

Certificate of Conformity

No. ESY 005028 0476 Rev. 00

Holder of Certificate: **Anker Innovations Limited**
Room 1318-19, Hollywood Plaza, 610 Nathan Road, Mongkok
Kowloon
HONG KONG

Product: **Converter**
(Hybrid Inverter)

Model(s): **X1-H5K-T, X1-H8K-T, X1-H10K-T, X1-H12K-T**

Parameters: See page 2

Applicable standards: VDE-AR-N 4105:2018
DIN VDE V 0124-100 (VDE V 0124-100):2020

This Certificate of Conformity confirms the compliance with the above listed standards on a voluntary basis. It refers only to the sample submitted to TÜV SÜD Product Service GmbH and does not certify the quality or safety of the serial products. It was issued according to TÜV SÜD Product Service certification program Photovoltaics and Grid Integration. For details see: www.tuvsud.com/ps-cert

Test report no.: 64290243011901

Date, 2024-05-24



(Billy Qiu)

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Parameters:

Model	X1-H5K-T	X1-H8K-T	X1-H10K-T	X1-H12K-T
PV terminal parameters				
Maximum PV voltage [V _{DC}]	1000			
Rated voltage [V _{DC}]	600			
MPPT voltage range [V _{DC}]	140-950			
MPPT voltage range (full load) [V _{DC}]	375-850			
Maximum input current [A _{DC}]	16/16			
Isc PV [A _{DC}]	20/20			
MPPT tracker number	2			
Maximum input power [W]	10000	16000	20000	24000
Battery input/output parameters				
Battery type	Li-ion	Li-ion	Li-ion	Li-ion
Maximum voltage [V _{DC}]	450			
Battery rated voltage [V _{DC}]	400			
Battery voltage range [V _{DC}]	350-450			
Maximum charge power [W]	5250	8400	10500	12600
Maximum discharge power [W]	5250	8400	10500	12600
Maximum charge current [A _{DC}]	15	24	30	36
Maximum discharge current [A _{DC}]	15	24	30	36
Maximum charge power from grid to battery [W]	5000	8000	10000	12000
Grid input terminal parameters				
Rated input voltage [V _{AC}]	3P+N+PE, 230/400			
Rated input frequency [Hz]	50			
Maximum continuous input current from grid to battery [A _{AC}]	7.2	11.6	14.5	17.4
Maximum continuous input current [A _{AC}]	15.2	24.3	30.3	30.3
Maximum continuous input power from grid to battery [W]	5000	8000	10000	12000
Maximum continuous input active power [W]	10000	16000	20000	20000
Maximum continuous input apparent power [VA]	10000	16000	20000	20000
Grid output terminal parameters				
Rated output voltage [V _{AC}]	3P+N+PE, 230/400			
Rated output frequency [Hz]	50			
Rated output current [A _{AC}]	7.2	11.6	14.5	17.4
Maximum continuous output current [A _{AC}]	8.4	13.3	16.7	20.0
Rated output active power [W]	5000	8000	10000	12000
Maximum output active power [W]	5000	8000	10000	12000
Maximum output active power P _{Emax} [W]	5000	8000	10000	12000
Maximum output apparent power [VA]	5500	8800	11000	13200
Maximum output apparent power S _{Emax} [VA]	5500	8800	11000	13200
Power factor range	0.8 under-excited to 0.8 over-excited			

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E.4 Unit certificate

Unit certificate		
Manufacturer	Anker Innovations Limited	
Power generation unit type	[Grid-Tied Solar Inverter]: <u>X1-H5K-T, X1-H8K-T, X1-H10K-T, X1-H12K-T.</u> Remark: certified on representative model <u>X1-H12K-T</u> of family design products, results of the measurement of <u>X1-H12K-T</u> can be transferred to other models based on transferability rule of measurements in DIN VDE V 0124-100 (VDE V 0124-100):2020-06.	
Assessment values	max. active power $P_{E_{max}}$	<u>12000 W (X1-H12K-T)</u>
	max. apparent power $S_{E_{max}}$	<u>13200 VA (X1-H12K-T)</u>
	Rated voltage	<u>230/400 V_{AC}, 3W+N+PE</u>
	Rated current (AC) I_r	<u>17.4 A (X1-H12K-T)</u>
	Initial short-circuit AC current I''_k	<u>20 A (X1-H12K-T)</u>
Network connection rule	VDE-AR-N 4105:2018-11 “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):2020-06 “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	
Test report	<u>64.290.24.30119.01</u> from <u>2024-04-10</u>	
The above designated power generation unit meets the requirements of VDE-AR-N 4105:2018-11.		

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E.5 Test report "Network interactions" for power generation units with an input current > 75 A

Extract of the test report for power generation units "Determination of electrical properties"		
System manufacturer:	Anker Innovations Limited Room 1318-19, Hollywood Plaza, 610 Nathan Road, Mongkok, Kowloon, Hong Kong	
Manufacturer indications:	Type of system	Battery Energy Storage System
	Max. active power $P_{E_{max}}$	5000 W(X1-H5K-T)
		8000 W(X1-H8K-T)
		10000 W(X1-H10K-T)
		12000 W(X1-H12K-T)
	Rated voltage	230/400 V _{AC} , 3W+N+PE
Measurement period:	From 2024-02-21 to 2024-04-05	

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Rapid voltage change	
Model	<u>X1-H10K-T</u>
Connection without provisions (regarding the primary energy carrier)	$K_i=0.5$
Most adverse case when switching between generator levels	$K_i=0.5$
Connection at nominal conditions (of the primary energy carrier)	$K_i=1.0$
Disconnection at rated power	$K_i=1.0$
Worst value of all switching operations	$K_{imax}=1.0$

Rapid voltage changes	
Model	<u>X1-H12K-T</u>
Connection without provisions (regarding the primary energy carrier)	$K_i=0.5$
Most adverse case when switching between generator levels	$K_i=0.5$
Connection at nominal conditions (of the primary energy carrier)	$K_i=1.0$
Disconnection at rated power	$K_i=1.0$
Worst value of all switching operations	$K_{imax}=1.0$

Flicker (<u>X1-H12K-T</u>)					
Network impedance angle Ψ_k	30°	50°	70°	85°	32°
Coefficient of system flicker $c\Psi$ (Maximum)					
L1	--	--	--	--	1.800
L2	--	--	--	--	1.800
L3	--	--	--	--	1.872

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Harmonics (≤16 A) (X1-H10K-T)												
Phase L1-N												
Active power P/Pn [%]	0%	10%	20%	30%	40%	50%	60%	70%	80%	90%	100%	Limit
Ordinal number	A	A	A	A	A	A	A	A	A	A	A	A
0	0.016	0.016	0.017	0.017	0.017	0.018	0.018	0.017	0.016	0.016	0.017	0.07
1	0.440	1.466	2.931	4.363	5.785	7.190	8.639	10.093	11.563	13.021	14.453	-
2	0.028	0.068	0.112	0.134	0.157	0.177	0.202	0.220	0.248	0.269	0.299	1.08
3	0.035	0.023	0.041	0.043	0.041	0.045	0.043	0.043	0.038	0.036	0.035	2.30
4	0.007	0.027	0.058	0.082	0.104	0.126	0.144	0.163	0.174	0.189	0.202	0.43
5	0.179	0.105	0.191	0.205	0.194	0.170	0.161	0.149	0.139	0.135	0.129	1.14
6	0.002	0.004	0.018	0.017	0.031	0.042	0.046	0.043	0.035	0.033	0.044	0.30
7	0.145	0.135	0.061	0.101	0.099	0.133	0.138	0.140	0.136	0.143	0.126	0.77
8	0.008	0.014	0.020	0.029	0.045	0.059	0.068	0.074	0.069	0.067	0.071	0.23
9	0.011	0.015	0.027	0.030	0.046	0.039	0.044	0.040	0.041	0.049	0.042	0.40
10	0.007	0.009	0.019	0.015	0.012	0.013	0.018	0.025	0.033	0.037	0.042	0.18
11	0.101	0.095	0.101	0.061	0.053	0.064	0.079	0.091	0.100	0.107	0.110	0.33
12	0.001	0.006	0.011	0.004	0.004	0.005	0.007	0.008	0.009	0.010	0.008	0.15
13	0.083	0.059	0.093	0.080	0.067	0.044	0.042	0.055	0.068	0.077	0.077	0.21
14	0.006	0.009	0.010	0.010	0.011	0.009	0.009	0.009	0.013	0.023	0.029	0.13
15	0.004	0.005	0.007	0.007	0.008	0.008	0.008	0.009	0.010	0.010	0.009	0.15
16	0.006	0.007	0.012	0.013	0.014	0.014	0.010	0.011	0.018	0.025	0.029	0.12
17	0.052	0.025	0.053	0.075	0.074	0.059	0.047	0.047	0.049	0.056	0.063	0.13
18	0.002	0.003	0.004	0.003	0.004	0.006	0.003	0.003	0.003	0.003	0.004	0.10
19	0.039	0.025	0.040	0.049	0.054	0.054	0.049	0.041	0.040	0.046	0.052	0.12
20	0.005	0.009	0.006	0.010	0.010	0.013	0.008	0.003	0.004	0.016	0.022	0.09
21	0.002	0.005	0.007	0.005	0.005	0.006	0.005	0.005	0.004	0.006	0.006	0.11
22	0.005	0.008	0.007	0.009	0.010	0.012	0.014	0.012	0.007	0.011	0.017	0.08
23	0.023	0.037	0.027	0.018	0.019	0.033	0.046	0.040	0.035	0.035	0.039	0.10
24	0.002	0.004	0.003	0.002	0.002	0.003	0.003	0.004	0.003	0.003	0.003	0.08
25	0.018	0.026	0.022	0.029	0.024	0.030	0.040	0.035	0.030	0.031	0.035	0.09
26	0.003	0.003	0.008	0.006	0.007	0.007	0.010	0.013	0.011	0.006	0.010	0.07
27	0.003	0.003	0.003	0.002	0.002	0.003	0.002	0.003	0.005	0.004	0.004	0.08
28	0.003	0.002	0.006	0.007	0.008	0.007	0.012	0.015	0.012	0.007	0.010	0.07
29	0.009	0.005	0.013	0.023	0.025	0.021	0.018	0.019	0.021	0.024	0.025	0.08
30	0.002	0.002	0.003	0.003	0.002	0.002	0.002	0.003	0.003	0.003	0.003	0.06
31	0.007	0.005	0.010	0.016	0.018	0.011	0.007	0.015	0.022	0.026	0.028	0.07
32	0.002	0.005	0.003	0.005	0.005	0.005	0.007	0.011	0.011	0.007	0.005	0.06
33	0.003	0.004	0.004	0.005	0.005	0.005	0.005	0.006	0.006	0.006	0.006	0.07

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34	0.002	0.003	0.003	0.004	0.005	0.006	0.006	0.010	0.012	0.008	0.005	0.05
35	0.002	0.013	0.003	0.006	0.004	0.006	0.012	0.015	0.019	0.024	0.026	0.06
36	0.002	0.004	0.001	0.001	0.002	0.002	0.002	0.003	0.003	0.002	0.002	0.05
37	0.002	0.012	0.007	0.012	0.008	0.013	0.019	0.021	0.024	0.028	0.030	0.06
38	0.002	0.003	0.002	0.003	0.003	0.005	0.005	0.007	0.009	0.010	0.008	0.05
39	0.002	0.002	0.004	0.003	0.002	0.002	0.003	0.003	0.003	0.004	0.004	0.06
40	0.002	0.004	0.003	0.003	0.003	0.004	0.005	0.005	0.008	0.009	0.006	0.05
THD	1.919 %	1.579%	2.012%	2.201%	2.272%	2.385%	2.538%	2.659%	2.796%	2.980%	3.147%	5%
Phase L2-N												
Active power P/Pn [%]	0%	10%	20%	30%	40%	50%	60%	70%	80%	90%	100%	Limit
Ordinal number	A	A	A	A	A	A	A	A	A	A	A	A
0	0.013	0.013	0.014	0.013	0.015	0.015	0.015	0.014	0.014	0.013	0.014	0.07
1	0.523	1.454	2.918	4.346	5.762	7.170	8.611	10.061	11.528	12.981	14.411	-
2	0.026	0.110	0.172	0.207	0.240	0.270	0.296	0.321	0.335	0.357	0.374	1.08
3	0.003	0.024	0.018	0.019	0.020	0.017	0.021	0.020	0.019	0.019	0.018	2.30
4	0.007	0.023	0.054	0.077	0.101	0.128	0.143	0.162	0.183	0.191	0.206	0.43
5	0.147	0.080	0.158	0.165	0.155	0.138	0.131	0.120	0.113	0.109	0.110	1.14
6	0.002	0.006	0.009	0.013	0.031	0.047	0.053	0.053	0.047	0.041	0.049	0.30
7	0.146	0.139	0.064	0.095	0.117	0.153	0.168	0.167	0.163	0.136	0.149	0.77
8	0.007	0.006	0.014	0.021	0.030	0.053	0.047	0.049	0.043	0.031	0.036	0.23
9	0.002	0.002	0.010	0.008	0.023	0.026	0.030	0.027	0.027	0.026	0.029	0.40
10	0.007	0.013	0.027	0.023	0.018	0.016	0.026	0.032	0.036	0.044	0.047	0.18
11	0.092	0.086	0.096	0.051	0.044	0.051	0.072	0.085	0.093	0.101	0.103	0.33
12	0.001	0.003	0.006	0.006	0.005	0.006	0.004	0.005	0.006	0.005	0.005	0.15
13	0.083	0.060	0.087	0.081	0.071	0.052	0.045	0.056	0.065	0.074	0.076	0.21
14	0.006	0.012	0.016	0.016	0.014	0.014	0.009	0.011	0.018	0.028	0.034	0.13
15	0.002	0.003	0.004	0.006	0.007	0.008	0.006	0.006	0.007	0.009	0.009	0.15
16	0.005	0.008	0.013	0.015	0.014	0.015	0.009	0.011	0.015	0.022	0.026	0.12
17	0.051	0.021	0.044	0.073	0.070	0.055	0.040	0.039	0.044	0.053	0.059	0.13
18	0.002	0.006	0.004	0.007	0.008	0.010	0.005	0.003	0.005	0.006	0.007	0.10
19	0.040	0.028	0.037	0.045	0.049	0.048	0.050	0.045	0.044	0.045	0.050	0.12
20	0.004	0.010	0.011	0.013	0.016	0.021	0.012	0.005	0.007	0.020	0.027	0.09
21	0.003	0.002	0.004	0.003	0.003	0.004	0.004	0.004	0.004	0.006	0.005	0.11
22	0.004	0.009	0.008	0.009	0.011	0.014	0.014	0.014	0.010	0.010	0.015	0.08
23	0.022	0.036	0.029	0.016	0.017	0.032	0.044	0.038	0.035	0.035	0.039	0.10
24	0.002	0.003	0.005	0.004	0.003	0.004	0.005	0.005	0.003	0.004	0.004	0.08
25	0.018	0.021	0.020	0.025	0.021	0.028	0.035	0.030	0.029	0.030	0.032	0.09
26	0.002	0.008	0.008	0.009	0.008	0.009	0.014	0.018	0.012	0.006	0.012	0.07

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27	0.002	0.003	0.003	0.004	0.003	0.003	0.005	0.006	0.003	0.003	0.004	0.08
28	0.002	0.004	0.007	0.008	0.008	0.005	0.011	0.015	0.013	0.007	0.008	0.07
29	0.008	0.008	0.014	0.024	0.024	0.018	0.016	0.017	0.020	0.023	0.024	0.08
30	0.002	0.002	0.003	0.004	0.003	0.003	0.004	0.005	0.003	0.003	0.003	0.06
31	0.006	0.007	0.008	0.014	0.016	0.009	0.006	0.012	0.019	0.025	0.029	0.07
32	0.002	0.005	0.005	0.007	0.007	0.007	0.009	0.015	0.015	0.008	0.006	0.06
33	0.002	0.003	0.004	0.004	0.004	0.004	0.004	0.005	0.005	0.005	0.006	0.07
34	0.002	0.002	0.004	0.003	0.005	0.007	0.005	0.010	0.011	0.009	0.006	0.05
35	0.002	0.014	0.003	0.007	0.004	0.007	0.013	0.016	0.019	0.023	0.026	0.06
36	0.002	0.003	0.002	0.001	0.002	0.003	0.002	0.003	0.003	0.002	0.003	0.05
37	0.002	0.009	0.007	0.010	0.008	0.011	0.016	0.018	0.021	0.026	0.029	0.06
38	0.001	0.002	0.003	0.002	0.004	0.007	0.006	0.008	0.012	0.012	0.009	0.05
39	0.002	0.002	0.002	0.002	0.002	0.002	0.003	0.003	0.004	0.003	0.003	0.06
40	0.002	0.004	0.003	0.003	0.003	0.004	0.005	0.005	0.006	0.008	0.007	0.05
THD	1.752 %	1.604%	2.012%	2.248%	2.447%	2.690%	2.900%	3.068%	3.184%	3.289%	3.478%	5%
Phase L3-N												
Active power P/Pn [%]	0%	10%	20%	30%	40%	50%	60%	70%	80%	90%	100%	Limit
Ordinal number	A	A	A	A	A	A	A	A	A	A	A	A
0	0.006	0.008	0.008	0.009	0.010	0.011	0.011	0.011	0.009	0.009	0.010	0.07
1	0.477	1.431	2.878	4.304	5.726	7.144	8.587	10.042	11.505	12.958	14.389	-
2	0.033	0.058	0.067	0.076	0.090	0.107	0.127	0.147	0.164	0.190	0.195	1.08
3	0.032	0.037	0.042	0.051	0.052	0.053	0.055	0.054	0.048	0.044	0.041	2.30
4	0.006	0.021	0.040	0.067	0.093	0.122	0.146	0.167	0.181	0.194	0.209	0.43
5	0.159	0.091	0.152	0.177	0.176	0.163	0.162	0.156	0.151	0.147	0.147	1.14
6	0.002	0.005	0.023	0.023	0.034	0.042	0.046	0.046	0.042	0.041	0.051	0.30
7	0.129	0.133	0.041	0.083	0.094	0.107	0.136	0.139	0.146	0.150	0.145	0.77
8	0.005	0.010	0.009	0.020	0.026	0.033	0.040	0.043	0.044	0.047	0.052	0.23
9	0.012	0.015	0.031	0.033	0.036	0.026	0.027	0.022	0.023	0.036	0.025	0.40
10	0.007	0.006	0.012	0.014	0.013	0.013	0.018	0.023	0.027	0.031	0.035	0.18
11	0.098	0.095	0.101	0.063	0.051	0.057	0.074	0.087	0.096	0.098	0.107	0.33
12	0.001	0.004	0.009	0.006	0.006	0.007	0.006	0.006	0.009	0.009	0.009	0.15
13	0.080	0.052	0.079	0.076	0.066	0.044	0.033	0.043	0.055	0.064	0.069	0.21
14	0.007	0.004	0.007	0.011	0.011	0.012	0.007	0.008	0.013	0.020	0.027	0.13
15	0.002	0.004	0.009	0.004	0.007	0.009	0.009	0.010	0.007	0.007	0.007	0.15
16	0.005	0.006	0.008	0.010	0.010	0.008	0.009	0.011	0.017	0.022	0.025	0.12
17	0.052	0.018	0.045	0.072	0.073	0.060	0.045	0.041	0.046	0.052	0.060	0.13
18	0.002	0.007	0.006	0.005	0.005	0.006	0.003	0.003	0.006	0.006	0.007	0.10
19	0.038	0.028	0.040	0.045	0.051	0.051	0.051	0.044	0.038	0.040	0.047	0.12

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20	0.005	0.004	0.010	0.008	0.012	0.015	0.011	0.005	0.005	0.016	0.023	0.09
21	0.002	0.003	0.006	0.003	0.003	0.005	0.003	0.004	0.004	0.004	0.004	0.11
22	0.003	0.002	0.006	0.006	0.008	0.012	0.010	0.010	0.007	0.007	0.013	0.08
23	0.023	0.035	0.025	0.019	0.017	0.031	0.047	0.041	0.036	0.035	0.039	0.10
24	0.002	0.007	0.003	0.003	0.003	0.003	0.004	0.003	0.003	0.004	0.004	0.08
25	0.016	0.021	0.020	0.026	0.022	0.027	0.039	0.035	0.030	0.028	0.030	0.09
26	0.003	0.006	0.004	0.007	0.006	0.006	0.010	0.014	0.011	0.004	0.009	0.07
27	0.002	0.003	0.003	0.003	0.003	0.004	0.004	0.006	0.004	0.003	0.003	0.08
28	0.003	0.004	0.005	0.006	0.007	0.005	0.010	0.012	0.012	0.005	0.008	0.07
29	0.007	0.008	0.013	0.023	0.025	0.020	0.017	0.019	0.019	0.022	0.023	0.08
30	0.002	0.002	0.002	0.002	0.002	0.002	0.003	0.003	0.003	0.003	0.003	0.06
31	0.005	0.005	0.008	0.014	0.019	0.013	0.006	0.012	0.022	0.027	0.028	0.07
32	0.002	0.002	0.004	0.004	0.005	0.006	0.006	0.011	0.012	0.007	0.005	0.06
33	0.002	0.003	0.004	0.003	0.004	0.005	0.005	0.005	0.005	0.005	0.006	0.07
34	0.002	0.003	0.003	0.004	0.004	0.005	0.005	0.009	0.012	0.009	0.005	0.05
35	0.002	0.014	0.002	0.007	0.004	0.005	0.013	0.015	0.020	0.023	0.025	0.06
36	0.002	0.003	0.003	0.002	0.002	0.002	0.002	0.003	0.003	0.002	0.002	0.05
37	0.003	0.010	0.005	0.009	0.008	0.010	0.017	0.019	0.023	0.029	0.030	0.06
38	0.002	0.002	0.003	0.003	0.003	0.005	0.005	0.006	0.010	0.010	0.008	0.05
39	0.003	0.003	0.004	0.004	0.003	0.003	0.003	0.004	0.005	0.006	0.006	0.06
40	0.002	0.002	0.003	0.003	0.003	0.004	0.004	0.004	0.007	0.008	0.006	0.05
THD	1.766 %	1.492%	1.635%	1.858%	1.949%	2.016%	2.248%	2.380%	2.510%	2.674%	2.785%	5%
Remark: Iref=14.5 A												

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Harmonics (>16 A and ≤75 A) (X1-H12K-T)												
Phase L1-N												
Active power P/Pn [%]	0%	10%	20%	30%	40%	50%	60%	70%	80%	90%	100%	Limit
Ordinal number	Ih/Iref(%)											[%]
0	0.031	0.026	0.031	0.054	0.074	0.066	0.052	0.041	0.101	0.115	0.074	0.5
1	6.260	11.179	21.080	30.656	40.313	50.334	60.383	70.236	80.789	89.764	100.244	-
2	0.277	0.419	0.682	0.973	1.197	1.308	1.446	1.462	1.810	1.932	1.977	8.0
3	0.156	0.112	0.143	0.174	0.201	0.215	0.204	0.245	0.147	0.193	0.157	-
4	0.094	0.182	0.376	0.495	0.661	0.808	0.943	1.095	1.089	1.203	1.296	4.0
5	0.800	0.767	1.122	1.154	1.038	0.954	0.882	0.817	0.767	0.777	0.763	10.7
6	0.039	0.064	0.067	0.167	0.244	0.291	0.248	0.194	0.231	0.345	0.307	2.67
7	0.816	0.586	0.537	0.593	0.757	0.800	0.815	0.850	0.800	0.758	0.758	7.2
8	0.085	0.101	0.167	0.295	0.336	0.474	0.443	0.387	0.402	0.451	0.433	2.0
9	0.078	0.095	0.154	0.291	0.315	0.284	0.239	0.236	0.236	0.186	0.175	-
10	0.071	0.088	0.085	0.078	0.095	0.110	0.170	0.200	0.229	0.249	0.246	1.6
11	0.617	0.532	0.456	0.337	0.362	0.476	0.560	0.627	0.648	0.668	0.678	3.1
12	0.024	0.022	0.019	0.028	0.029	0.030	0.030	0.033	0.036	0.039	0.033	1.33
13	0.393	0.381	0.551	0.432	0.306	0.268	0.361	0.436	0.470	0.473	0.489	2.0
14	0.061	0.066	0.080	0.073	0.059	0.060	0.075	0.111	0.173	0.188	0.186	-
15	0.041	0.072	0.046	0.048	0.047	0.051	0.052	0.063	0.048	0.049	0.049	-
16	0.062	0.061	0.087	0.094	0.097	0.072	0.091	0.140	0.181	0.197	0.186	-
17	0.231	0.373	0.375	0.452	0.381	0.294	0.291	0.317	0.375	0.391	0.398	-
18	0.036	0.021	0.026	0.026	0.030	0.035	0.038	0.034	0.036	0.034	0.026	-
19	0.216	0.160	0.206	0.318	0.328	0.304	0.251	0.258	0.306	0.345	0.365	-
20	0.068	0.049	0.065	0.079	0.098	0.066	0.031	0.076	0.148	0.158	0.150	-
21	0.032	0.046	0.044	0.043	0.047	0.048	0.043	0.038	0.057	0.057	0.059	-
22	0.059	0.034	0.065	0.070	0.090	0.092	0.075	0.047	0.108	0.142	0.160	-
23	0.204	0.185	0.165	0.113	0.188	0.284	0.238	0.218	0.243	0.258	0.276	-
24	0.034	0.022	0.021	0.024	0.024	0.023	0.025	0.030	0.035	0.035	0.029	-
25	0.117	0.230	0.193	0.158	0.172	0.244	0.206	0.188	0.203	0.223	0.224	-
26	0.047	0.034	0.055	0.054	0.060	0.074	0.091	0.057	0.074	0.088	0.100	-
27	0.030	0.029	0.021	0.022	0.022	0.026	0.031	0.040	0.036	0.036	0.038	-
28	0.042	0.045	0.055	0.063	0.055	0.088	0.109	0.061	0.063	0.098	0.118	-
29	0.043	0.113	0.093	0.154	0.134	0.105	0.118	0.140	0.154	0.153	0.148	-
30	0.025	0.019	0.019	0.018	0.026	0.021	0.018	0.017	0.031	0.033	0.035	-
31	0.048	0.036	0.042	0.108	0.080	0.053	0.114	0.154	0.180	0.188	0.201	-
32	0.035	0.023	0.033	0.047	0.043	0.057	0.088	0.072	0.048	0.054	0.066	-
33	0.027	0.032	0.033	0.032	0.035	0.035	0.038	0.047	0.043	0.044	0.044	-

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34	0.027	0.026	0.030	0.037	0.052	0.047	0.083	0.078	0.053	0.049	0.070	-
35	0.050	0.055	0.024	0.032	0.039	0.087	0.108	0.140	0.162	0.168	0.165	-
36	0.021	0.017	0.013	0.018	0.019	0.025	0.027	0.024	0.026	0.028	0.031	-
37	0.045	0.079	0.049	0.064	0.075	0.117	0.131	0.152	0.168	0.172	0.164	-
38	0.020	0.017	0.025	0.024	0.040	0.044	0.059	0.072	0.067	0.059	0.061	-
39	0.019	0.023	0.014	0.013	0.015	0.020	0.024	0.026	0.037	0.039	0.041	-
40	0.017	0.017	0.022	0.025	0.033	0.040	0.041	0.061	0.059	0.047	0.048	-
THC/I _{ref}	1.472	1.384	1.746	1.960	2.114	2.252	2.371	2.464	2.693	2.856	2.924	13
PWHC/I _{ref}	2.016	2.508	2.448	2.919	2.873	3.010	2.945	3.107	3.594	3.848	3.960	22
Phase L2-N												
Active power P/P _n [%]	0%	10%	20%	30%	40%	50%	60%	70%	80%	90%	100%	Limit
Ordinal number	I _h /I _{ref} (%)											[%]
0	0.028	0.024	0.035	0.070	0.084	0.081	0.057	0.043	0.083	0.117	0.076	0.5
1	6.398	11.250	21.078	30.546	40.194	50.161	60.173	70.050	80.562	89.560	99.978	-
2	0.234	0.393	0.684	1.087	1.329	1.577	1.741	2.031	1.890	2.151	2.409	8.0
3	0.116	0.064	0.110	0.126	0.102	0.122	0.133	0.119	0.126	0.111	0.135	-
4	0.097	0.190	0.345	0.520	0.678	0.804	0.964	1.079	1.148	1.234	1.311	4.0
5	0.691	0.651	0.927	0.910	0.817	0.749	0.711	0.692	0.641	0.677	0.658	10.7
6	0.034	0.036	0.037	0.168	0.255	0.332	0.293	0.226	0.255	0.348	0.291	2.67
7	0.845	0.684	0.478	0.627	0.864	0.943	0.946	0.879	0.866	0.844	0.843	7.2
8	0.039	0.057	0.114	0.153	0.286	0.279	0.290	0.215	0.197	0.322	0.252	2.0
9	0.024	0.050	0.061	0.188	0.234	0.177	0.158	0.112	0.140	0.116	0.086	-
10	0.070	0.083	0.123	0.105	0.103	0.152	0.199	0.235	0.261	0.282	0.284	1.6
11	0.551	0.456	0.394	0.263	0.289	0.428	0.518	0.571	0.599	0.600	0.586	3.1
12	0.030	0.027	0.022	0.031	0.043	0.026	0.024	0.031	0.028	0.042	0.040	1.33
13	0.393	0.407	0.520	0.441	0.327	0.273	0.346	0.403	0.449	0.460	0.487	2.0
14	0.049	0.057	0.076	0.072	0.066	0.051	0.073	0.132	0.177	0.201	0.208	-
15	0.025	0.048	0.040	0.046	0.054	0.040	0.034	0.044	0.040	0.053	0.046	-
16	0.047	0.053	0.085	0.084	0.083	0.056	0.074	0.107	0.151	0.165	0.164	-
17	0.202	0.327	0.381	0.432	0.348	0.242	0.238	0.282	0.347	0.352	0.344	-
18	0.024	0.022	0.015	0.026	0.044	0.028	0.024	0.028	0.026	0.034	0.037	-
19	0.213	0.124	0.203	0.286	0.284	0.293	0.258	0.258	0.282	0.315	0.324	-
20	0.050	0.047	0.050	0.079	0.110	0.060	0.022	0.077	0.146	0.167	0.163	-
21	0.017	0.025	0.029	0.017	0.021	0.028	0.027	0.021	0.025	0.032	0.031	-
22	0.040	0.031	0.050	0.062	0.087	0.088	0.084	0.057	0.081	0.107	0.122	-
23	0.186	0.197	0.159	0.099	0.185	0.270	0.220	0.211	0.226	0.249	0.262	-
24	0.017	0.016	0.013	0.014	0.018	0.025	0.026	0.016	0.016	0.021	0.027	-
25	0.091	0.209	0.153	0.133	0.155	0.203	0.168	0.170	0.178	0.188	0.181	-

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26	0.035	0.027	0.053	0.049	0.050	0.081	0.098	0.048	0.061	0.089	0.105	-
27	0.016	0.019	0.016	0.022	0.023	0.024	0.029	0.018	0.018	0.026	0.035	-
28	0.024	0.027	0.042	0.048	0.033	0.072	0.095	0.065	0.042	0.062	0.074	-
29	0.049	0.092	0.102	0.156	0.119	0.106	0.114	0.132	0.142	0.152	0.147	-
30	0.017	0.012	0.013	0.012	0.016	0.014	0.020	0.014	0.014	0.016	0.020	-
31	0.037	0.026	0.042	0.090	0.062	0.037	0.085	0.125	0.166	0.170	0.172	-
32	0.029	0.019	0.029	0.044	0.040	0.056	0.094	0.076	0.034	0.052	0.070	-
33	0.020	0.021	0.019	0.022	0.023	0.025	0.028	0.031	0.030	0.033	0.037	-
34	0.017	0.019	0.019	0.025	0.042	0.036	0.065	0.064	0.045	0.038	0.046	-
35	0.050	0.071	0.024	0.021	0.035	0.079	0.103	0.124	0.154	0.166	0.170	-
36	0.014	0.009	0.009	0.010	0.011	0.010	0.013	0.015	0.014	0.014	0.018	-
37	0.034	0.082	0.042	0.055	0.059	0.095	0.109	0.126	0.157	0.161	0.147	-
38	0.016	0.014	0.025	0.022	0.040	0.039	0.061	0.078	0.056	0.048	0.054	-
39	0.015	0.011	0.013	0.014	0.012	0.017	0.014	0.022	0.015	0.017	0.020	-
40	0.012	0.017	0.016	0.013	0.020	0.028	0.027	0.041	0.046	0.042	0.043	-
THC/Iref	1.374	1.310	1.557	1.849	2.093	2.329	2.511	2.749	2.702	2.963	3.175	13
PWHC/Iref	1.768	2.263	2.334	2.685	2.586	2.694	2.650	2.830	3.262	3.518	3.565	22
Phase L3-N												
Active power P/Pn [%]	0%	10%	20%	30%	40%	50%	60%	70%	80%	90%	100%	Limit
Ordinal number	Ih/Iref(%)											[%]
0	0.124	0.125	0.137	0.162	0.173	0.166	0.161	0.162	0.122	0.115	0.095	0.5
1	6.020	10.864	20.642	30.258	39.987	50.008	60.067	69.979	80.373	89.459	99.914	-
2	0.088	0.168	0.328	0.383	0.477	0.681	0.838	1.071	1.265	1.272	1.376	8.0
3	0.183	0.125	0.186	0.249	0.252	0.286	0.280	0.304	0.183	0.224	0.201	-
4	0.047	0.126	0.308	0.449	0.644	0.824	0.967	1.087	1.152	1.237	1.310	4.0
5	0.774	0.665	1.013	1.037	0.979	0.948	0.938	0.872	0.884	0.904	0.885	10.7
6	0.053	0.074	0.070	0.194	0.229	0.304	0.257	0.201	0.290	0.360	0.306	2.67
7	0.752	0.597	0.399	0.580	0.631	0.844	0.826	0.871	0.856	0.784	0.795	7.2
8	0.056	0.049	0.090	0.209	0.261	0.308	0.290	0.269	0.340	0.414	0.362	2.0
9	0.087	0.065	0.204	0.256	0.240	0.198	0.147	0.166	0.163	0.142	0.130	-
10	0.019	0.049	0.073	0.088	0.079	0.095	0.130	0.168	0.189	0.221	0.221	1.6
11	0.600	0.464	0.473	0.312	0.313	0.423	0.513	0.575	0.612	0.647	0.638	3.1
12	0.028	0.013	0.021	0.034	0.036	0.026	0.026	0.043	0.037	0.051	0.053	1.33
13	0.364	0.367	0.496	0.408	0.293	0.208	0.284	0.352	0.416	0.430	0.457	2.0
14	0.043	0.055	0.070	0.075	0.076	0.050	0.062	0.109	0.153	0.179	0.187	-
15	0.040	0.051	0.041	0.030	0.044	0.052	0.055	0.042	0.036	0.047	0.033	-
16	0.048	0.065	0.068	0.064	0.049	0.057	0.085	0.115	0.147	0.166	0.158	-
17	0.202	0.327	0.330	0.426	0.370	0.259	0.242	0.280	0.328	0.353	0.361	-

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18	0.022	0.026	0.018	0.030	0.037	0.019	0.024	0.041	0.036	0.037	0.033	-
19	0.202	0.114	0.200	0.302	0.305	0.303	0.253	0.233	0.270	0.313	0.338	-
20	0.047	0.045	0.054	0.070	0.091	0.071	0.029	0.060	0.120	0.144	0.150	-
21	0.022	0.019	0.014	0.028	0.038	0.020	0.024	0.025	0.037	0.030	0.023	-
22	0.036	0.036	0.038	0.047	0.066	0.057	0.052	0.021	0.075	0.107	0.119	-
23	0.168	0.167	0.163	0.090	0.159	0.271	0.231	0.205	0.215	0.242	0.269	-
24	0.021	0.024	0.018	0.019	0.022	0.020	0.016	0.027	0.030	0.030	0.027	-
25	0.094	0.233	0.159	0.139	0.155	0.233	0.204	0.180	0.175	0.197	0.200	-
26	0.031	0.026	0.043	0.042	0.040	0.071	0.095	0.060	0.048	0.068	0.089	-
27	0.035	0.019	0.021	0.019	0.017	0.023	0.032	0.023	0.019	0.024	0.029	-
28	0.029	0.035	0.043	0.043	0.038	0.063	0.080	0.052	0.046	0.079	0.095	-
29	0.029	0.103	0.070	0.143	0.115	0.093	0.107	0.110	0.123	0.132	0.138	-
30	0.017	0.020	0.014	0.017	0.016	0.021	0.021	0.016	0.020	0.024	0.028	-
31	0.037	0.044	0.055	0.112	0.093	0.044	0.093	0.142	0.174	0.174	0.183	-
32	0.022	0.017	0.021	0.031	0.037	0.041	0.077	0.072	0.032	0.036	0.054	-
33	0.019	0.032	0.023	0.027	0.033	0.031	0.037	0.035	0.033	0.037	0.036	-
34	0.018	0.028	0.023	0.030	0.033	0.033	0.068	0.069	0.037	0.029	0.043	-
35	0.034	0.053	0.018	0.037	0.026	0.077	0.095	0.126	0.143	0.149	0.154	-
36	0.014	0.018	0.013	0.012	0.017	0.014	0.020	0.019	0.016	0.023	0.028	-
37	0.043	0.094	0.038	0.052	0.057	0.107	0.121	0.148	0.177	0.179	0.173	-
38	0.012	0.010	0.019	0.015	0.027	0.032	0.041	0.060	0.058	0.042	0.041	-
39	0.022	0.028	0.028	0.020	0.022	0.017	0.020	0.027	0.029	0.026	0.029	-
40	0.014	0.022	0.024	0.022	0.029	0.029	0.033	0.052	0.044	0.032	0.028	-
THC/Iref	1.362	1.213	1.479	1.615	1.665	1.909	2.030	2.214	2.393	2.479	2.563	13
PWHC/Iref	1.609	2.197	2.048	2.547	2.484	2.644	2.573	2.685	3.019	3.298	3.461	22

Remark: Iref= 17.4 A

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E.6 Certificate of the network and system protection

Certificate of NS protection		
Manufacturer	Anker Innovations Limited	
Type of NS protection	Integrated NS protection	
Central NS protection	☐	
Integrated NS protection	☒	Assigned to power generation unit of type: <u>X1-H5K-T, X1-H8K-T, X1-H10K-T, X1-H12K-T.</u>
Network connection rule	VDE-AR-N 4105:2018-11 “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):2020-06 “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	
Test report	: <u>64.290.24.30119.01</u> from <u>2024-04-10</u>	
The network and system protection designated above meets the requirements of VDE-AR-N 4105:2018-11.		

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

Extract from test report for NS protection				
“Determination of electrical properties”				
NS protection test report				
Type of NS system:	Integrated NS protection		Other Manufacturer indications	
Software version:	DSP: V1.0, ARM: V1.0			
Manufacturer:	Anker Innovations Limited Room 1318-19, Hollywood Plaza, 610 Nathan Road, Mongkok, Kowloon, Hong Kong			
Measuring period:	From 2024-02-21 to 2024-04-05			
		Inverter		
Protection function	Setting value	Tripping value		Tripping time NS protection*
Rise-in-voltage protection $U >>$	$1.25 * U_n$	L1-N/L2-N/L3-N: 287.2 V/287.3 V/287.2 V; L1-N: 287.1 V; L2-N: 287.3 V; L3-N: 287.2 V;		L1-N/L2-N/L3-N: 129.30 ms; L1-N: 122.64 ms; L2-N: 122.43 ms; L3-N: 120.58 ms;
Rise-in-voltage protection $U >$	$1.10 * U_n$	$1.10 * U_n$		ms**
Voltage drop protection $U <$	$0.8 * U_n$	L1-N/L2-N/L3-N: 183.2 V/183.3 V/183.3 V; L1-N: 183.2 V; L2-N: 183.2 V; L3-N: 183.2 V;		L1-N/L2-N/L3-N: 3049.00 ms; L1-N: 3040.00 ms; L2-N: 3044.00 ms; L3-N: 3043.00 ms;
Voltage drop protection $U <<$	$0.45 * U_n$	L1-N/L2-N/L3-N: 103.1 V/103.1 V/103.1 V; L1-N: 103.1 V; L2-N: 103.1 V; L3-N: 103.1 V;		L1-N/L2-N/L3-N: 319.90 ms; L1-N: 320.93 ms; L2-N: 323.65 ms; L3-N: 320.92 ms;
Frequency decrease protection $f <$	47.5 Hz	47.50 Hz		139.97 ms
Frequency increase protection $f >$	51.5 Hz	51.49 Hz		134.95 ms

Certificate of Conformity

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*: The tripping time includes the period from the limit value 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. **: Verification disconnection time of moving 10-min-average value. Disconnecting time as below: 489.10 s (L1-N&L2-N&L3-N from $600\text{s}@U_n$ to $112\%U_n$) Continuous operation (L1-N&L2-N&L3-N from $600\text{s}@U_n$ to $108\%U_n$) 266.20 s (L1-N&L2-N&L3-N from $600\text{s}@106\%U_n$ to $114\%U_n$)	
☒ as integrated NS protection	
Assigned to power generation unit type	<u>X1-H5K-T, X1-H8K-T, X1-H10K-T, X1-H12K-T.</u>
Integrated interface switch type	Series-connected relays for all phase conductors each Relay type: HF161F-W/12-HT(A27)
Response time of interface switch for integrated NS protection	Release time: Max. 10 ms
Verification of the entire functional chain "integrated NS protection – interface switch" has resulted in successful disconnection.	☒