

TEST REPORT

Report no.:
236-EL-LAB-00XX-EN



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Init.: #Author/#Co reading
Order no.: #
No. of appendices: #

Requested by:

Company: DTI
Address: #
Postcode/town: #
Country: #
Email: #
Telephone: #+45

Product: Battery or hybrid solar/battery system Type: #type

Sample: Receipt at DTI, Aarhus: #.#.2018, sampled by #company

Test period: Date of testing: #.#.2018 - #.#.2018

Procedure Test and assessment of ## battery/hybrid system in accordance with test and assessment procedure developed in the ELFORSK project "Benchmark of battery systems".

Issued: Date 11.07.2018, Danish Technological Institute, Aarhus, Electrical Laboratory.

Signature:

#Name
#Title

#Co reading
Quality Assurance



1. Documentation material

2. Remarks

No remarks.

3. The basis of the test

The results presented in this test report is obtained on the basis of the method described in the report "Metode til afprøvning af batterianlæg", where some results are provided by the supplier, some are obtained by tests and some are obtained by an assessment carried out by DTI.

All testing was carried out by Danish Technological Institute, Kongsvang Allé 29, DK-8000 Aarhus C, Denmark.

4. Product description

4.1. Test specimen

The battery system consist of:

Battery system part	Model no.	Serial no.
Inverter		
Battery		

Accessories:

5. Arrangement and premises for test

The battery system was installed in accordance with the report "Metode til afprøvning af batterianlæg", and the solar panels was simulated by using a DC source.

The test was carried out according to the test method developed in the ELFORSK project Benchmark of Battery systems.

Test of nominal output in accordance with the Benchmark test method was carried out connected to a nominal 230 VAC, 50 Hz connection.



6. Parameters provided by the supplier

Parameter	Value
Chemistry of battery cells:	
Weight of battery:	
Height x width x depth:	
Nominal voltage of battery:	
Voltage range of battery:	
Nominal battery capacity:	
Nominal battery energy:	
Available battery capacity:	
Available battery energy:	
Noise emission:	
Expected cycle life:	

7. Test results

7.1. Static test

Parameter	Value	Unit	Remarks
Voltage range of battery at 50% load		Volt	
Voltage range of battery at 100% load		Volt	
Available battery capacity at 50% load		Ah	
Available battery capacity at 100% load		Ah	
Available battery energy at 50% load		kWh	
Available battery energy at 100% load		kWh	
Efficiency PV-Battery-load at 50% load		%	Note 1
Efficiency PV-Battery-load at 100% load		%	Note 1
Stand-by power consumption		W	
Deep sleep power consumption		W	

Notes:

- 1) This efficiency express the losses in the inverter when charging the battery from the solar cell and when applying the battery energy in the household plus the losses in the battery.

7.2. Dynamic test

Battery system efficiency during 24 hour dynamic test:
 Battery package efficiency during 24 hour dynamic test:



7.3. Test of high power electronics.

Battery system efficiencies for different loads

Efficiency solar cells to battery, $\eta_{sol-bat}$
 Efficiency battery to house net, $\eta_{bat-house}$
 Internal battery efficiency, η_{bat}
 Total battery system efficiency, η_{tot}

Load power	$\eta_{sol-bat}$	$\eta_{bat-house}$	η_{bat}	η_{tot}
5%				
10%				
20%				
30%				
50%				
75%				
100%				

Yearly battery system efficiency according to European weight:

Efficiencies from solar cells directly to house net for different loads

Load power	$\eta_{sol-house}$
5%	
10%	
20%	
30%	
50%	
75%	
100%	

Yearly solar cells to house net efficiency according to European weight:



7.4. Weighted total efficiency

	Test pattern	η	Weight
1	Efficiency at 50% load		20%
2	Efficiency at 100% load		10%
3	Efficiency at dynamic simple operation		40%
4	EU efficiency Solar-Bat-Housenet		15%
5	EU efficiency Solar-Housenet		15%
	Total		100%

8. Assessment results

8.1. Lifetime calculation

Remaining energy content after a number of years at different temperatures.

Battery energy content after one to twenty years of operation [% of nominal energy content]					
Temperatur	1 år	5 år	10 år	15 år	20 år
5°C					
25°C					
40°C					

Maximum battery lifetime

Temperature	Maximum battery lifetime	
5°C		
25°C		
40°C		

At maximum battery lifetime the energy content is reduced to 20% of the original energy content.



8.2. Legal and safety requirements

Legal requirements

Requirement	Result
CE-mark location	
CE-mark according to Low voltage directive	
CE-mark according to EMC directive	
CE-mark according to ROHS directive	
Prototype Test according to UN38.3	
Marking according to Battery and WEEE directive	

Safety assessment of lead-acid batteries

Safety parameter	Result
Charge according to battery specification.	
Discharge according to battery specification.	

Safety assessment of lithium-ion batteries

Safety parameter	Result
Charge stopped before upper voltage limit	
Discharge stopped before lower voltage limit	

Assessment of documentation

Item	Result
Safety instructions in Danish	
Operation instructions	
List of alarms, warnings and messages	
Maintenance instructions	
Installation instructions	
Disposal instructions	

Teknisk forskrift 3.3.1

Battery system is / is not on positive list at Energinet (TF 3.3.1)

