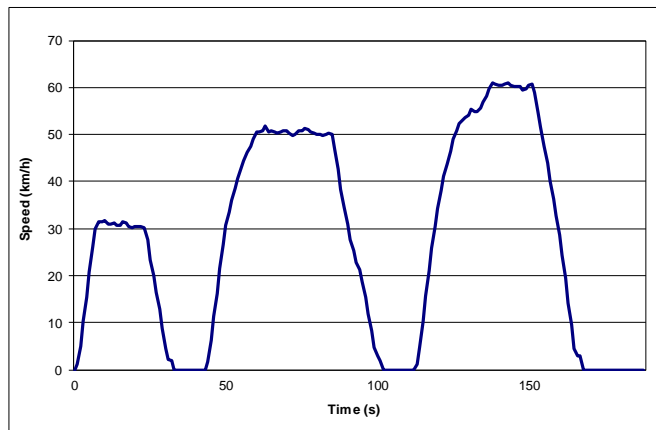
3.5. Test cycle SORT 3

The tables below show test characteristics in both directions of SORT3 cycles:

SORT 3 - Test 1

DIRECTION 1

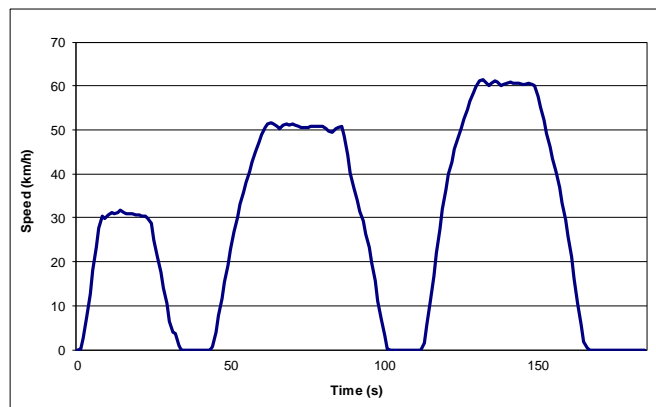
Date
2022/6/30 15:06



Total test distance	(m)	1,451.0
Total test time	(s)	188.0
Cycle speed	(km/h)	27.8
Total electricity / distance	(kWh/km)	0.669

DIRECTION 2

Date
2022/6/30 15:22



Total test distance	(m)	1,449.5
Total test time	(s)	185.0
Cycle speed	(km/h)	28.2
Total electricity / distance	(kWh/km)	0.567

Speed average	(km/h)	28.0
Electricity consumption average	(kWh/km)	0.618

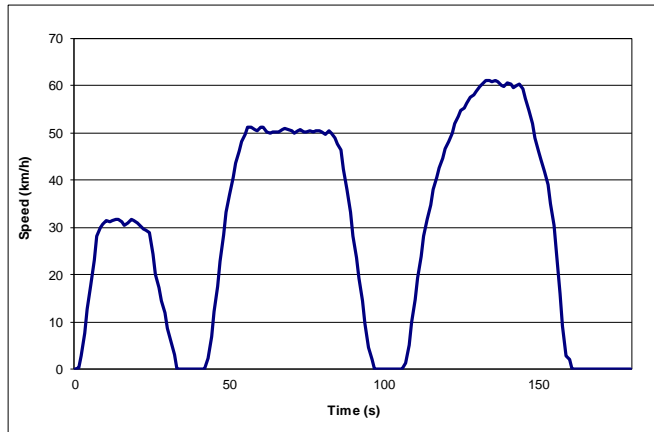
The results refer exclusively to the sample tested.

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SORT 3 - Test 2

DIRECTION 1

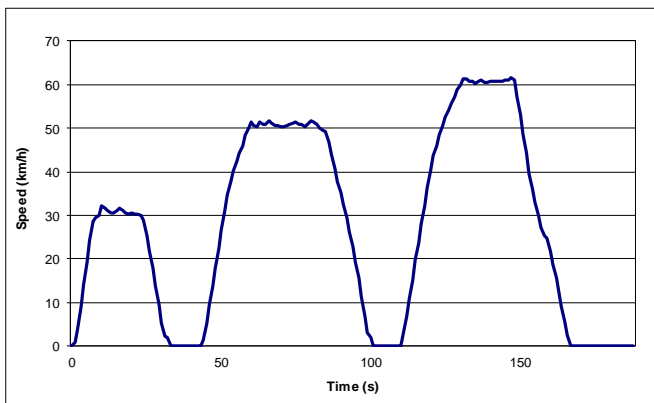
Date
2022/6/30 15:36



Total test distance	(m)	1,448.9
Total test time	(s)	180.0
Cycle speed	(km/h)	29.0
Total electricity / distance	(kWh/km)	0.682

DIRECTION 2

Date
2022/6/30 15:42:00



Total test distance	(m)	1,451.0
Total test time	(s)	188.0
Cycle speed	(km/h)	27.8
Total electricity / distance	(kWh/km)	0.558

Speed average	(km/h)	28.4
Electricity consumption average	(kWh/km)	0.620

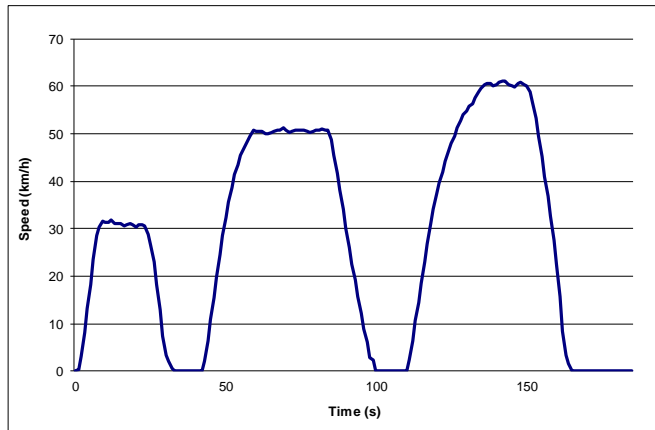
The results refer exclusively to the sample tested.

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SORT 3 - Test 3

DIRECTION 1

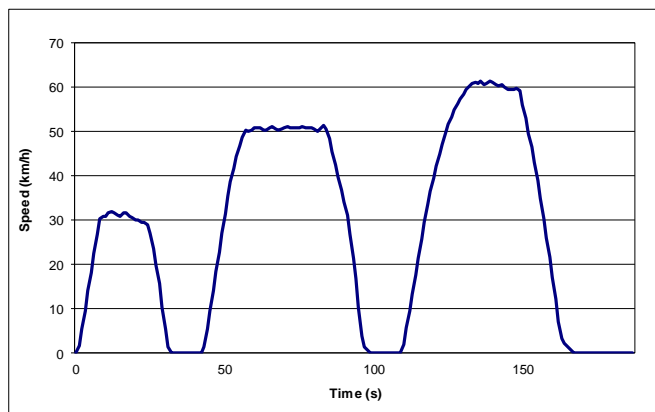
Date
2022/6/30 15:50



Total test distance	(m)	1,447.7
Total test time	(s)	185.0
Cycle speed	(km/h)	28.2
Total electricity / distance	(kWh/km)	0.670

DIRECTION 2

Date
2022/6/30 16:45



Total test distance	(m)	1,451.0
Total test time	(s)	187.0
Cycle speed	(km/h)	27.9
Total electricity / distance	(kWh/km)	0.556

Speed average	(km/h)	28.1
Electricity consumption average	(kWh/km)	0.613

Final electrical consumption SORT3

Electricity consumption average SORT3	(kWh/km)	0.617
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4. VEHICLE INSTRUMENTATION

The vehicle instrumentation used during the test was as follows:

Equipment	Brand	Model	Serial Number
Speed sensor	Racelogic	VBoxX3i	059985
Electrical consumption	Hioki	3390	--
Current clamp-500A	Hioki	CT6844-05	181016105
Current clamp-500A	Hioki	CT6844-05	181016104
Current clamp-500A	Hioki	CT6844-05	181140239
Current clamp-1000A	Hioki	CT6846-05	181118470
Digital Anemometer	Peakmeter	PM6252A	H11J-B07537
Digital Temperature&Humidity meter	Peakmeter	PM6508	H12A-F31886
Caliper	Sata	91512	S181010765
Tyre pressure gauge	PCL	G74529	151292

Annex I: Sheet 3 Test protocol

This annex contains 5 pages.

Sheet 3: Test protocol

For tests to be repeatable, it is necessary to definition with accuracy the vehicle actually tested, especially because a certain level of margin is left to manufacturers.

The test must consequently be documented with accuracy in a test protocol describing the most relevant elements, so that in case of later confirmation tests, the tested bus is clearly defined and cannot give rise to dispute or misinterpretation.

Date of test	28/06/2022-01/07/2022
Time of test begin	10:00
Time of test end	17:00
Place of test	Open road located in BingHaiDong Road, Xiamen, Fujian, China

A. Test external conditions (for information)

1. Street conditions

N°	Item	Value	Unit
1.1	State of track surface	Dry	-
1.2	Min / Max longitudinal gradient	-0.3 /0.2	%
1.3	Track altitude	0.0	m
1.4	Min. radius	-	m
1.5	Track length	1,500	m

2. Weather conditions

N°	Item	Value						Unit
		Sort 1 start	Sort 1 end	Sort 2 start	Sort 2 end	Sort 3 start	Sort 3 end	
2.1	Wind speed	1.3	1.5	0.8	1.9	2.8	1.9	m/s
2.2	Temperature	34.7*	34.9*	31.3*	32.3*	34.9*	32.3*	°C
2.3	Humidity	64.4	67.2	70.8	63.8	58.0	73.8	%
2.4	Atmospheric pressure	100.4	100.4	100.4	100.5	100.1	100.8	kPa

B. Vehicle set-up

1.1. Type et dimension:

N°	Item	Value	Unit
1.1.1	Vehicle type(name)	M3	-
1.1.2	Length	9.18	m
1.1.3	Width	2.45	m
1.1.4	Height	3.24	m
1.1.5	Empty weight	10510	kg
1.1.6	Mileage	1040	km

The results refer exclusively to the sample tested.

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1.2. Engine

N°	Item	Value	Unit
1.2.1	Manufacturer and type	DANA MD130B	-
1.2.2	Maximum power	245	kW
1.2.3	Maximum torque	2875	Nm
1.2.4	Engine governed speed	--	rpm
1.2.5	Driving mode of engine ventilator	--	

1.3. Gearbox

N°	Item	Value
1.3.1	Manufacturer and type	--
1.3.2	Programme used	--

1.4. Rear Axle

N°	Item	Value
1.4.1	Manufacturer and type	N/A
1.4.2	Reduction ratio	N/A

1.5. Tyres

N°	Item	Value	Unit
1.5.1	Manufacturer and type	Hankook	-
1.5.2	Dimensions	265/70R19.5	-
1.5.3	Front axle nominal pressure	7.6	bar
1.5.4	Rear axle nominal pressure	7.6	bar
1.5.5	Pattern depth of new tyres	15.5	mm
1.5.6	Actual pattern depth measured	12.8	mm

1.6. Engine lubricant

N°	Item	Value
1.6.1	Type	--
1.6.2	SAE Grade	--
1.6.3	Other features	--

1.7. Gearbox lubricant

N°	Item	Value
1.7.1	Type	--
1.7.2	SAE Grade	--
1.7.3	Other features	--

1.8. Batteries

N°	Item	Value	Unit
1.8.1	Type	180AH	-
1.8.2	Number	2	-
1.8.3	Nominal unit voltage	2*12	V
1.8.4	Total capacity	--	Ah

The results refer exclusively to the sample tested.

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1.9. Miscellaneous equipment

N°	Item	Value
1.9.1	Number of doors	2
1.9.2	ABS/ASR	--
1.9.3	Retarder / alternator	--
1.9.4	Steering pump	--
1.9.5	Air conditioning	Yes, not active
1.9.6	A/C compressor	--

1.10. Calculation of the load characteristics C_L , of the tested vehicle

N°	Item	Formula	Calculated Value
1.10.1	Load factor C_L (load)	$C_L = 116,19 \times (L - 1,20) \times W$	2272

1.11. Optional equipment

N°	Item	Weight to deduct from lump load	Unit
1.11.1	Air-conditioning	248	kg
1.11.2	Ticketing equipment (excluding pay desk)	--	kg
1.11.3	Automatic vehicle monitoring system (AVM)	10	kg
1.11.4	Information equipment	10	kg
1.11.5	Security driver cabin	65	kg
1.11.6	Additional mass of double glazing	--	kg
1.11.7	Lubrimatic equipment	--	kg
1.11.8	Ramp for wheelchair users	--	kg
1.11.9	Other equipment	--	kg
(1)	Total weight to be deducted from lump load	333	kg

1.12. Other factors to take into account

N°	Item	Actual weight (A)	Reference weight (B)	Difference (A-B)
1.12.1	Seats			
	Load factor C_S (seats)	$C_S = \text{the integers of } \{1,09 \times (L-1,20) \times W\}$		
	N is the actual number of seats in the tested vehicle	$N \times 10 \text{ kg}$	$C_S \times 10 \text{ kg}$	$(C_S - N) \times 10 \text{ kg}$
	Calculated values:	230	210	20
1.12.2	Fuel tank capacity (litres x 0,840)			
	Load factor C_F (fuel volume)	$C_F = 7,26 \times (L-1,20) \times W$		
	V is the actual volume of the fuel tank of the tested vehicle	$V \times 0,840$	$C_F \times 0,840$	$(C_F - V) \times 0,84 \text{ kg}$
	Calculated values:	--	--	--
1.12.3	On board persons excluding the driver	--	--	--
1.12.4	Electrical measuring equipment	--	--	
(2)	Total weight to be deducted from lump load			20

The results refer exclusively to the sample tested.

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1.13. Final value of lump load to apply

N°	Item	Value		
1.13.1	Empty weight	10510		kg
1.13.2	Lump load	2272		kg
1.13.3	Optional equipment (1)	333		kg
1.13.4	Other factors (2)	20		kg
1.13.5	=2272-(1)-(2)	1919		kg
1.13.6	Empty weight + load	Calculated	12429	kg
		Measured	12440	kg

1.14. Rechargeable Energy Storage System (RESS)

N°	Parameter	Value	Unit
1.14.1	Types	Lithium iron phosphate	-
1.14.2	Nominal tension	618.24	V
1.14.3	Power	294.75	kW
1.14.4	Weight	1768±52.8	kg
1.14.5	Capacity C3	456	Ah
1.14.6	Minimum SOC level	0	%
1.14.7	Warning SOC level	20	%
1.14.8	Maximum SOC level	100	%
1.14.9	RESS temperature before test	NA	°C
1.14.10	RESS temperature after test	NA	°C

1.15. Electric motors

N°	Parameter	Value	Unit
1.15.1	Type	DANA MD130B	-
1.15.2	Number	1	-
1.15.3	Power	245	kW
1.15.4	Weight	220	kg

1.16. Hybrid drive line

N°	Parameter	Value
1.16.1	Configuration (series/parallel)	--

1.17. Variation of state of charge

N°	Parameter	Value
1.17.1	Device used to measure current: specify and document (via a current clamp or shunt resistor or similar)	HIOKI 3390 with current clamp

Annex II: Test results

CONSUMPTION MEASURES

Test 1: Usable energy

N°	Item	Definition	Value	Unit
0.1	Charger	RGZP-80KW850-EN		
0.2	EGmax	Energy from the grid	249.077	kWh
0.3	ECmax	Energy from the charger	234.028	kWh
0.5	/	Nominal charging power	120	kW
0.6	/	Charge duration (maximum 360 minutes)	178	min

Comments:

The vehicle was discharged until 18% of vehicle SOC level (when the warning alarm appeared) and charged until it's maximum SOC (100%) level obtaining the values described above.

Test 2: Energy consumption

Data to provide for each needed SORT cycle

N°	Item	Definition	Value	Unit
1.1	Di	Total distance on SORT 1	1,04	km
1.2		Energy consumption on SORT1	0.740	kWh
1.3	Di	Total distance on SORT 2	0,92	km
1.4		Energy consumption on SORT2	0.577	kWh
1.5	Di	Total distance on SORT 3	1,45	km
1.6		Energy consumption on SORT3	0.895	kWh
1.7	/	Battery pack outside temperature at the beginning of the tests	NA	°C
1.8	/	Battery pack outside temperature at the end of the tests)	NA	°C

Annex III: Run-in statement


Page 1

DECLARATION OF VEHICLE MILEAGE

Date: 27th June, 2022

We, Xiamen King Long United Automotive Industry Co., LTD., are the manufacturer of the bus XMQ6900BWEV chassis no. LA6N6EAA9NB101385.

We certify that the test vehicle traveled more than 300km in the seven days before June 27,2022.



Signature: 
 Name: Chen Liyan
 Position: Manager of overseas homologation

Yours faithfully
 Xiamen King Long United Automotive Industry Co., Ltd.

Xiamen King Long United Automotive Industry Co.,Ltd.
 Add: No.9, King Long Road, Jimel District, Xiamen 361023, Fujian, P. R. China
 Sales Hotline: +86-592-6370892 Fax: +86-592-6370995 E-mail: export@mail.king-long.com.cn

CHINA'S BUS & COACH LEADER 