

EXTRACT FROM REPORT N. SUEE240400004251 REFERENCE STANDARD

VDE-AR-N 4105:2018-11 + CORRECTION 1: 2020-10: GENERATORS CONNECTED TO THE LOW-VOLTAGE DISTRIBUTION NETWORK – TECHNICAL REQUIREMENTS FOR THE CONNECTION TO AND PARALLEL OPERATION WITH LOW-VOLTAGE DISTRIBUTION NETWORKS

Test Report Number : **SUEE240400004251 Attachment Report**

Type : Energy Storage System

Trademark : ANKER

Tested Model : **A17C1**

Variant Models : A17C3

APPLICANT

Name : **Anker Innovations Limited**

Address : Room 1318-19, Hollywood Plaza, 610 Nathan Road, Mongkok, Kowloon, HongKong

TESTING LABORATORY

Name : **SGS-CSTC Standards Technical Services Co., Ltd. Suzhou Branch**

Address : 1/F., Building 12, Xinxing Industry Park, No.78, Xinglin Street, Suzhou Industrial Park, Suzhou, Jiangsu, China

Conducted (tested) by : Horace Hao
(Project Engineer)

Reviewed & Approved by : Colin Chen
(Technical Reviewer)

Date of issue : **2024/04/09**

Number of pages : 9

This document is issued by the Company subject to its General Conditions of Service printed overleaf, available on request or accessible at <http://www.sgs.com/en/Terms-and-Conditions.aspx> and, for electronic format documents, subject to Terms and Conditions for Electronic Documents at <http://www.sgs.com/en/Terms-and-Conditions/Terms-e-Document.aspx>. Attention is drawn to the limitation of liability, indemnification and jurisdiction issues defined therein.

Any holder of this document is advised that information contained hereon reflects the Company's findings at the time of its intervention only and within the limits of Client's instructions, if any. The Company's sole responsibility is to its Client and this document does not exonerate parties to a transaction from exercising all their rights and obligations under the transaction documents. This document cannot be reproduced except in full, without prior written approval of the Company. Any unauthorized alteration, forgery or falsification of the content or appearance of this document is unlawful and offenders may be prosecuted to the fullest extent of the law.

Unless otherwise stated the results shown in this test report refer only to the sample(s) tested and such sample(s) are retained for 30 days only.

Member of the SGS Group (SGS SA)
TRF No. EEC_ VDE-AR-N 4105

Important Note:

- This document is issued by the Company under its General Conditions of service accessible at http://www.sgs.com/terms_and_conditions.htm. Attention is drawn to the limitation of liability, indemnification and jurisdiction issues defined therein. Any holder of this document is advised that information contained hereon reflects the Company's findings at the time of its intervention only and within the limits of Client's instructions, if any. The Company's sole responsibility is to its Client and this document does not exonerate parties to a transaction from exercising all their rights and obligations under the transaction documents.
- This document cannot be reproduced except in full, without prior approval of the Company. Any unauthorized alteration, forgery or falsification of the content or appearance of this document is unlawful and offenders may be prosecuted to the fullest extent of the law.
- Unless otherwise stated the results shown in this test report refer only to the sample(s) tested as received. Information of derived or extension models of the range as provided by the applicant, (if any), is included in this report only for informative purposes. The Company SGS shall not be liable for any incorrect results arising from unclear, erroneous, incomplete, misleading or false information provided by Client.

Data Provided By The Client:

The following data has been provided by the applicant:

1. Any information regarding technical characteristics of the equipment (ratings, operation modes, software and hardware versions, dimensions and weight).
2. Equipment operation & construction information (manuals, electrical diagrams, information about components, operation procedures).
3. Documental information (brand and models' names, address or other information about applicant, company or manufacturer).
4. Other information remarked within this report.

SGS-CSTC Standards Technical Services Co., Ltd. Suzhou Branch declines any responsibility with respect to the information provided by the applicant and that may affect the validity of results. It is not covered by A2LA accreditation.

Test Report Historical Revision:

Test Report Version	Date	Resume
SUEE240400004251 Attachment Report	2024/04/09	First issuance

INDEX

1- SCOPE	4
2- EQUIPMENT UNDER TESTING.....	5
E.4 UNIT CERTIFICATE	6
E.5 REQUIREMENTS FOR THE TEST REPORT FOR POWER GENERATION UNITS	7
E.7 REQUIREMENTS FOR THE TEST REPORT FOR THE NS PROTECTION.....	9

1- Scope

SGS-CSTC Standards Technical Services Co., Ltd. Suzhou Branch has been contracted by Anker Innovations Limited, in order to perform the testing according to:

- VDE-AR-N 4105:2018-11: "Generators connected to the low-voltage distribution network – Technical requirements for the connection to and parallel operation with low-voltage distribution networks" and including "Correction 1:2020-10".

This document is an extract from the test report SUEE240400004251 compliant to the Annex E of VDE-AR-N 4105:2018-11: "Power generation systems connected to the low-voltage distribution network" and including "Correction 1:2020-10".

- VDE V 0124-100:2020-06: Grid integration of generator plants Low-voltage – Test requirements for generation units, intended for connection and parallel operation on the low-voltage grid.

2- Equipment Under Testing

Apparatus type	:	Energy Storage System
Installation	:	Fixed installation
Manufacturer	:	Anker Innovations Limited
Trade mark	:	ANKER
Model / Type reference	:	A17C1
Serial Number	:	APCGQ80E13200076
Software Version	:	v1.3.1.0
Rated Characteristics	:	PV input: 16-60 V, Max. 4× 16 A Battery rated voltage: 16V, Max.: 75A AC output: L/N/PE 230 V, 50 Hz, 3.5 A, 800 W

E.4 Unit certificate

Unit certificate		No. SUEE240400004251
Manufacture		Anker Innovations Limited
Power generation unit type		Single phase – Fixed installation
<input checked="" type="checkbox"/> Inverter	<input checked="" type="checkbox"/> Asynchronous generator	<input type="checkbox"/> Synchronous generator
<input type="checkbox"/> Stirling generator	<input type="checkbox"/> Fuel cell	Other _____
Assessment values	max. active power $P_{E_{max}}$	0.8 kW
	max. apparent power $S_{E_{max}}$	0.8 kVA
	Rated voltage	230 V
Rated values	Rated current (AC) I_r	3.5 A
Rated values	Initial short-circuit AC current	3.5 A
Network connection rule	VDE-AR-N 4105 “Generators connected to the low-voltage distribution network” Technical minimum requirements for connection and parallel operation of power generation systems connected to the low-voltage network	
Test requirement	DIN VDE V 0124-100 (VDE V 0124-100) “Network integration of power generation systems – Low voltage” Test requirements for power generation units intended for connection to and parallel operation on the low-voltage network	

E.5 Requirements for the test report for power generation units

Extract from test report for unit certificate "Determination of electrical properties"		No. SUEE240400004251		
System Manufacturer		Anker Innovations Limited		
Manufacturer indications:		Type of system:	Single phase – Fixed installation	
		Max. active power $P_{E_{max}}$	0.8 kW	
		Rated voltage:	230 V	
Flicker	Network impedance angle ψ_k	32°		
	Initial flicker factor C_ψ	33%Pn	66% Pn	100% Pn
		3.19	5.63	5.63

VDE-AR-N 4105:2018-11 + Correction 1:2020-10

P (%P _n)	0	10	20	30	40	50	60	70	80	90	100	Limit
Nr. / Order	I (A)	I (A)	I (A)	I (A)	I (A)	I (A)	I (A)	I (A)	I (A)	I (A)	I (A)	I (A)
2	0.013	0.013	0.014	0.013	0.013	0.013	0.013	0.012	0.011	0.010	0.008	1.080
3	0.059	0.059	0.059	0.066	0.072	0.081	0.090	0.099	0.107	0.116	0.124	2.300
4	0.009	0.011	0.009	0.009	0.009	0.008	0.007	0.008	0.008	0.007	0.006	0.430
5	0.034	0.036	0.036	0.035	0.036	0.035	0.033	0.031	0.030	0.029	0.028	1.140
6	0.004	0.003	0.004	0.004	0.004	0.003	0.003	0.003	0.003	0.003	0.003	0.300
7	0.021	0.021	0.022	0.020	0.021	0.021	0.019	0.019	0.019	0.018	0.018	0.770
8	0.005	0.005	0.004	0.004	0.004	0.004	0.005	0.004	0.004	0.004	0.004	0.230
9	0.015	0.015	0.012	0.013	0.012	0.014	0.014	0.014	0.014	0.015	0.015	0.400
10	0.005	0.004	0.004	0.005	0.004	0.005	0.005	0.005	0.005	0.004	0.004	0.184
11	0.010	0.011	0.011	0.011	0.010	0.009	0.010	0.010	0.010	0.010	0.010	0.330
12	0.003	0.003	0.003	0.003	0.003	0.003	0.003	0.004	0.004	0.003	0.003	0.153
13	0.009	0.009	0.010	0.010	0.010	0.010	0.009	0.009	0.009	0.009	0.009	0.210
14	0.003	0.002	0.003	0.002	0.003	0.002	0.003	0.003	0.003	0.003	0.003	0.131
15	0.005	0.005	0.004	0.004	0.004	0.005	0.005	0.005	0.005	0.005	0.005	0.150
16	0.003	0.003	0.003	0.003	0.003	0.003	0.003	0.003	0.003	0.003	0.003	0.115
17	0.004	0.004	0.004	0.004	0.003	0.003	0.003	0.004	0.003	0.004	0.004	0.132
18	0.003	0.003	0.003	0.003	0.003	0.003	0.003	0.003	0.003	0.003	0.003	0.102
19	0.003	0.003	0.003	0.003	0.003	0.003	0.003	0.003	0.003	0.003	0.003	0.118
20	0.003	0.003	0.003	0.003	0.003	0.003	0.003	0.003	0.003	0.003	0.003	0.092
21	0.003	0.003	0.003	0.003	0.003	0.003	0.003	0.003	0.003	0.003	0.003	0.107
22	0.003	0.003	0.003	0.003	0.003	0.003	0.003	0.003	0.003	0.003	0.003	0.084
23	0.003	0.003	0.003	0.003	0.003	0.003	0.003	0.003	0.003	0.003	0.003	0.098
24	0.003	0.003	0.003	0.003	0.003	0.003	0.003	0.003	0.003	0.003	0.003	0.077
25	0.003	0.003	0.003	0.003	0.003	0.003	0.003	0.003	0.004	0.004	0.004	0.090
26	0.003	0.003	0.003	0.003	0.003	0.003	0.003	0.003	0.003	0.003	0.003	0.071
27	0.003	0.003	0.003	0.003	0.003	0.003	0.003	0.003	0.003	0.004	0.004	0.083
28	0.003	0.003	0.003	0.003	0.003	0.003	0.003	0.003	0.003	0.003	0.003	0.066
29	0.004	0.004	0.004	0.004	0.004	0.004	0.004	0.004	0.004	0.004	0.005	0.078
30	0.003	0.003	0.003	0.003	0.003	0.003	0.004	0.003	0.003	0.003	0.003	0.061
31	0.005	0.005	0.005	0.005	0.005	0.005	0.005	0.005	0.005	0.005	0.005	0.073
32	0.003	0.003	0.003	0.003	0.003	0.003	0.003	0.003	0.003	0.004	0.003	0.058
33	0.006	0.005	0.005	0.005	0.005	0.005	0.005	0.005	0.005	0.005	0.006	0.068
34	0.003	0.003	0.004	0.004	0.004	0.003	0.003	0.004	0.003	0.004	0.004	0.054
35	0.006	0.006	0.006	0.006	0.006	0.006	0.006	0.006	0.006	0.006	0.006	0.064
36	0.004	0.004	0.004	0.004	0.004	0.004	0.004	0.004	0.004	0.004	0.004	0.051
37	0.006	0.006	0.006	0.006	0.006	0.006	0.006	0.006	0.005	0.005	0.005	0.061
38	0.004	0.004	0.004	0.004	0.004	0.004	0.004	0.004	0.004	0.004	0.004	0.048
39	0.006	0.006	0.005	0.005	0.005	0.005	0.005	0.005	0.005	0.005	0.005	0.058
40	0.004	0.004	0.004	0.004	0.004	0.004	0.004	0.004	0.004	0.004	0.004	0.046
THC (%)	0.079	0.080	0.080	0.084	0.089	0.096	0.103	0.110	0.117	0.125	0.132	23.000
PWHC (%)	0.111	0.109	0.108	0.107	0.107	0.106	0.108	0.108	0.106	0.109	0.111	23.000

E.7 Requirements for the test report for the NS protection

Extract from test report for NS protection		No. SUEE240400004251	
"Determination of electrical properties"			
Test report NS protection			
Type of NS protection: Integrated NS protection		Further manufacturer indications	
Protective function	Set value	Tripping value	Tripping time NS protection ⁽¹⁾
Rise-in voltage protection U>>	1.250 Un	1.248 Un	93.0 ms
⁽²⁾ Rise-in voltage protection U>	1.100 Un	--	485.4 s
Voltage drop protection U<	0.800 Un	0.798 Un	274.4 s
Voltage drop protection U<	0.450 Un	0.450 Un	327.0 ms
Frequency decrease protection f<	47.50 Hz	47.50 Hz	92.0 ms
Frequency increase protection f>	51.50 Hz	51.50 Hz	93.5 ms
<p>⁽¹⁾ The tripping time includes the period from the limit violation U/f until the tripping signal to the interface switch. When planning the power generation system, the response time of the interface switch shall be added to the maximum time value obtained as indicated above. The disconnection time (sum of tripping time of the NS protection plus response time of the interface switch) shall not exceed 200 ms.</p> <p>⁽²⁾ Longest disconnection of the voltage increase protection as a sliding 10 min mean value, according to clause 5.5.7 of VDE 0124-100 standard.</p>			
<input checked="" type="checkbox"/> For integrated NS protection			
Assigned to power generation unit of type		HF140FF/012-2HSW	
Type integrated interface switch		Power Relay	
Response time of interface switch for integrated NS protection		20 ms	
Verification of the entire functional chain "integrated NS protection – interface switch" has resulted in successful disconnection			<input checked="" type="checkbox"/>

-----END OF THE REPORT-----