ZERTIFIKAT ◆ CERTIFICATE ◆ 認證證書 ◆ СЕРТИФИКАТ ◆ CERTIFICADO ◆ CERTIFICAT

DAkkS Deutsche Akkreditierungsstelle D-ZE-11321-01-00

TÜV SÜD Product Service

Certificate of Conformity

No. ESY 126875 0023 Rev. 00

Holder of Certificate: **Atmoce Holding B.V.**
Singel 250
1016 AB Amsterdam
THE NETHERLANDS

Product: **Energy Storage System**
Energy Storage System

Model(s): **MS-7K-U**

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.: 704092520335-00

Date, 2025-04-30

(Zhengdong Ma)

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Model	MS-7K-U
Integrated Battery System	
Battery Type	Rechargeable Li-ion
Nominal Battery Voltage	DC 25.6 V
Battery Voltage Range	DC 20.4 V, …, 28.8 V
Max. Battery Continuous Charging Current	DC 235 A
Max. Battery Continuous Discharging Current	DC 270 A
Rated Battery Energy	7 kWh
Nominal Battery Capacity	280 Ah
Grid Port Parameters	
Input / Output Nominal Voltage	1/N/PE ~ 230V (single-phase mode) 3/N/PE ~ 230/400V (three-phase mode)
AC Max. Output Current (Discharging)	AC 21.74 A@230V (single-phase mode) AC 7.25 A@230/400V (three-phase mode)
AC Max. Input Current (Charging)	AC 16.3 A@230V (single-phase mode) AC 5.41 A@230/400V (three-phase mode)
Nominal Frequency	50 Hz
Max. Output Power (Overload)	5 kW
Max. Continuous Output Power	4.5 kW
Max. Continuous Input Power	3.75 kW
Adjustable Power Factor Range:	-0.8, …, +0.8
Number of Phases	1 a.c. or 3 a.c.

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E.4 Unit certificate

Unit certificate	No. 704092520335-00	
Manufacturer	Atmoce Holding B.V. Singel 250, 1016 AB Amsterdam THE NETHERLANDS	
Power generation unit type	MS-7K-U Remark: certified on representative model MS-7K-U of family design products, results of the measurement of MS-7K-U can be transferred to other models based on transferability rule of measurements in DIN VDE V 0124-100 (VDE V 0124-100):2020.	
☑ Inverter	☐ Asynchronous generator	☐ Synchronous generator
☐ Stirling generator	☐ Fuel cell	☐ others
Assessment values	Max. active power P_{Emax}	4999 W for single phase mode 4995 W for three phase mode
	Max. apparent power S_{Emax}	5011 VA for single phase mode 5075 VA for three phase mode
	Rated voltage	3/N/PE AC 230/400 V 1/N/PE AC 230V
Rated values	Max. current (AC) I_{max}	7.25 A for three phase mode 21.74 A for single phase mode
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. 704092520335-00
Generation unit manufacturer:	Atmoce Holding B.V. Singel 250, 1016 AB Amsterdam THE NETHERLANDS	
Manufacturer indications:	Type of system	Energy Storage System
	Max. active power P_{Emax}	4999 W for single phase mode 4995 W for three phase mode
	Rated voltage	3/N/PE AC 230/400 V 1/N/PE AC 230V
Period of measurement:	2025-02-25 to 2025-04-20	

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E.6 Certificate of the network and system protection

Certificate of NS protection	No. 704092520335-00		
Manufacturer	Atmoce Holding B.V. Singel 250, 1016 AB Amsterdam THE NETHERLANDS		
Type of NS protection			
Central NS protection	☐		
Integrated NS protection	☑	Assigned to power generation unit type	MS-7K-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.			

Flicker–DIN EN 61000-3-11 (VDE 0838-11):2001-04 single phase mode					
Mode (Energy supply)					
Test items	$d_{(t)\ -\ 500ms}$ [%]	d_c [%]	d_{max} [%]	P_{st}	P_{lt}
Limit	3.30	3.30	4.00	1.00	0.65
L1-N	0.000	0.001	-0.504	0.011	0.011
L2-N	-	-	-	-	-
L3-N	-	-	-	-	-

		d(t) - 500ms [%]	dc [%]	dmax [%]
Start	L1-N	0.000	0.003	0.498
	L2-N	-	-	-
	L3-N	-	-	-
Stop	L1-N	0.000	0.001	-0.504
	L2-N	-	-	-
	L3-N	-	-	-
Limit		3.3%	3.3%	4%

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Flicker–DIN EN 61000-3-11 (VDE 0838-11):2001-04 single phase mode					
Mode (Energy consumption)					
Test items	$d_{(t)\ -\ 500ms}$ [%]	d_c [%]	d_{max} [%]	P_{st}	P_{lt}
Limit	3.30	3.30	4.00	1.00	0.65
L1-N	0.000	0.002	-0.306	0.010	0.010
L2-N	-	-	-	-	-
L3-N	-	-	-	-	-

		d(t) - 500ms [%]	dc [%]	dmax [%]
Start	L1-N	0.000	0.002	-0.034
	L2-N	-	-	-
	L3-N	-	-	-
Stop	L1-N	0.000	0.002	-0.226
	L2-N	-	-	-
	L3-N	-	-	-
Limit		3.3%	3.3%	4%

Flicker–DIN EN 61000-3-11 (VDE 0838-11):2001-04 three phase mode					
Mode (Energy supply)					
Test items	$d_{(t)\ -\ 500ms}$ [%]	d_c [%]	d_{max} [%]	P_{st}	P_{lt}
Limit	3.30	3.30	4.00	1.00	0.65
L1-N	0.000	0.002	-0.410	0.011	0.011
L2-N	0.000	0.001	0.557	0.011	0.011
L3-N	0.000	0.001	-0.420	0.011	0.011

		d(t) - 500ms [%]	dc [%]	dmax [%]
Start	L1-N	0.000	0.001	-0.483
	L2-N	0.000	0.001	0.553
	L3-N	0.000	0.001	-0.325
Stop	L1-N	0.000	0.001	-0.410
	L2-N	0.000	0.002	0.557
	L3-N	0.000	0.001	-0.481
Limit		3.3%	3.3%	4%

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Flicker–DIN EN 61000-3-11 (VDE 0838-11):2001-04 three phase mode					
Mode (Energy consumption)					
Test items	$d_{(t)\ -\ 500ms}$ [%]	d_c [%]	d_{max} [%]	P_{st}	P_{lt}
Limit	3.30	3.30	4.00	1.00	0.65
L1-N	0.000	0.003	0.497	0.010	0.010
L2-N	0.000	0.002	0.498	0.010	0.010
L3-N	0.000	0.003	0.497	0.010	0.010

		d(t) - 500ms [%]	dc [%]	dmax [%]
Start	L1-N	0.000	0.003	0.450
	L2-N	0.000	0.004	0.497
	L3-N	0.000	0.002	0.497
Stop	L1-N	0.000	0.002	0.497
	L2-N	0.000	0.003	0.497
	L3-N	0.000	0.002	0.498
Limit		3.3%	3.3%	4%

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No. ESY 126875 0023 Rev. 00

Harmonics DIN EN 61000-3-12 (VDE 0838-12):2012-06													
1.Mode (Energy supply)													
Power P/Pn[%]	3	10	20	30	40	50	60	70	80	90	100	IEC 61000-3-12 limit	
Ordinal number	[%]	[%]	[%]	[%]	[%]	[%]	[%]	[%]	[%]	[%]	[%]	1 phase [%]	3 phase [%]
2	0.044	0.044	0.011	0.038	0.020	0.028	0.045	0.055	0.071	0.089	0.123	8%	8%
3	0.517	0.271	0.105	0.141	0.209	0.256	0.309	0.297	0.350	0.441	0.518	21.6%	Not stated
4	0.031	0.036	0.025	0.015	0.007	0.016	0.017	0.023	0.026	0.025	0.030	4%	4%
5	0.359	0.388	0.474	0.465	0.418	0.442	0.377	0.276	0.238	0.228	0.247	10.7%	10.7%
6	0.010	0.008	0.014	0.011	0.017	0.011	0.022	0.029	0.041	0.043	0.021	2.67%	2.67%
7	0.386	0.462	0.563	0.403	0.636	0.455	0.578	0.577	0.415	0.243	0.216	7.2%	7.2%
8	0.008	0.008	0.016	0.014	0.011	0.010	0.010	0.011	0.017	0.017	0.021	2%	2%
9	0.150	0.367	0.418	0.656	0.779	0.651	0.448	0.556	1.015	1.153	0.851	3.8%	Not stated
10	0.009	0.009	0.007	0.011	0.016	0.014	0.020	0.017	0.012	0.010	0.013	1.6%	1.6%
11	0.286	0.134	0.155	0.153	0.420	0.608	0.727	0.971	0.990	0.626	0.381	3.1%	3.1%
12	0.006	0.006	0.010	0.007	0.006	0.009	0.016	0.020	0.029	0.028	0.019	1.33%	1.33%
13	0.237	0.209	0.247	0.051	0.255	0.483	0.753	0.862	0.483	0.179	0.146	2%	2%
14	0.010	0.011	0.011	0.013	0.008	0.009	0.008	0.010	0.011	0.014	0.019	-	-
15	0.215	0.066	0.224	0.207	0.182	0.135	0.046	0.374	0.633	0.399	0.120	-	-
16	0.007	0.006	0.007	0.010	0.009	0.010	0.014	0.012	0.009	0.012	0.019	-	-
17	0.083	0.069	0.021	0.224	0.257	0.454	0.641	0.698	0.690	0.772	0.618	-	-
18	0.008	0.007	0.009	0.008	0.009	0.010	0.014	0.018	0.024	0.027	0.023	-	-
19	0.032	0.163	0.121	0.109	0.098	0.193	0.099	0.115	0.101	0.343	0.661	-	-
20	0.007	0.007	0.008	0.009	0.009	0.008	0.007	0.008	0.011	0.012	0.017	-	-
21	0.080	0.042	0.105	0.021	0.164	0.187	0.138	0.148	0.111	0.131	0.126	-	-
22	0.007	0.006	0.013	0.008	0.009	0.008	0.011	0.014	0.012	0.011	0.012	-	-
23	0.059	0.086	0.133	0.173	0.165	0.102	0.095	0.312	0.410	0.345	0.175	-	-
24	0.009	0.008	0.013	0.007	0.010	0.010	0.009	0.013	0.015	0.016	0.013	-	-
25	0.052	0.063	0.018	0.118	0.052	0.154	0.257	0.176	0.030	0.097	0.129	-	-
26	0.006	0.007	0.012	0.010	0.008	0.008	0.008	0.009	0.009	0.010	0.019	-	-
27	0.070	0.050	0.153	0.091	0.103	0.201	0.213	0.214	0.079	0.157	0.258	-	-
28	0.007	0.007	0.017	0.008	0.012	0.011	0.017	0.015	0.012	0.011	0.013	-	-

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29	0.037	0.045	0.030	0.151	0.110	0.052	0.126	0.127	0.100	0.209	0.244	-	-
30	0.009	0.008	0.011	0.013	0.009	0.009	0.011	0.011	0.014	0.016	0.015	-	-
31	0.033	0.058	0.033	0.087	0.051	0.090	0.185	0.246	0.329	0.124	0.059	-	-
32	0.007	0.006	0.009	0.009	0.008	0.009	0.009	0.011	0.013	0.011	0.019	-	-
33	0.078	0.086	0.048	0.088	0.065	0.069	0.151	0.181	0.258	0.250	0.033	-	-
34	0.008	0.008	0.011	0.010	0.012	0.015	0.015	0.018	0.015	0.011	0.015	-	-
35	0.050	0.050	0.046	0.073	0.139	0.136	0.087	0.183	0.181	0.214	0.149	-	-
36	0.007	0.008	0.018	0.018	0.013	0.011	0.012	0.011	0.016	0.025	0.015	-	-
37	0.016	0.032	0.042	0.125	0.109	0.091	0.125	0.147	0.166	0.227	0.264	-	-
38	0.007	0.008	0.009	0.013	0.012	0.013	0.008	0.010	0.009	0.010	0.021	-	-
39	0.060	0.056	0.132	0.101	0.102	0.094	0.088	0.152	0.177	0.187	0.282	-	-
40	0.010	0.013	0.026	0.013	0.016	0.013	0.019	0.017	0.019	0.021	0.014	-	-
THC/Iref	0.89	0.84	0.98	1.04	1.31	1.39	1.59	1.88	1.99	1.84	1.58	23%	13%
PWHD	1.29	1.25	1.82	2.28	2.33	2.98	3.71	4.59	5.16	5.13	5.16	23%	22%

Harmonics DIN EN 61000-3-12 (VDE 0838-12):2012-06

2.Mode (Energy consumption)

Power P/Pn[%]	3	10	20	30	40	50	60	70	80	90	100	IEC 61000-3-12 limit	
Ordinal number	[%]	[%]	[%]	[%]	[%]	[%]	[%]	[%]	[%]	[%]	[%]	1 phase [%]	3 phase [%]
2	0.053	0.053	0.046	0.037	0.013	0.044	0.065	0.053	0.036	0.042	0.052	8%	8%
3	0.533	0.187	0.349	0.681	0.734	0.739	0.677	0.711	0.555	0.546	0.688	21.6%	Not stated
4	0.048	0.037	0.040	0.060	0.017	0.032	0.027	0.019	0.038	0.033	0.036	4%	4%
5	0.487	0.353	0.533	0.537	0.733	0.788	0.843	0.846	0.715	0.652	0.513	10.7%	10.7%
6	0.013	0.019	0.020	0.013	0.010	0.038	0.027	0.024	0.026	0.035	0.033	2.67%	2.67%
7	0.292	0.843	0.580	0.328	0.796	1.032	0.175	0.206	0.282	0.382	0.245	7.2%	7.2%
8	0.022	0.019	0.029	0.021	0.024	0.018	0.023	0.022	0.017	0.018	0.021	2%	2%
9	0.036	0.245	0.453	0.763	0.923	0.989	1.011	1.018	0.923	1.006	1.571	3.8%	Not stated
10	0.010	0.015	0.024	0.014	0.013	0.012	0.010	0.011	0.010	0.012	0.012	1.6%	1.6%
11	0.060	0.062	0.537	0.734	0.062	0.500	0.540	0.498	0.439	0.303	0.554	3.1%	3.1%
12	0.018	0.009	0.017	0.013	0.009	0.009	0.014	0.016	0.014	0.017	0.029	1.33%	1.33%
13	0.161	0.183	0.145	0.111	0.327	0.511	0.912	1.077	1.241	1.372	1.172	2%	2%
14	0.019	0.010	0.017	0.010	0.009	0.009	0.013	0.014	0.012	0.013	0.017	-	-

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15	0.234	0.339	0.260	0.591	0.337	0.149	0.202	0.339	0.574	0.918	1.355	-	-
16	0.017	0.011	0.016	0.011	0.009	0.012	0.011	0.011	0.012	0.012	0.014	-	-
17	0.067	0.162	0.114	0.306	0.310	0.143	0.172	0.480	0.523	0.446	0.424	-	-
18	0.024	0.012	0.011	0.010	0.012	0.010	0.010	0.014	0.012	0.011	0.016	-	-
19	0.113	0.056	0.090	0.187	0.229	0.322	0.319	0.292	0.402	0.442	0.481	-	-
20	0.019	0.011	0.015	0.015	0.010	0.009	0.012	0.012	0.013	0.013	0.018	-	-
21	0.130	0.065	0.064	0.183	0.219	0.279	0.147	0.202	0.194	0.319	0.409	-	-
22	0.021	0.008	0.011	0.010	0.011	0.010	0.013	0.012	0.011	0.011	0.013	-	-
23	0.088	0.047	0.044	0.298	0.321	0.278	0.285	0.169	0.218	0.390	0.438	-	-
24	0.021	0.011	0.012	0.012	0.009	0.010	0.014	0.011	0.011	0.012	0.015	-	-
25	0.112	0.106	0.156	0.080	0.274	0.218	0.245	0.139	0.299	0.355	0.502	-	-
26	0.017	0.010	0.010	0.012	0.010	0.011	0.011	0.011	0.012	0.013	0.018	-	-
27	0.163	0.144	0.128	0.215	0.112	0.150	0.200	0.201	0.077	0.140	0.202	-	-
28	0.022	0.009	0.012	0.013	0.011	0.012	0.012	0.011	0.012	0.014	0.017	-	-
29	0.052	0.075	0.109	0.087	0.078	0.299	0.284	0.390	0.252	0.087	0.129	-	-
30	0.016	0.009	0.013	0.010	0.010	0.010	0.010	0.012	0.013	0.013	0.015	-	-
31	0.144	0.089	0.168	0.125	0.100	0.181	0.143	0.173	0.174	0.265	0.395	-	-
32	0.015	0.010	0.011	0.017	0.009	0.010	0.010	0.012	0.013	0.013	0.015	-	-
33	0.121	0.070	0.144	0.073	0.126	0.128	0.243	0.231	0.351	0.246	0.054	-	-
34	0.019	0.010	0.014	0.011	0.015	0.010	0.013	0.015	0.013	0.012	0.013	-	-
35	0.016	0.043	0.091	0.125	0.210	0.129	0.346	0.259	0.324	0.338	0.180	-	-
36	0.012	0.010	0.011	0.016	0.012	0.009	0.012	0.012	0.014	0.014	0.015	-	-
37	0.134	0.085	0.056	0.034	0.230	0.137	0.182	0.165	0.125	0.212	0.238	-	-
38	0.011	0.009	0.013	0.012	0.011	0.013	0.014	0.016	0.012	0.014	0.015	-	-
39	0.067	0.069	0.029	0.085	0.092	0.066	0.213	0.254	0.234	0.276	0.340	-	-
40	0.015	0.012	0.012	0.011	0.015	0.013	0.014	0.017	0.014	0.014	0.015	-	-
THC/Iref	0.92	1.09	1.21	1.65	1.82	2.07	2.02	2.16	2.20	2.42	2.87	23%	13%
PWHD	2.14	2.06	2.14	3.65	3.81	3.63	4.36	4.73	5.28	6.40	7.97	23%	22%

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Harmonics DIN EN 61000-3-2 (VDE 0838-2):2019-12												
1.Mode (Energy supply)												
L1												
Power P/Pn[%]	3	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	0.002	0.001	0.001	0.003	0.004	0.002	0.002	0.004	0.007	0.010	0.016	1.080
3	0.012	0.015	0.018	0.017	0.012	0.006	0.003	0.012	0.020	0.027	0.032	2.300
4	0.001	0.001	0.001	0.001	0.001	0.003	0.003	0.003	0.002	0.002	0.010	0.430
5	0.005	0.007	0.011	0.013	0.014	0.013	0.009	0.003	0.003	0.004	0.008	1.140
6	0.002	0.002	0.002	0.002	0.002	0.002	0.001	0.001	0.001	0.002	0.003	0.300
7	0.021	0.007	0.021	0.037	0.056	0.029	0.036	0.033	0.018	0.005	0.010	0.770
8	0.003	0.002	0.002	0.002	0.001	0.001	0.001	0.001	0.001	0.001	0.001	0.230
9	0.011	0.009	0.029	0.041	0.043	0.034	0.019	0.035	0.067	0.069	0.039	0.400
10	0.001	0.002	0.002	0.002	0.003	0.002	0.001	0.001	0.001	0.001	0.001	0.184
11	0.025	0.012	0.006	0.006	0.033	0.047	0.053	0.062	0.052	0.029	0.037	0.330
12	0.001	0.001	0.001	0.001	0.002	0.001	0.001	0.001	0.001	0.001	0.002	0.153
13	0.007	0.004	0.009	0.009	0.013	0.024	0.038	0.038	0.018	0.025	0.013	0.210
14	0.002	0.002	0.001	0.001	0.001	0.001	0.001	0.001	0.001	0.001	0.002	0.131
15	0.013	0.004	0.008	0.014	0.008	0.009	0.009	0.035	0.048	0.023	0.006	0.150
16	0.001	0.002	0.002	0.002	0.003	0.002	0.001	0.001	0.001	0.001	0.001	0.115
17	0.010	0.009	0.004	0.009	0.012	0.024	0.036	0.036	0.031	0.033	0.022	0.132
18	0.002	0.001	0.002	0.002	0.002	0.001	0.001	0.001	0.001	0.001	0.001	0.102
19	0.008	0.008	0.003	0.003	0.004	0.009	0.002	0.009	0.018	0.032	0.038	0.118
20	0.001	0.002	0.002	0.001	0.001	0.001	0.001	0.001	0.001	0.001	0.002	0.092
21	0.008	0.005	0.009	0.003	0.008	0.011	0.006	0.003	0.006	0.006	0.022	0.107
22	0.001	0.002	0.002	0.002	0.002	0.001	0.001	0.001	0.001	0.001	0.001	0.084
23	0.005	0.004	0.006	0.008	0.009	0.006	0.007	0.019	0.019	0.012	0.003	0.098
24	0.002	0.001	0.001	0.002	0.002	0.001	0.001	0.001	0.001	0.001	0.001	0.077
25	0.005	0.005	0.004	0.004	0.003	0.009	0.012	0.002	0.012	0.017	0.012	0.090
26	0.001	0.002	0.001	0.001	0.001	0.001	0.001	0.001	0.001	0.001	0.001	0.071
27	0.004	0.003	0.007	0.007	0.003	0.012	0.012	0.014	0.005	0.004	0.009	0.083
28	0.001	0.001	0.002	0.002	0.002	0.001	0.001	0.001	0.001	0.001	0.001	0.066
29	0.007	0.003	0.006	0.007	0.006	0.005	0.009	0.010	0.007	0.010	0.012	0.078
30	0.001	0.002	0.002	0.001	0.001	0.001	0.001	0.001	0.001	0.001	0.001	0.061
31	0.002	0.006	0.005	0.005	0.002	0.004	0.008	0.010	0.007	0.008	0.011	0.073
32	0.001	0.001	0.001	0.002	0.001	0.001	0.001	0.001	0.001	0.002	0.001	0.058
33	0.005	0.005	0.002	0.006	0.002	0.004	0.009	0.012	0.018	0.010	0.003	0.068
34	0.001	0.001	0.001	0.001	0.002	0.001	0.001	0.001	0.001	0.001	0.001	0.054
35	0.004	0.002	0.005	0.005	0.008	0.008	0.006	0.012	0.011	0.014	0.004	0.064
36	0.001	0.001	0.001	0.001	0.001	0.001	0.001	0.001	0.001	0.001	0.001	0.051
37	0.001	0.001	0.006	0.007	0.006	0.005	0.005	0.005	0.006	0.008	0.007	0.061
38	0.001	0.001	0.001	0.001	0.001	0.001	0.001	0.001	0.001	0.001	0.001	0.048
39	0.003	0.004	0.004	0.008	0.005	0.006	0.005	0.009	0.009	0.009	0.012	0.058
40	0.001	0.001	0.001	0.001	0.001	0.001	0.001	0.001	0.001	0.001	0.001	0.046
L2												
Power P/Pn[%]	3	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	0.001	0.001	0.001	0.001	0.001	0.003	0.006	0.008	0.007	0.007	0.009	1.080
3	0.011	0.015	0.018	0.015	0.010	0.005	0.004	0.011	0.023	0.030	0.038	2.300
4	0.001	0.001	0.001	0.001	0.001	0.001	0.002	0.006	0.014	0.022	0.010	0.430
5	0.005	0.005	0.010	0.014	0.012	0.012	0.008	0.004	0.003	0.004	0.010	1.140
6	0.001	0.001	0.001	0.000	0.000	0.001	0.003	0.007	0.011	0.014	0.007	0.300
7	0.020	0.007	0.021	0.037	0.057	0.029	0.035	0.035	0.017	0.004	0.012	0.770
8	0.001	0.000	0.001	0.001	0.000	0.001	0.001	0.003	0.003	0.002	0.002	0.230

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9	0.011	0.009	0.029	0.041	0.043	0.035	0.021	0.034	0.068	0.072	0.045	0.400
10	0.001	0.001	0.000	0.001	0.001	0.002	0.003	0.003	0.003	0.007	0.004	0.184
11	0.025	0.012	0.007	0.006	0.033	0.046	0.053	0.062	0.054	0.028	0.035	0.330
12	0.001	0.000	0.001	0.000	0.000	0.001	0.003	0.007	0.011	0.011	0.004	0.153
13	0.007	0.005	0.009	0.008	0.013	0.024	0.038	0.039	0.017	0.026	0.015	0.210
14	0.000	0.001	0.000	0.001	0.000	0.001	0.003	0.005	0.004	0.002	0.003	0.131
15	0.012	0.003	0.008	0.012	0.007	0.011	0.009	0.033	0.049	0.028	0.003	0.150
16	0.001	0.000	0.000	0.001	0.000	0.002	0.003	0.002	0.003	0.005	0.002	0.115
17	0.011	0.009	0.004	0.009	0.012	0.022	0.034	0.036	0.031	0.033	0.024	0.132
18	0.001	0.000	0.000	0.000	0.000	0.001	0.002	0.006	0.008	0.007	0.002	0.102
19	0.007	0.009	0.005	0.004	0.004	0.010	0.002	0.007	0.016	0.029	0.038	0.118
20	0.000	0.001	0.000	0.000	0.001	0.001	0.002	0.003	0.002	0.003	0.003	0.092
21	0.007	0.005	0.010	0.003	0.006	0.010	0.005	0.002	0.005	0.006	0.022	0.107
22	0.001	0.001	0.001	0.001	0.000	0.001	0.002	0.002	0.002	0.005	0.002	0.084
23	0.007	0.005	0.007	0.008	0.009	0.006	0.006	0.018	0.018	0.011	0.003	0.098
24	0.001	0.000	0.001	0.001	0.000	0.001	0.001	0.004	0.006	0.004	0.001	0.077
25	0.005	0.004	0.001	0.006	0.001	0.006	0.009	0.002	0.013	0.018	0.014	0.090
26	0.001	0.001	0.000	0.001	0.001	0.001	0.001	0.003	0.002	0.004	0.003	0.071
27	0.004	0.001	0.009	0.007	0.004	0.011	0.011	0.012	0.004	0.004	0.011	0.083
28	0.001	0.000	0.001	0.001	0.001	0.001	0.002	0.002	0.001	0.003	0.001	0.066
29	0.006	0.003	0.005	0.009	0.009	0.007	0.011	0.011	0.009	0.011	0.012	0.078
30	0.001	0.000	0.000	0.001	0.001	0.001	0.001	0.003	0.005	0.005	0.001	0.061
31	0.002	0.006	0.002	0.007	0.004	0.005	0.008	0.011	0.009	0.007	0.012	0.073
32	0.000	0.001	0.000	0.001	0.000	0.001	0.001	0.002	0.003	0.003	0.002	0.058
33	0.003	0.004	0.003	0.005	0.003	0.004	0.009	0.011	0.018	0.013	0.003	0.068
34	0.000	0.000	0.001	0.001	0.001	0.001	0.001	0.002	0.002	0.004	0.001	0.054
35	0.004	0.002	0.005	0.005	0.008	0.009	0.007	0.012	0.011	0.012	0.004	0.064
36	0.000	0.000	0.001	0.001	0.000	0.001	0.001	0.003	0.005	0.004	0.001	0.051
37	0.002	0.002	0.007	0.007	0.006	0.005	0.005	0.005	0.006	0.008	0.008	0.061
38	0.001	0.001	0.000	0.001	0.001	0.001	0.001	0.001	0.002	0.002	0.001	0.048
39	0.002	0.003	0.004	0.007	0.005	0.006	0.006	0.009	0.010	0.010	0.013	0.058
40	0.001	0.000	0.001	0.000	0.001	0.001	0.001	0.002	0.002	0.003	0.001	0.046
L3												
Power P/Pn[%]	3	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	0.002	0.002	0.001	0.002	0.004	0.001	0.001	0.002	0.004	0.006	0.007	1.080
3	0.079	0.063	0.056	0.053	0.053	0.054	0.051	0.047	0.044	0.045	0.047	2.300
4	0.001	0.001	0.002	0.001	0.001	0.003	0.003	0.006	0.008	0.010	0.015	0.430
5	0.062	0.064	0.078	0.074	0.066	0.062	0.056	0.051	0.048	0.048	0.049	1.140
6	0.001	0.001	0.001	0.001	0.001	0.002	0.003	0.005	0.005	0.005	0.007	0.300
7	0.055	0.069	0.080	0.031	0.010	0.051	0.055	0.050	0.042	0.040	0.043	0.770
8	0.001	0.001	0.001	0.001	0.001	0.001	0.001	0.003	0.002	0.001	0.002	0.230
9	0.048	0.055	0.052	0.059	0.071	0.066	0.055	0.071	0.101	0.105	0.080	0.400
10	0.001	0.001	0.001	0.000	0.001	0.003	0.003	0.002	0.001	0.002	0.003	0.184
11	0.045	0.033	0.040	0.031	0.029	0.030	0.043	0.069	0.065	0.029	0.006	0.330
12	0.001	0.000	0.001	0.001	0.001	0.002	0.003	0.005	0.006	0.004	0.004	0.153
13	0.036	0.033	0.036	0.018	0.028	0.041	0.057	0.060	0.039	0.039	0.034	0.210
14	0.000	0.000	0.001	0.000	0.001	0.002	0.004	0.005	0.003	0.001	0.003	0.131
15	0.017	0.013	0.025	0.022	0.020	0.011	0.012	0.034	0.051	0.036	0.023	0.150
16	0.001	0.000	0.001	0.000	0.001	0.004	0.003	0.002	0.001	0.002	0.003	0.115
17	0.006	0.009	0.006	0.023	0.023	0.034	0.047	0.051	0.047	0.045	0.035	0.132
18	0.001	0.001	0.001	0.001	0.001	0.002	0.002	0.004	0.004	0.003	0.003	0.102
19	0.015	0.012	0.012	0.010	0.013	0.016	0.011	0.009	0.011	0.030	0.041	0.118
20	0.000	0.001	0.000	0.001	0.000	0.001	0.002	0.003	0.002	0.001	0.003	0.092
21	0.013	0.008	0.001	0.006	0.013	0.016	0.012	0.009	0.008	0.007	0.015	0.107
22	0.001	0.001	0.001	0.000	0.001	0.002	0.002	0.002	0.001	0.002	0.002	0.084

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23	0.003	0.011	0.017	0.017	0.014	0.007	0.010	0.024	0.026	0.015	0.007	0.098
24	0.001	0.000	0.001	0.000	0.001	0.001	0.001	0.002	0.003	0.002	0.002	0.077
25	0.006	0.004	0.003	0.007	0.008	0.012	0.020	0.012	0.004	0.012	0.011	0.090
26	0.001	0.001	0.001	0.001	0.001	0.001	0.002	0.002	0.001	0.001	0.002	0.071
27	0.013	0.010	0.009	0.003	0.009	0.015	0.014	0.011	0.004	0.007	0.013	0.083
28	0.001	0.001	0.000	0.001	0.001	0.002	0.002	0.002	0.001	0.001	0.001	0.066
29	0.006	0.006	0.004	0.014	0.006	0.003	0.002	0.005	0.005	0.008	0.009	0.078
30	0.001	0.001	0.001	0.000	0.000	0.001	0.001	0.001	0.002	0.002	0.002	0.061
31	0.006	0.002	0.007	0.006	0.007	0.010	0.014	0.015	0.013	0.011	0.016	0.073
32	0.001	0.000	0.001	0.000	0.001	0.001	0.001	0.002	0.003	0.001	0.002	0.058
33	0.005	0.006	0.004	0.007	0.004	0.003	0.007	0.008	0.018	0.014	0.006	0.068
34	0.001	0.000	0.000	0.001	0.001	0.002	0.002	0.002	0.002	0.003	0.002	0.054
35	0.003	0.003	0.005	0.003	0.005	0.006	0.005	0.011	0.012	0.014	0.006	0.064
36	0.001	0.000	0.001	0.001	0.001	0.001	0.001	0.001	0.002	0.002	0.002	0.051
37	0.005	0.006	0.001	0.007	0.004	0.007	0.006	0.006	0.006	0.008	0.008	0.061
38	0.000	0.001	0.000	0.000	0.000	0.001	0.001	0.002	0.002	0.001	0.001	0.048
39	0.002	0.002	0.007	0.007	0.008	0.006	0.003	0.006	0.009	0.012	0.014	0.058
40	0.001	0.001	0.001	0.001	0.001	0.001	0.001	0.002	0.002	0.003	0.003	0.046
Harmonics DIN EN 61000-3-2 (VDE 0838-2):2019-12												
2.Mode (Energy consumption)												
L1												
Power P/Pn[%]	3	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	0.002	0.003	0.004	0.002	0.004	0.005	0.007	0.009	0.011	0.013	0.015	1.080
3	0.009	0.013	0.029	0.042	0.038	0.032	0.026	0.018	0.016	0.022	0.030	2.300
4	0.002	0.003	0.005	0.003	0.005	0.005	0.007	0.007	0.006	0.007	0.009	0.430
5	0.009	0.005	0.006	0.017	0.025	0.030	0.032	0.035	0.032	0.026	0.023	1.140
6	0.002	0.002	0.003	0.002	0.001	0.001	0.002	0.002	0.004	0.003	0.003	0.300
7	0.007	0.028	0.049	0.026	0.059	0.064	0.025	0.024	0.028	0.031	0.023	0.770
8	0.002	0.002	0.002	0.001	0.001	0.002	0.002	0.002	0.002	0.003	0.003	0.230
9	0.020	0.005	0.014	0.027	0.036	0.040	0.044	0.046	0.043	0.053	0.085	0.400
10	0.001	0.001	0.002	0.002	0.002	0.001	0.001	0.001	0.001	0.001	0.003	0.184
11	0.017	0.011	0.019	0.028	0.012	0.037	0.040	0.038	0.034	0.024	0.028	0.330
12	0.002	0.002	0.002	0.002	0.002	0.002	0.001	0.001	0.002	0.003	0.005	0.153
13	0.015	0.007	0.005	0.008	0.010	0.019	0.041	0.051	0.060	0.067	0.054	0.210
14	0.002	0.002	0.002	0.002	0.002	0.003	0.005	0.006	0.008	0.009	0.010	0.131
15	0.017	0.014	0.012	0.023	0.014	0.006	0.014	0.026	0.039	0.056	0.081	0.150
16	0.001	0.002	0.002	0.002	0.001	0.002	0.002	0.003	0.003	0.002	0.001	0.115
17	0.008	0.010	0.003	0.026	0.022	0.007	0.014	0.029	0.030	0.026	0.025	0.132
18	0.002	0.002	0.002	0.001	0.001	0.002	0.002	0.001	0.001	0.002	0.004	0.102
19	0.011	0.007	0.006	0.005	0.012	0.014	0.019	0.018	0.024	0.026	0.029	0.118
20	0.002	0.001	0.002	0.002	0.002	0.002	0.004	0.005	0.005	0.007	0.009	0.092
21	0.011	0.003	0.003	0.005	0.011	0.016	0.010	0.010	0.013	0.019	0.022	0.107
22	0.002	0.002	0.002	0.002	0.001	0.001	0.001	0.001	0.003	0.004	0.005	0.084
23	0.005	0.005	0.005	0.015	0.021	0.017	0.015	0.007	0.011	0.019	0.022	0.098
24	0.002	0.002	0.002	0.001	0.001	0.002	0.001	0.003	0.003	0.003	0.002	0.077
25	0.008	0.008	0.006	0.011	0.013	0.009	0.012	0.010	0.018	0.021	0.029	0.090
26	0.002	0.001	0.001	0.002	0.002	0.002	0.002	0.002	0.004	0.005	0.007	0.071
27	0.010	0.010	0.007	0.009	0.007	0.012	0.015	0.013	0.003	0.004	0.009	0.083
28	0.002	0.001	0.002	0.002	0.001	0.001	0.001	0.002	0.002	0.003	0.004	0.066
29	0.003	0.008	0.008	0.008	0.004	0.014	0.013	0.018	0.010	0.003	0.005	0.078
30	0.002	0.002	0.002	0.001	0.002	0.002	0.002	0.002	0.003	0.005	0.005	0.061
31	0.009	0.003	0.009	0.007	0.005	0.011	0.010	0.012	0.011	0.012	0.019	0.073
32	0.001	0.001	0.001	0.002	0.001	0.002	0.002	0.002	0.002	0.002	0.004	0.058
33	0.006	0.003	0.009	0.005	0.006	0.008	0.013	0.013	0.019	0.012	0.003	0.068
34	0.002	0.002	0.002	0.001	0.001	0.001	0.001	0.001	0.002	0.002	0.003	0.054

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No. ESY 126875 0023 Rev. 00

35	0.002	0.007	0.007	0.007	0.013	0.008	0.018	0.014	0.017	0.018	0.009	0.064
36	0.002	0.002	0.002	0.001	0.001	0.001	0.001	0.002	0.002	0.002	0.004	0.051
37	0.007	0.007	0.005	0.006	0.013	0.007	0.011	0.010	0.008	0.013	0.013	0.061
38	0.001	0.001	0.002	0.001	0.001	0.001	0.002	0.002	0.002	0.002	0.002	0.048
39	0.004	0.005	0.003	0.006	0.007	0.005	0.011	0.013	0.012	0.015	0.017	0.058
40	0.001	0.002	0.002	0.001	0.001	0.001	0.002	0.002	0.002	0.002	0.003	0.046
L2												
Power P/Pn[%]	3	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	0.002	0.002	0.003	0.002	0.003	0.005	0.006	0.007	0.009	0.011	0.012	1.080
3	0.006	0.016	0.027	0.041	0.038	0.033	0.026	0.020	0.017	0.023	0.030	2.300
4	0.002	0.003	0.003	0.003	0.004	0.005	0.005	0.005	0.005	0.005	0.006	0.430
5	0.006	0.006	0.006	0.017	0.025	0.030	0.032	0.034	0.033	0.028	0.025	1.140
6	0.001	0.002	0.002	0.002	0.001	0.001	0.002	0.002	0.003	0.003	0.002	0.300
7	0.007	0.029	0.052	0.027	0.060	0.064	0.024	0.024	0.026	0.030	0.024	0.770
8	0.002	0.001	0.002	0.001	0.001	0.002	0.002	0.002	0.002	0.003	0.003	0.230
9	0.020	0.005	0.012	0.027	0.036	0.040	0.044	0.048	0.045	0.051	0.082	0.400
10	0.001	0.001	0.001	0.002	0.001	0.001	0.001	0.001	0.001	0.001	0.002	0.184
11	0.017	0.011	0.024	0.028	0.011	0.036	0.040	0.037	0.034	0.023	0.024	0.330
12	0.001	0.002	0.002	0.002	0.001	0.002	0.001	0.001	0.002	0.002	0.003	0.153
13	0.016	0.007	0.007	0.007	0.010	0.019	0.040	0.049	0.057	0.064	0.054	0.210
14	0.001	0.001	0.001	0.001	0.002	0.002	0.003	0.004	0.006	0.007	0.007	0.131
15	0.016	0.014	0.013	0.026	0.015	0.006	0.013	0.027	0.041	0.057	0.081	0.150
16	0.001	0.001	0.001	0.002	0.001	0.001	0.002	0.002	0.002	0.001	0.001	0.115
17	0.009	0.009	0.004	0.024	0.021	0.008	0.013	0.029	0.030	0.026	0.024	0.132
18	0.002	0.002	0.002	0.001	0.001	0.001	0.001	0.001	0.002	0.002	0.003	0.102
19	0.011	0.008	0.007	0.007	0.012	0.015	0.018	0.017	0.023	0.024	0.026	0.118
20	0.001	0.001	0.001	0.001	0.001	0.002	0.003	0.003	0.004	0.005	0.006	0.092
21	0.010	0.003	0.004	0.006	0.012	0.015	0.010	0.012	0.014	0.020	0.024	0.107
22	0.001	0.001	0.001	0.001	0.001	0.001	0.001	0.001	0.002	0.003	0.003	0.084
23	0.006	0.003	0.005	0.016	0.021	0.017	0.016	0.007	0.010	0.020	0.023	0.098
24	0.002	0.002	0.002	0.001	0.001	0.001	0.001	0.001	0.002	0.002	0.001	0.077
25	0.010	0.010	0.007	0.008	0.013	0.010	0.013	0.009	0.018	0.020	0.028	0.090
26	0.001	0.001	0.001	0.002	0.002	0.002	0.002	0.002	0.003	0.004	0.005	0.071
27	0.008	0.008	0.006	0.010	0.006	0.011	0.012	0.011	0.004	0.007	0.010	0.083
28	0.002	0.001	0.002	0.002	0.001	0.001	0.001	0.001	0.002	0.002	0.003	0.066
29	0.001	0.010	0.010	0.007	0.003	0.016	0.015	0.020	0.011	0.003	0.007	0.078
30	0.001	0.001	0.001	0.001	0.001	0.001	0.001	0.001	0.002	0.002	0.003	0.061
31	0.008	0.005	0.007	0.010	0.008	0.009	0.006	0.011	0.013	0.017	0.022	0.073
32	0.001	0.001	0.001	0.001	0.001	0.001	0.002	0.001	0.001	0.002	0.003	0.058
33	0.008	0.002	0.010	0.004	0.008	0.010	0.016	0.014	0.019	0.013	0.003	0.068
34	0.001	0.001	0.001	0.001	0.001	0.001	0.001	0.001	0.002	0.003	0.003	0.054
35	0.002	0.005	0.007	0.010	0.015	0.008	0.017	0.013	0.017	0.019	0.011	0.064
36	0.001	0.002	0.001	0.001	0.001	0.001	0.001	0.001	0.001	0.002	0.002	0.051
37	0.006	0.007	0.005	0.004	0.013	0.006	0.011	0.011	0.009	0.013	0.013	0.061
38	0.001	0.001	0.001	0.001	0.001	0.001	0.001	0.001	0.002	0.001	0.002	0.048
39	0.005	0.006	0.002	0.008	0.006	0.005	0.010	0.012	0.012	0.015	0.018	0.058
40	0.001	0.001	0.001	0.001	0.001	0.001	0.001	0.001	0.002	0.002	0.003	0.046
L3												
Power P/Pn[%]	3	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	0.001	0.002	0.003	0.001	0.001	0.001	0.001	0.001	0.002	0.002	0.002	1.080
3	0.084	0.063	0.050	0.056	0.064	0.067	0.065	0.060	0.057	0.059	0.064	2.300
4	0.001	0.001	0.001	0.003	0.002	0.001	0.002	0.002	0.002	0.002	0.002	0.430

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5	0.066	0.057	0.067	0.075	0.080	0.079	0.075	0.071	0.066	0.059	0.054	1.140
6	0.001	0.001	0.001	0.002	0.001	0.001	0.001	0.001	0.001	0.001	0.001	0.300
7	0.070	0.090	0.072	0.035	0.007	0.035	0.023	0.025	0.027	0.028	0.028	0.770
8	0.001	0.001	0.002	0.002	0.001	0.001	0.001	0.001	0.001	0.001	0.002	0.230
9	0.038	0.058	0.046	0.057	0.067	0.081	0.082	0.080	0.071	0.070	0.100	0.400
10	0.001	0.001	0.001	0.002	0.001	0.001	0.001	0.001	0.001	0.001	0.001	0.184
11	0.025	0.040	0.046	0.062	0.022	0.032	0.028	0.024	0.021	0.029	0.046	0.330
12	0.001	0.001	0.001	0.002	0.001	0.001	0.001	0.001	0.001	0.001	0.001	0.153
13	0.021	0.025	0.032	0.025	0.032	0.040	0.057	0.069	0.080	0.090	0.075	0.210
14	0.001	0.001	0.001	0.001	0.001	0.001	0.001	0.001	0.001	0.001	0.001	0.131
15	0.014	0.014	0.023	0.051	0.037	0.020	0.024	0.015	0.013	0.030	0.059	0.150
16	0.001	0.001	0.001	0.001	0.001	0.001	0.001	0.001	0.001	0.001	0.001	0.115
17	0.013	0.008	0.011	0.017	0.017	0.009	0.002	0.021	0.026	0.026	0.027	0.132
18	0.001	0.001	0.001	0.001	0.001	0.001	0.001	0.001	0.001	0.001	0.001	0.102
19	0.009	0.009	0.009	0.016	0.010	0.019	0.016	0.013	0.020	0.020	0.022	0.118
20	0.001	0.001	0.001	0.001	0.001	0.001	0.001	0.001	0.001	0.001	0.001	0.092
21	0.011	0.018	0.020	0.013	0.027	0.026	0.004	0.010	0.004	0.008	0.019	0.107
22	0.001	0.001	0.001	0.001	0.001	0.001	0.001	0.001	0.001	0.001	0.001	0.084
23	0.014	0.016	0.014	0.015	0.013	0.006	0.013	0.014	0.016	0.026	0.030	0.098
24	0.001	0.001	0.001	0.001	0.001	0.001	0.001	0.001	0.001	0.001	0.001	0.077
25	0.006	0.010	0.006	0.004	0.015	0.016	0.019	0.005	0.010	0.012	0.018	0.090
26	0.001	0.001	0.001	0.001	0.001	0.001	0.001	0.001	0.001	0.001	0.002	0.071
27	0.014	0.014	0.014	0.011	0.009	0.015	0.008	0.007	0.006	0.009	0.012	0.083
28	0.001	0.001	0.001	0.001	0.001	0.001	0.001	0.001	0.001	0.001	0.002	0.066
29	0.008	0.009	0.006	0.008	0.009	0.017	0.015	0.023	0.018	0.011	0.015	0.078
30	0.001	0.001	0.001	0.001	0.001	0.001	0.001	0.001	0.001	0.001	0.001	0.061
31	0.009	0.004	0.005	0.013	0.008	0.014	0.015	0.011	0.003	0.013	0.024	0.073
32	0.001	0.001	0.001	0.001	0.001	0.001	0.001	0.001	0.001	0.001	0.001	0.058
33	0.011	0.004	0.007	0.012	0.009	0.006	0.014	0.013	0.020	0.016	0.007	0.068
34	0.001	0.001	0.001	0.001	0.001	0.001	0.001	0.001	0.001	0.001	0.002	0.054
35	0.003	0.006	0.007	0.013	0.008	0.002	0.020	0.016	0.019	0.020	0.011	0.064
36	0.001	0.001	0.001	0.001	0.001	0.001	0.001	0.001	0.001	0.001	0.001	0.051
37	0.011	0.011	0.013	0.008	0.004	0.002	0.015	0.011	0.008	0.009	0.008	0.061
38	0.001	0.001	0.001	0.001	0.001	0.001	0.001	0.001	0.001	0.001	0.001	0.048
39	0.004	0.004	0.008	0.006	0.004	0.003	0.013	0.018	0.018	0.021	0.025	0.058
40	0.001	0.001	0.001	0.001	0.001	0.001	0.001	0.001	0.001	0.001	0.001	0.046

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

Extract from test report for NS protection "Determination of electrical properties"			No. 704092520335-00
NS protection test report			
Type of NS system:	Integrated NS protection		**Other Manufacturer indications**
Software version:	Firmware version: 01.01.00		
Manufacturer:	Atmoce Holding B.V. Singel 250, 1016 AB Amsterdam THE NETHERLANDS		
Measuring period:	2025-02-25 to 2025-04-20		

	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 * Un	L1-N: 288.48 V for three phase mode L2-N: 288.40 V for three phase mode L3-N: 288.53 V for three phase mode L-N:288.43 V for single phase mode	L1-N: 183 ms for three phase mode L2-N: 181 ms for three phase mode L3-N: 192 ms for three phase mode L-N:112 ms for single phase mode
Rise-in-voltage protection *U* >	1.10 * Un	1.10 * Un	ms**
Voltage drop protection *U* <	0.8 * Un	L1-N: 183.01 V for three phase mode L2-N: 183.00 V for three phase mode L3-N: 183.31 V for three phase mode L-N:182.80 V for single phase mode	L1-N: 3053 ms for three phase mode L2-N: 3059 ms for three phase mode L3-N: 3039 ms for three phase mode L-N: 3051 ms for single phase mode
Voltage drop protection *U* <<	0.45 * Un	L1-N: 102.78 V for three phase mode L2-N: 102.81 V for three phase mode L3-N: 102.67 V for three phase mode L-N: 102.43 V for single phase mode	L1-N: 349 ms for three phase mode L2-N: 372 ms for three phase mode L3-N: 344 ms for three phase mode L-N: 351 ms for single phase mode
Frequency decrease protection *f* <	47.5 Hz	47.47 Hz for single phase mode 47.48 Hz for three phase mode	140 ms for single phase mode 155 ms for three phase mode
Frequency increase protection *f* >	51.5 Hz	51.50 Hz for single phase mode 51.51 Hz for three phase mode	175 ms for single phase mode 197ms for three phase mode

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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: 1. 509.26 s (L-N from 600s@Un to 112%Un) for single phase mode 2. Continuous operation (L-N from 600s@Un to 108%Un) for single phase mode 3. 280.00 s (L-N from 600s@106%Un to 114%Un) for single phase mode 4. 491s / 501s / 531s (L1-N/L2-N/L3-N from 600s@Un to 112%Un) for three phase mode 5. Continuous operation (L1-N/L2-N/L3-N from 600s@Un to 108%Un); for three phase mode 6. 301s / 315s / 355s (L1-N/L2-N/L3-N from 600s@106%Un to 114%Un) for three phase mode	
☑ **as integrated NS protection**	
Assigned to power generation unit type	Energy Storage System MS-7K-U
Integrated interface switch type	Single relay for both the neutral conductor and the line conductor due to isolated inverter defined by manufacturer. Relay type: HF140FF012-2HSWT(456)
Response time of interface switch for integrated NS protection	HF140FF012-2HSWT(456) Release time: Max. 5 ms Operate time: Max. 20 ms
Verification of the entire functional chain “integrated NS protection – interface switch” has resulted in successful disconnection.	☑