

Certificate of Conformity

No. ESY 125564 0006 Rev. 00

Holder of Certificate: **Qingdao Haier Energy Technology Co., Ltd.**
Room 102-3, Building E2
No. 289 Laiqing Road, Wenquan Street Office
Jimo District
266207 Qingdao City, Shandong Province
PEOPLE'S REPUBLIC OF CHINA

Product: **Converter**
Hybrid Inverter

Model(s): HAH3P-4KB1/HU9, HAH3P-5KB1/HU9, HAH3P-6KB1/HU9,
HAH3P-8KB1/HU9, HAH3P-10KB1/HU9, HAH3P-12KB1/HU9,
HAH3P-15KB1/HU9

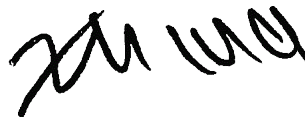
Parameters: See next pages.

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.: 5040925025907-00

Date, 2025-07-23



(Zhengdong Ma)

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Model Name	HAH3P-4KB1/HU9	HAH3P-5KB1/HU9	HAH3P-6KB1/HU9
PV Input Parameters			
Max. PV Power	8000 W	10000 W	12000 W
Max. Input Voltage	DC 1100 V		
Isc PV	DC 24 / 24 / 24 A		
MPPT Voltage Range	DC 140, ..., 950 V		
Max. PV Input Current	DC 16 / 16 / 16 A		
Battery Input Port Parameters			
Battery Type	LFP (LiFePO4)		
Battery Voltage Range	DC 90, ..., 700 V		
Max. Charge/Discharge Current	DC 50 A / 50 A		
A.C. Output Parameters			
Rated Grid Voltage	3/N/PE AC 230/400 V		
Rated Grid Frequency	50 Hz		
Rated Grid Apparent Power	4.0 kVA	5.0 kVA	6.0 kVA
Max. Grid Apparent Power	4.4 kVA	5.5 kVA	6.6 kVA
Rated Grid Output Current	AC 5.8 A	AC 7.2 A	AC 8.7 A
Max Grid Output Current	AC 6.7 A	AC 8.3 A	AC 10 A
Power Factor Range	-0.8, ..., 1, ..., +0.8		

Model Name	HAH3P-8KB1/HU9	HAH3P-10KB1/HU9
PV Input Parameters		
Max. PV Power	16000 W	20000 W
Max. Input Voltage	DC 1100 V	
Isc PV	DC 24 / 24 / 24 A	
MPPT Voltage Range	DC 140, ..., 950 V	
Max. PV Input Current	DC 16 / 16 / 16 A	
Battery Input Port Parameters		
Battery Type	LFP (LiFePO4)	
Battery Voltage Range	DC 90, ..., 700 V	
Max. Charge/Discharge Current	DC 50 A / 50 A	
A.C. Output Parameters		
Rated Grid Voltage	3/N/PE AC 230/400 V	
Rated Grid Frequency	50 Hz	
Rated Grid Apparent Power	8.0 kVA	10.0 kVA
Max. Grid Apparent Power	8.8 kVA	11.0 kVA
Rated Grid Output Current	AC 11.6 A	AC 14.5 A
Max Grid Output Current	AC 13.3 A	AC 16.7 A
Power Factor Range	-0.8, ..., 1, ..., +0.8	

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Model Name	HAH3P-12KB1/HU9	HAH3P-15KB1/HU9
PV Input Parameters		
Max. PV Power	22500 W	
Max. Input Voltage	DC 1000 V	
Isc PV	DC 24 / 24 / 24 A	
MPPT Voltage Range	DC 140, ..., 950 V	
Max. PV Input Current	DC 16 / 16 / 16 A	
Battery Input Port Parameters		
Battery Type	LFP (LiFePO4)	
Battery Voltage Range	DC 90, ..., 700 V	
Max. Charge/Discharge Current	DC 50 A / 50 A	
A.C. Output Parameters		
Rated Grid Voltage	3/N/PE AC 230/400 V	
Rated Grid Frequency	50 Hz	
Rated Grid Apparent Power	12.0 kVA	15.0 kVA
Max. Grid Apparent Power	13.2 kVA	15.75 kVA
Rated Grid Output Current	AC 17.4 A	AC 21.7 A
Max Grid Output Current	AC 20.0 A	AC 22.8 A
Power Factor Range	-0.8, ..., 1, ..., +0.8	

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E.4 Unit certificate

Unit certificate	No. 5040925025907-00	
Manufacturer	Qingdao Haier Energy Technology Co., Ltd. Room 102-3, Building E2, No.289 Laiqing Road, Wenquan Street Office Jimo District, 266207 Qingdao City, Shandong Province, PEOPLE'S REPUBLIC OF CHINA	
Power generation unit type	HAH3P-4KB1/HU9 HAH3P-5KB1/HU9 HAH3P-6KB1/HU9 HAH3P-8KB1/HU9 HAH3P-10KB1/HU9 HAH3P-12KB1/HU9 HAH3P-15KB1/HU9 Remark: certified on representative model HAH3P-10KB1/HU9 of family design products, results of the measurement of HAH3P-10KB1/HU9 can be transferred to other models based on transferability rule of measurements in DIN VDE V 0124-100 (VDE V 0124-100):2020. Additional test for HAH3P-15KB1/HU9	
☒ Inverter	☐ Asynchronous generator	☐ Synchronous generator
☐ Stirling generator	☐ Fuel cell	☐ others
Assessment values	Max. active power $P_{E_{max}}$	10058 W (HAH3P-10KB1/HU9) 14976 W (HAH3P-15KB1/HU9)
	Max. apparent power $S_{E_{max}}$	11071 VA (HAH3P-10KB1/HU9) 15801 VA (HAH3P-15KB1/HU9)
	Rated voltage	3/N/PE AC 230/400 V
Rated values	Max. current (AC) I_{max}	16.7 A (HAH3P-10KB1/HU9) 22.8 A (HAH3P-15KB1/HU9)
Network connection rules	VDE-AR-N 4105:2018-11/Corrigendum 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 requirement	DIN VDE V 0124-100 (VDE V 0124-100):2020-06 “Network integration of power generation system – Low voltage” Test requirements for power generation units intended for connection to and parallel operation on the low-voltage network.	
The above mentioned power generation unit meets the requirements of VDE-AR-N 4105.		

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

Extract from test report for unit certificate "Determination of electrical properties"		No. 5040925025907-00
Generation unit manufacturer:	Qingdao Haier Energy Technology Co., Ltd. Room 102-3, Building E2, No.289 Laiqing Road, Wenquan Street Office Jimo District, 266207 Qingdao City, Shandong Province, PEOPLE'S REPUBLIC OF CHINA	
Manufacturer indications:	Type of system	Hybrid Inverter for PV system
	Max. active power $P_{E_{max}}$	4000 W (HAH3P-4KB1/HU9) 5000 W (HAH3P-5KB1/HU9) 6000 W (HAH3P-6KB1/HU9) 8000 W (HAH3P-8KB1/HU9) 10000 W (HAH3P-10KB1/HU9) 12000 W (HAH3P-12KB1/HU9) 15000 W (HAH3P-15KB1/HU9)
	Rated voltage	3/N/PE AC 230/400 V
Period of measurement:	2024-12-01 to 2024-12-20, 2025-06-13	

Flicker-DIN EN 61000-3-3 (VDE 0838-3):2014-03 (≤ 16 A) (HAH3P-10KB1/HU9)					
Test items	$d_{(t)} - 500ms$ [%]	d_c [%]	d_{max} [%]	P_{st}	P_{it}
Limit	3.30	3.30	4.00	1.00	0.65
L1-N	0.00	0.01	0.51	0.06	0.06
L2-N	0.00	0.01	0.64	0.06	0.06
L3-N	0.00	0.01	0.51	0.06	0.06
		$d(t) - 500ms$ [%]	d_c [%]	d_{max} [%]	
Start	L1-N	0	0.020	0.590	
	L2-N	0	0.004	0.550	
	L3-N	0	0.030	0.510	
Stop	L1-N	0	0.002	0.490	
	L2-N	0	0.010	0.490	
	L3-N	0	0.003	0.500	
Limit		3.3%	3.3%	4%	

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Harmonics-DIN EN 61000-3-2 (VDE 0838-2): 2019-12 (≤ 16 A) (HAH3P-10KB1/HU9)												
L1-N												
Active power P/Pn[%]	5	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
2	0.079	0.043	0.031	0.022	0.030	0.030	0.032	0.030	0.028	0.029	0.166	1.080
3	0.196	0.243	0.272	0.240	0.235	0.251	0.276	0.305	0.339	0.370	0.455	2.300
4	0.115	0.174	0.109	0.112	0.106	0.105	0.105	0.106	0.105	0.103	0.245	0.430
5	0.166	0.130	0.194	0.190	0.162	0.153	0.151	0.151	0.148	0.144	0.152	1.140
6	0.050	0.078	0.068	0.023	0.016	0.018	0.019	0.019	0.018	0.020	0.038	0.300
7	0.107	0.154	0.073	0.116	0.095	0.085	0.080	0.080	0.078	0.072	0.061	0.770
8	0.039	0.022	0.093	0.069	0.062	0.053	0.044	0.040	0.038	0.032	0.039	0.230
9	0.087	0.252	0.122	0.137	0.112	0.085	0.073	0.072	0.073	0.072	0.063	0.400
10	0.045	0.028	0.079	0.054	0.043	0.030	0.022	0.020	0.017	0.023	0.046	0.184
11	0.074	0.062	0.160	0.076	0.093	0.073	0.062	0.058	0.055	0.051	0.045	0.330
12	0.030	0.057	0.014	0.014	0.016	0.020	0.019	0.016	0.017	0.016	0.009	0.153
13	0.025	0.077	0.069	0.017	0.030	0.024	0.017	0.014	0.012	0.013	0.018	0.210
14	0.013	0.032	0.021	0.017	0.012	0.012	0.009	0.008	0.007	0.006	0.005	0.131
15	0.014	0.066	0.054	0.043	0.038	0.038	0.032	0.028	0.025	0.020	0.012	0.150
16	0.015	0.012	0.016	0.018	0.013	0.010	0.007	0.005	0.004	0.004	0.007	0.115
17	0.012	0.043	0.037	0.028	0.011	0.011	0.007	0.006	0.006	0.007	0.009	0.132
18	0.010	0.004	0.008	0.010	0.005	0.005	0.003	0.002	0.003	0.003	0.003	0.102
19	0.012	0.022	0.027	0.019	0.003	0.004	0.003	0.004	0.006	0.009	0.010	0.118
20	0.006	0.008	0.009	0.008	0.005	0.005	0.004	0.003	0.003	0.003	0.003	0.092
21	0.009	0.015	0.013	0.027	0.015	0.018	0.017	0.015	0.013	0.012	0.011	0.107
22	0.007	0.018	0.010	0.008	0.006	0.006	0.005	0.004	0.003	0.003	0.002	0.084
23	0.004	0.022	0.004	0.014	0.003	0.003	0.002	0.002	0.003	0.005	0.006	0.098
24	0.006	0.012	0.008	0.005	0.006	0.007	0.005	0.005	0.004	0.003	0.002	0.077
25	0.009	0.022	0.006	0.011	0.002	0.003	0.002	0.002	0.004	0.005	0.007	0.090
26	0.005	0.004	0.005	0.002	0.003	0.003	0.003	0.003	0.003	0.003	0.002	0.071
27	0.004	0.012	0.010	0.010	0.007	0.006	0.006	0.005	0.003	0.002	0.002	0.083
28	0.005	0.008	0.007	0.002	0.004	0.004	0.003	0.003	0.003	0.002	0.001	0.066
29	0.004	0.012	0.013	0.012	0.007	0.004	0.004	0.003	0.002	0.003	0.004	0.078
30	0.004	0.009	0.007	0.002	0.004	0.005	0.005	0.005	0.004	0.003	0.003	0.061
31	0.006	0.013	0.013	0.012	0.008	0.005	0.005	0.003	0.002	0.003	0.003	0.073
32	0.005	0.006	0.003	0.001	0.002	0.002	0.003	0.003	0.003	0.003	0.002	0.058
33	0.004	0.013	0.013	0.010	0.005	0.002	0.002	0.004	0.006	0.006	0.006	0.068
34	0.004	0.004	0.002	0.002	0.003	0.003	0.003	0.003	0.003	0.003	0.002	0.054
35	0.004	0.011	0.010	0.008	0.007	0.005	0.005	0.004	0.002	0.004	0.003	0.064
36	0.003	0.006	0.004	0.002	0.002	0.003	0.003	0.004	0.003	0.003	0.006	0.051
37	0.005	0.009	0.008	0.007	0.007	0.005	0.005	0.003	0.002	0.003	0.003	0.061
38	0.004	0.008	0.004	0.002	0.002	0.002	0.003	0.003	0.003	0.003	0.006	0.048
39	0.006	0.011	0.008	0.007	0.006	0.003	0.002	0.004	0.006	0.007	0.008	0.058
40	0.004	0.007	0.005	0.003	0.002	0.002	0.003	0.004	0.003	0.002	0.002	0.046
L2-N												
Active power P/Pn[%]	5	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
2	0.025	0.084	0.038	0.027	0.027	0.026	0.021	0.020	0.019	0.019	0.277	1.080
3	0.205	0.232	0.252	0.225	0.223	0.241	0.264	0.293	0.324	0.357	0.374	2.300
4	0.078	0.156	0.078	0.078	0.078	0.077	0.078	0.079	0.080	0.079	0.169	0.430

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5	0.163	0.120	0.191	0.175	0.152	0.145	0.144	0.139	0.135	0.134	0.143	1.140
6	0.017	0.094	0.066	0.019	0.013	0.008	0.010	0.014	0.016	0.016	0.041	0.300
7	0.101	0.149	0.075	0.109	0.093	0.084	0.079	0.078	0.075	0.073	0.061	0.770
8	0.016	0.037	0.100	0.049	0.033	0.021	0.011	0.010	0.010	0.009	0.013	0.230
9	0.090	0.255	0.085	0.123	0.104	0.080	0.075	0.074	0.075	0.077	0.068	0.400
10	0.019	0.033	0.066	0.038	0.023	0.016	0.006	0.007	0.007	0.009	0.016	0.184
11	0.052	0.056	0.144	0.075	0.082	0.063	0.055	0.051	0.046	0.043	0.037	0.330
12	0.029	0.047	0.019	0.018	0.017	0.018	0.017	0.014	0.012	0.012	0.012	0.153
13	0.007	0.071	0.072	0.012	0.023	0.015	0.011	0.010	0.013	0.018	0.024	0.210
14	0.010	0.031	0.018	0.021	0.015	0.011	0.008	0.006	0.005	0.006	0.007	0.131
15	0.021	0.067	0.056	0.039	0.038	0.037	0.033	0.029	0.026	0.022	0.017	0.150
16	0.010	0.008	0.011	0.014	0.009	0.007	0.004	0.004	0.004	0.004	0.005	0.115
17	0.006	0.039	0.032	0.022	0.011	0.010	0.007	0.006	0.006	0.006	0.007	0.132
18	0.008	0.006	0.005	0.008	0.006	0.006	0.005	0.004	0.004	0.004	0.004	0.102
19	0.004	0.027	0.030	0.018	0.008	0.008	0.008	0.009	0.010	0.012	0.012	0.118
20	0.006	0.010	0.005	0.007	0.008	0.007	0.005	0.005	0.004	0.003	0.004	0.092
21	0.013	0.017	0.022	0.032	0.019	0.022	0.022	0.021	0.019	0.018	0.017	0.107
22	0.008	0.014	0.007	0.005	0.005	0.004	0.004	0.003	0.003	0.003	0.003	0.084
23	0.005	0.019	0.010	0.017	0.005	0.006	0.006	0.005	0.004	0.004	0.002	0.098
24	0.004	0.010	0.008	0.004	0.005	0.005	0.005	0.004	0.004	0.003	0.002	0.077
25	0.005	0.024	0.008	0.016	0.006	0.006	0.006	0.004	0.002	0.002	0.004	0.090
26	0.005	0.004	0.006	0.003	0.004	0.005	0.004	0.004	0.003	0.003	0.002	0.071
27	0.004	0.011	0.014	0.012	0.010	0.008	0.007	0.005	0.003	0.002	0.002	0.083
28	0.006	0.007	0.005	0.003	0.003	0.004	0.003	0.003	0.003	0.003	0.003	0.066
29	0.006	0.007	0.010	0.009	0.006	0.005	0.004	0.003	0.002	0.002	0.002	0.078
30	0.003	0.009	0.006	0.001	0.004	0.005	0.005	0.005	0.004	0.003	0.003	0.061
31	0.006	0.011	0.012	0.010	0.007	0.005	0.004	0.003	0.003	0.004	0.006	0.073
32	0.003	0.006	0.004	0.001	0.003	0.003	0.004	0.003	0.003	0.003	0.002	0.058
33	0.005	0.017	0.015	0.012	0.008	0.005	0.003	0.003	0.004	0.004	0.004	0.068
34	0.005	0.004	0.002	0.002	0.003	0.003	0.003	0.003	0.003	0.003	0.003	0.054
35	0.005	0.013	0.012	0.008	0.009	0.007	0.007	0.006	0.004	0.004	0.003	0.064
36	0.003	0.004	0.002	0.002	0.002	0.003	0.004	0.004	0.004	0.004	0.006	0.051
37	0.004	0.007	0.009	0.007	0.008	0.006	0.006	0.004	0.002	0.003	0.003	0.061
38	0.003	0.007	0.003	0.002	0.002	0.002	0.002	0.003	0.002	0.002	0.006	0.048
39	0.005	0.012	0.009	0.009	0.007	0.004	0.001	0.003	0.006	0.007	0.009	0.058
40	0.005	0.007	0.004	0.002	0.002	0.002	0.003	0.003	0.002	0.002	0.003	0.046

L3-N

Active power P/Pn[%]	5	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
2	0.116	0.120	0.067	0.048	0.045	0.042	0.044	0.042	0.043	0.043	0.099	1.080
3	0.143	0.173	0.192	0.176	0.176	0.194	0.221	0.252	0.285	0.317	0.336	2.300
4	0.108	0.155	0.082	0.083	0.083	0.082	0.085	0.087	0.088	0.088	0.227	0.430
5	0.159	0.107	0.168	0.156	0.124	0.113	0.110	0.107	0.104	0.101	0.098	1.140
6	0.020	0.125	0.130	0.077	0.063	0.055	0.049	0.046	0.044	0.045	0.074	0.300
7	0.128	0.170	0.096	0.138	0.119	0.106	0.102	0.099	0.097	0.093	0.083	0.770
8	0.023	0.014	0.078	0.050	0.038	0.035	0.028	0.021	0.017	0.018	0.042	0.230
9	0.085	0.240	0.122	0.142	0.117	0.089	0.077	0.076	0.075	0.075	0.072	0.400
10	0.020	0.051	0.082	0.054	0.032	0.020	0.012	0.018	0.022	0.021	0.027	0.184
11	0.053	0.047	0.164	0.075	0.096	0.081	0.068	0.063	0.059	0.054	0.046	0.330
12	0.030	0.057	0.019	0.032	0.035	0.034	0.032	0.028	0.026	0.025	0.026	0.153
13	0.017	0.096	0.086	0.029	0.043	0.035	0.027	0.023	0.017	0.012	0.014	0.210

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14	0.013	0.027	0.018	0.017	0.007	0.003	0.003	0.005	0.006	0.007	0.008	0.131
15	0.007	0.074	0.047	0.031	0.023	0.024	0.019	0.015	0.011	0.007	0.005	0.150
16	0.006	0.009	0.010	0.019	0.016	0.012	0.008	0.007	0.006	0.006	0.005	0.115
17	0.011	0.043	0.038	0.030	0.011	0.012	0.009	0.010	0.010	0.012	0.012	0.132
18	0.009	0.007	0.006	0.004	0.007	0.008	0.009	0.009	0.009	0.009	0.010	0.102
19	0.004	0.017	0.026	0.021	0.002	0.004	0.002	0.002	0.003	0.006	0.006	0.118
20	0.008	0.013	0.006	0.008	0.007	0.005	0.004	0.002	0.002	0.002	0.002	0.092
21	0.011	0.018	0.018	0.034	0.021	0.024	0.023	0.021	0.020	0.019	0.017	0.107
22	0.004	0.016	0.010	0.007	0.009	0.008	0.006	0.005	0.004	0.003	0.003	0.084
23	0.006	0.024	0.005	0.018	0.005	0.006	0.006	0.006	0.005	0.007	0.006	0.098
24	0.005	0.007	0.008	0.003	0.004	0.004	0.005	0.005	0.005	0.005	0.005	0.077
25	0.005	0.021	0.007	0.009	0.005	0.003	0.005	0.006	0.007	0.007	0.008	0.090
26	0.005	0.006	0.007	0.004	0.005	0.004	0.003	0.003	0.002	0.002	0.002	0.071
27	0.009	0.014	0.020	0.019	0.020	0.018	0.019	0.017	0.016	0.014	0.013	0.083
28	0.003	0.010	0.006	0.002	0.005	0.005	0.005	0.004	0.003	0.003	0.002	0.066
29	0.004	0.012	0.015	0.014	0.009	0.005	0.003	0.003	0.004	0.005	0.005	0.078
30	0.003	0.008	0.004	0.002	0.003	0.003	0.004	0.003	0.003	0.003	0.003	0.061
31	0.006	0.013	0.011	0.011	0.005	0.001	0.002	0.004	0.005	0.006	0.005	0.073
32	0.004	0.005	0.002	0.001	0.003	0.003	0.003	0.003	0.003	0.002	0.002	0.058
33	0.003	0.010	0.011	0.011	0.014	0.012	0.012	0.011	0.010	0.008	0.009	0.068
34	0.003	0.005	0.002	0.002	0.003	0.004	0.004	0.004	0.004	0.003	0.002	0.054
35	0.006	0.011	0.013	0.011	0.010	0.005	0.003	0.002	0.003	0.005	0.004	0.064
36	0.003	0.007	0.005	0.004	0.001	0.002	0.003	0.004	0.003	0.003	0.007	0.051
37	0.005	0.009	0.008	0.007	0.007	0.003	0.002	0.002	0.002	0.003	0.004	0.061
38	0.004	0.007	0.005	0.002	0.002	0.003	0.003	0.003	0.003	0.002	0.006	0.048
39	0.003	0.009	0.004	0.004	0.007	0.008	0.008	0.008	0.006	0.004	0.003	0.058
40	0.003	0.005	0.006	0.003	0.002	0.003	0.004	0.003	0.003	0.002	0.002	0.046

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Flicker-DIN EN 61000-3-11 (VDE 0838-11):2014-03 >16 A and ≤ 75 A) (HAH3P-15KB1/HU9)				
Test no.	P _{st}	d(t) - 500ms [%]	dc [%]	dmax [%]
	L1/L2/L3	L1/L2/L3	L1/L2/L3	L1/L2/L3
Limit	1,0	3,3%	3,3%	4%
1	0.09/0.09/0.09	0/0/0	0.11/0.01/0.06	0.36/0.09/0.25
2	0.10/0.09/0.09	0/0/0	0.07/0.11/0.02	0.27/0.32/0.28
3	0.10/0.10/0.10	0/0/0	0.09/0.11/0.06	0.35/0.39/0.24
4	0.09/0.09/0.08	0/0/0	0.00/0.12/0.00	0.00/0.33/0.21
5	0.09/0.10/0.10	0/0/0	0.10/0.09/0.06	0.25/0.38/0.22
6	0.10/0.10/0.09	0/0/0	0.05/0.16/0.05	0.25/0.41/0.26
7	0.08/0.07/0.08	0/0/0	0.07/0.00/0.00	0.59/0.00/0.00
8	0.08/0.09/0.09	0/0/0	0.23/0.14/0.09	0.26/0.30/0.16
9	0.09/0.09/0.09	0/0/0	0.03/0.13/0.09	0.27/0.32/0.35
10	0.09/0.08/0.08	0/0/0	0.09/0.03/0.00	0.50/0.23/0.00
11	0.09/0.09/0.09	0/0/0	0.16/0.05/0.20	0.30/0.19/0.31
12	0.08/0.08/0.08	0/0/0	0.11/0.06/0.11	0.27/0.21/0.30
P_{It} measured	0.09/0.09/0.09		P_{It} limit	0.65
	d(t) - 500ms [%]		dc [%]	dmax [%]
START	0/0/0		0.11/0.14/0.04	0.36/0.42/0.09
STOP	0/0/0		0.04/0.20/0.14	0.24/0.39/0.33
LIMIT	3.3%		3.3%	4%

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Harmonics-DIN EN 61000-3-12 (VDE 0838-12): 2019-12 (>16 A and ≤75 A) (HAH3P-15KB1/HU9)												
L1-N												
Active power P/Pn[%]	5	10	20	30	40	50	60	70	80	90	100	Limit
Ordinal number	[%]	[%]	[%]	[%]	[%]	[%]	[%]	[%]	[%]	[%]	[%]	[%]
2	0.096	0.074	0.128	0.180	0.270	0.343	0.410	0.478	0.536	0.608	0.682	8%
3	0.310	0.373	0.263	0.498	0.567	0.568	0.502	0.731	0.847	0.971	1.107	Not stated
4	0.041	0.024	0.021	0.033	0.022	0.031	0.024	0.034	0.029	0.041	0.035	4%
5	0.234	0.404	0.251	0.393	0.427	0.424	0.430	0.393	0.372	0.484	0.464	10.7%
6	0.032	0.019	0.015	0.021	0.026	0.018	0.020	0.020	0.020	0.026	0.025	2.67%
7	0.079	0.156	0.169	0.259	0.284	0.328	0.293	0.317	0.324	0.403	0.400	7.2%
8	0.028	0.016	0.012	0.023	0.016	0.021	0.021	0.019	0.018	0.021	0.025	2%
9	0.057	0.066	0.104	0.218	0.057	0.156	0.114	0.103	0.154	0.243	0.324	Not stated
10	0.027	0.016	0.011	0.020	0.015	0.015	0.018	0.019	0.019	0.023	0.025	1.6%
11	0.130	0.130	0.100	0.144	0.156	0.146	0.151	0.177	0.179	0.249	0.227	3.1%
12	0.024	0.017	0.011	0.031	0.018	0.015	0.017	0.016	0.019	0.026	0.029	1.33%
13	0.160	0.217	0.071	0.140	0.128	0.159	0.145	0.139	0.156	0.169	0.186	2%
14	0.016	0.014	0.009	0.024	0.018	0.017	0.018	0.021	0.019	0.023	0.027	-
15	0.081	0.080	0.026	0.052	0.096	0.069	0.094	0.069	0.083	0.131	0.138	-
16	0.032	0.034	0.022	0.024	0.036	0.021	0.020	0.026	0.022	0.029	0.033	-
17	0.064	0.039	0.043	0.050	0.100	0.088	0.125	0.125	0.139	0.156	0.166	-
18	0.014	0.015	0.009	0.013	0.016	0.019	0.025	0.021	0.018	0.025	0.029	-
19	0.049	0.028	0.045	0.050	0.090	0.110	0.110	0.097	0.112	0.159	0.160	-
20	0.015	0.015	0.009	0.018	0.014	0.018	0.020	0.022	0.017	0.027	0.023	-
21	0.078	0.094	0.052	0.087	0.083	0.103	0.161	0.090	0.085	0.129	0.114	-
22	0.016	0.015	0.012	0.015	0.014	0.029	0.020	0.025	0.024	0.033	0.025	-
23	0.056	0.066	0.016	0.027	0.040	0.064	0.044	0.087	0.105	0.114	0.119	-
24	0.015	0.017	0.009	0.016	0.015	0.037	0.019	0.026	0.022	0.038	0.026	-
25	0.051	0.072	0.015	0.023	0.051	0.058	0.107	0.101	0.113	0.129	0.114	-
26	0.015	0.016	0.009	0.015	0.014	0.017	0.019	0.022	0.023	0.038	0.027	-
27	0.083	0.057	0.016	0.025	0.078	0.047	0.054	0.108	0.146	0.142	0.136	-
28	0.014	0.016	0.010	0.016	0.016	0.017	0.022	0.020	0.023	0.033	0.028	-
29	0.034	0.034	0.017	0.041	0.028	0.051	0.049	0.037	0.030	0.082	0.112	-
30	0.018	0.016	0.010	0.026	0.017	0.028	0.046	0.030	0.036	0.032	0.037	-
31	0.054	0.045	0.020	0.064	0.023	0.063	0.065	0.126	0.153	0.126	0.105	-
32	0.057	0.064	0.039	0.019	0.066	0.022	0.024	0.025	0.024	0.029	0.031	-
33	0.077	0.094	0.074	0.099	0.098	0.104	0.156	0.070	0.101	0.111	0.161	-
34	0.020	0.015	0.011	0.017	0.016	0.021	0.025	0.020	0.021	0.022	0.026	-
35	0.035	0.047	0.016	0.030	0.035	0.040	0.051	0.025	0.042	0.036	0.062	-
36	0.023	0.019	0.009	0.016	0.017	0.015	0.019	0.016	0.020	0.023	0.024	-
37	0.049	0.054	0.016	0.025	0.033	0.027	0.027	0.067	0.093	0.086	0.109	-
38	0.015	0.028	0.009	0.014	0.017	0.017	0.021	0.018	0.019	0.027	0.027	-
39	0.085	0.101	0.034	0.125	0.044	0.143	0.102	0.145	0.130	0.110	0.160	-
40	0.015	0.034	0.011	0.015	0.019	0.016	0.021	0.017	0.020	0.025	0.027	-
THC/I _{ref}	0.526	0.685	0.472	0.805	0.878	0.945	0.939	1.098	1.221	1.436	1.579	13%
PWHD	1.270	1.379	0.713	1.272	1.279	1.582	1.825	1.820	2.072	2.228	2.469	22%
L2-N												
Active power P/Pn[%]	5	10	20	30	40	50	60	70	80	90	100	Limit
Ordinal number	[%]	[%]	[%]	[%]	[%]	[%]	[%]	[%]	[%]	[%]	[%]	[%]
2	0.139	0.122	0.175	0.217	0.294	0.358	0.435	0.497	0.565	0.641	0.692	8%

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3	0.122	0.263	0.258	0.413	0.423	0.475	0.443	0.583	0.681	0.774	0.898	Not stated
4	0.032	0.015	0.013	0.022	0.026	0.024	0.027	0.023	0.024	0.039	0.052	4%
5	0.310	0.425	0.279	0.380	0.414	0.389	0.385	0.370	0.332	0.423	0.375	10.7%
6	0.021	0.017	0.020	0.035	0.030	0.026	0.029	0.024	0.024	0.037	0.040	2.67%
7	0.113	0.166	0.196	0.250	0.256	0.280	0.284	0.282	0.294	0.330	0.347	7.2%
8	0.026	0.016	0.015	0.019	0.022	0.023	0.025	0.021	0.022	0.030	0.037	2%
9	0.042	0.024	0.020	0.070	0.031	0.053	0.041	0.029	0.026	0.045	0.085	Not stated
10	0.019	0.016	0.010	0.018	0.016	0.015	0.018	0.017	0.015	0.024	0.030	1.6%
11	0.206	0.150	0.117	0.154	0.163	0.166	0.169	0.158	0.157	0.168	0.170	3.1%
12	0.019	0.017	0.019	0.056	0.023	0.022	0.024	0.025	0.023	0.029	0.035	1.33%
13	0.150	0.151	0.071	0.115	0.109	0.138	0.145	0.134	0.134	0.164	0.173	2%
14	0.012	0.012	0.009	0.038	0.014	0.022	0.024	0.030	0.019	0.030	0.040	-
15	0.129	0.135	0.098	0.102	0.150	0.070	0.108	0.056	0.054	0.066	0.062	-
16	0.028	0.031	0.023	0.033	0.033	0.018	0.021	0.032	0.021	0.026	0.034	-
17	0.104	0.082	0.072	0.063	0.117	0.106	0.114	0.119	0.106	0.114	0.127	-
18	0.014	0.012	0.010	0.017	0.018	0.019	0.022	0.033	0.021	0.029	0.027	-
19	0.060	0.050	0.047	0.049	0.089	0.101	0.082	0.113	0.087	0.130	0.128	-
20	0.016	0.017	0.009	0.017	0.014	0.022	0.015	0.033	0.015	0.036	0.021	-
21	0.049	0.037	0.012	0.042	0.021	0.066	0.059	0.082	0.070	0.108	0.089	-
22	0.015	0.014	0.009	0.014	0.013	0.051	0.016	0.033	0.016	0.042	0.022	-
23	0.059	0.082	0.025	0.029	0.067	0.095	0.079	0.083	0.065	0.101	0.107	-
24	0.015	0.013	0.010	0.013	0.018	0.068	0.023	0.027	0.020	0.054	0.029	-
25	0.040	0.042	0.018	0.020	0.043	0.040	0.070	0.068	0.095	0.095	0.090	-
26	0.012	0.014	0.009	0.013	0.017	0.021	0.021	0.016	0.019	0.054	0.027	-
27	0.103	0.075	0.037	0.048	0.084	0.049	0.055	0.058	0.066	0.105	0.090	-
28	0.013	0.013	0.010	0.016	0.013	0.020	0.022	0.017	0.015	0.050	0.025	-
29	0.032	0.029	0.018	0.050	0.023	0.066	0.067	0.085	0.090	0.114	0.112	-
30	0.015	0.014	0.011	0.034	0.016	0.039	0.059	0.042	0.044	0.042	0.043	-
31	0.027	0.044	0.019	0.076	0.035	0.078	0.085	0.097	0.131	0.137	0.149	-
32	0.083	0.088	0.061	0.021	0.089	0.021	0.027	0.024	0.025	0.030	0.032	-
33	0.080	0.086	0.069	0.089	0.099	0.099	0.105	0.094	0.109	0.039	0.049	-
34	0.019	0.013	0.010	0.015	0.014	0.016	0.019	0.016	0.016	0.022	0.022	-
35	0.036	0.044	0.021	0.021	0.026	0.031	0.041	0.077	0.110	0.115	0.130	-
36	0.017	0.015	0.009	0.013	0.014	0.015	0.018	0.020	0.018	0.025	0.024	-
37	0.021	0.035	0.020	0.039	0.022	0.051	0.043	0.067	0.076	0.090	0.097	-
38	0.018	0.019	0.011	0.016	0.017	0.020	0.019	0.021	0.021	0.025	0.023	-
39	0.068	0.067	0.043	0.111	0.045	0.112	0.078	0.119	0.090	0.144	0.129	-
40	0.015	0.023	0.009	0.018	0.016	0.019	0.017	0.014	0.016	0.019	0.022	-
THC/I _{ref}	0.536	0.642	0.516	0.728	0.793	0.854	0.871	0.980	1.068	1.237	1.336	13%
PWHD	1.333	1.333	0.881	1.271	1.385	1.564	1.509	1.732	1.793	2.161	2.123	22%
L3-N												
Active power P/P _n [%]	5	10	20	30	40	50	60	70	80	90	100	Limit
Ordinal number	[%]	[%]	[%]	[%]	[%]	[%]	[%]	[%]	[%]	[%]	[%]	[%]
2	0.114	0.127	0.182	0.232	0.299	0.380	0.454	0.518	0.577	0.665	0.731	8%
3	0.442	0.309	0.075	0.210	0.257	0.246	0.172	0.348	0.447	0.491	0.625	Not stated
4	0.030	0.023	0.018	0.028	0.016	0.020	0.022	0.025	0.026	0.026	0.034	4%
5	0.240	0.422	0.247	0.380	0.382	0.406	0.403	0.396	0.370	0.475	0.420	10.7%
6	0.022	0.024	0.012	0.024	0.017	0.025	0.027	0.027	0.027	0.033	0.040	2.67%
7	0.061	0.211	0.157	0.213	0.242	0.307	0.280	0.307	0.304	0.309	0.297	7.2%
8	0.022	0.018	0.013	0.018	0.014	0.016	0.020	0.017	0.021	0.021	0.028	2%

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9	0.536	0.406	0.193	0.117	0.369	0.095	0.184	0.182	0.164	0.175	0.099	Not stated
10	0.020	0.017	0.013	0.024	0.018	0.013	0.019	0.022	0.021	0.021	0.028	1.6%
11	0.135	0.111	0.112	0.144	0.157	0.153	0.154	0.171	0.148	0.206	0.173	3.1%
12	0.021	0.013	0.015	0.030	0.019	0.025	0.026	0.033	0.024	0.023	0.031	1.33%
13	0.185	0.184	0.060	0.108	0.122	0.162	0.154	0.121	0.130	0.110	0.130	2%
14	0.013	0.014	0.009	0.025	0.018	0.019	0.025	0.022	0.021	0.026	0.035	-
15	0.115	0.094	0.048	0.184	0.057	0.210	0.071	0.217	0.174	0.235	0.227	-
16	0.025	0.027	0.019	0.023	0.029	0.019	0.020	0.027	0.021	0.026	0.034	-
17	0.069	0.084	0.057	0.043	0.106	0.097	0.121	0.124	0.136	0.121	0.149	-
18	0.014	0.013	0.009	0.014	0.015	0.014	0.022	0.025	0.023	0.021	0.025	-
19	0.111	0.054	0.039	0.051	0.082	0.116	0.096	0.085	0.059	0.099	0.129	-
20	0.014	0.014	0.010	0.014	0.013	0.016	0.020	0.023	0.019	0.026	0.025	-
21	0.334	0.328	0.205	0.282	0.281	0.253	0.321	0.161	0.175	0.050	0.063	-
22	0.015	0.014	0.012	0.015	0.015	0.032	0.023	0.027	0.021	0.032	0.025	-
23	0.021	0.019	0.014	0.020	0.081	0.070	0.075	0.101	0.100	0.106	0.102	-
24	0.015	0.018	0.010	0.016	0.014	0.041	0.023	0.021	0.021	0.034	0.028	-
25	0.075	0.045	0.015	0.032	0.042	0.043	0.101	0.103	0.149	0.159	0.125	-
26	0.015	0.016	0.009	0.014	0.020	0.017	0.020	0.019	0.020	0.034	0.026	-
27	0.122	0.125	0.085	0.135	0.044	0.152	0.109	0.217	0.202	0.301	0.319	-
28	0.012	0.013	0.010	0.014	0.014	0.016	0.021	0.019	0.024	0.037	0.030	-
29	0.020	0.042	0.016	0.042	0.026	0.052	0.073	0.076	0.102	0.152	0.166	-
30	0.017	0.014	0.015	0.021	0.022	0.025	0.040	0.024	0.028	0.032	0.035	-
31	0.054	0.025	0.024	0.052	0.035	0.047	0.068	0.125	0.188	0.179	0.156	-
32	0.040	0.045	0.032	0.017	0.049	0.018	0.024	0.019	0.023	0.027	0.031	-
33	0.097	0.086	0.036	0.041	0.068	0.034	0.083	0.045	0.049	0.264	0.286	-
34	0.016	0.013	0.013	0.017	0.015	0.022	0.028	0.019	0.021	0.023	0.029	-
35	0.038	0.019	0.016	0.036	0.027	0.043	0.041	0.063	0.098	0.113	0.145	-
36	0.025	0.014	0.010	0.018	0.019	0.017	0.021	0.019	0.021	0.024	0.031	-
37	0.048	0.034	0.028	0.043	0.037	0.041	0.048	0.062	0.081	0.079	0.084	-
38	0.015	0.019	0.011	0.019	0.018	0.020	0.026	0.021	0.024	0.028	0.030	-
39	0.206	0.201	0.066	0.048	0.179	0.046	0.037	0.101	0.057	0.059	0.051	-
40	0.013	0.021	0.010	0.018	0.016	0.021	0.020	0.018	0.021	0.025	0.027	-
THC/lref	0.916	0.865	0.496	0.700	0.833	0.839	0.866	0.966	1.030	1.209	1.285	13%
PWHD	2.400	2.270	1.249	1.816	1.999	1.945	2.079	2.233	2.395	3.120	3.257	22%

Certificate of Conformity

No. ESY 125564 0006 Rev. 00

E.6 Certificate of the network and system protection

Certificate of NS protection	No. 5040925025907-00		
Manufacturer	Qingdao Haier Energy Technology Co., Ltd. Room 102-3, Building E2, No.289 Laiqing Road, Wenquan Street Office Jimo District, 266207 Qingdao City, Shandong Province, PEOPLE'S REPUBLIC OF CHINA		
Type of NS protection			
Central NS protection	☐		
Integrated NS protection	☒	Assigned to power generation unit type	<u>HAH3P-4KB1/HU9</u> <u>HAH3P-5KB1/HU9</u> <u>HAH3P-6KB1/HU9</u> <u>HAH3P-8KB1/HU9</u> <u>HAH3P-10KB1/HU9</u> <u>HAH3P-12KB1/HU9</u> <u>HAH3P-15KB1/HU9</u>
Network connection rules	VDE-AR-N 4105:2018-11/Corrigendum 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 requirement	DIN VDE V 0124-100 (VDE V 0124-100):2020-06 “Network integration of power generation system – Low voltage” Test requirements for power generation units intended for connection to and parallel operation on the low-voltage network.		
The network and system protection mentioned above meets the requirements of VDE-AR-N 4105.			

Certificate of Conformity

No. ESY 125564 0006 Rev. 00

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

Extract from test report for NS protection “Determination of electrical properties”		No. 5040925025907-00	
NS protection test report			
Type of NS system:	Integrated NS protection	Other Manufacturer indications	
Software version:	Hardware version: V1.0 Firmware version: E1.0		
Manufacturer:	Qingdao Haier Energy Technology Co., Ltd. Room 102-3, Building E2, No.289 Laiqing Road, Wenquan Street Office Jimo District, 266207 Qingdao City, Shandong Province, PEOPLE’S REPUBLIC OF CHINA		
Measuring period:	2024-12-01 to 2024-12-20, 2025-06-13		
	Inverter		
	directly coupled synchronous and asynchronous generators with Pn > 50 kW		
Protection function	Setting value	Tripping value	Break time NS protection
Rise-in-voltage protection $U >>$	$1.25 * U_n$	L1-N: 289.2 V; L2-N: 289.2 V; L3-N: 289.4 V;	L1-N: 170.6 ms; L2-N: 173.5 ms; L3-N: 176.9 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: 183.3 V; L2-N: 183.2 V; L3-N: 183.3 V;	L1-N: 3040 ms; L2-N: 3040 ms; L3-N: 3040 ms;
Voltage drop protection $U <<$	$0.45 * U_n$	L1-N: 105.0 V; L2-N: 104.9 V; L3-N: 104.9 V;	L1-N: 371.8 ms; L2-N: 393.8 ms; L3-N: 377.5 ms;
Frequency decrease protection $f <$	47.5 Hz	47.50 Hz	150.3 ms
Frequency increase protection $f >$	51.5 Hz	51.50 Hz	150.3 ms
*: 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:			
1. 496.60 s (L1-N from 600s@ U_n to 112% U_n); 462.50 s (L2-N from 600s@ U_n to 112% U_n); 507.70 s (L3-N from 600s@ U_n to 112% U_n)			
2. Continuous operation (L1-N from 600s@ U_n to 108% U_n); Continuous operation (L2-N from 600s@ U_n to 108% U_n); Continuous operation (L3-N from 600s@ U_n to 108% U_n)			
3. 310.00 s (L1-N from 600s@106% U_n to 114% U_n); 265.30 s (L2-N from 600s@106% U_n to 114% U_n); 274.40 s (L3-N from 600s@106% U_n to 114% U_n)			

Certificate of Conformity

No. ESY 125564 0006 Rev. 00

☒ as integrated NS protection	
Assigned to power generation unit type	Hybrid Inverter for PV system: HAH3P-4KB1/HU9 HAH3P-5KB1/HU9 HAH3P-6KB1/HU9 HAH3P-8KB1/HU9 HAH3P-10KB1/HU9 HAH3P-12KB1/HU9 HAH3P-15KB1/HU9
Integrated interface switch type	Series-connected relays for both line and neutral conductors Relay type: HF-161F-W/12-HT (477)
Response time of interface switch for integrated NS protection	HF-161F-W/12-HT (477) Release time: Max. 10 ms Operate time: Max. 20 ms
Verification of the entire functional chain "integrated NS protection – interface switch" has resulted in successful disconnection.	☒