



Konformitätsnachweis für Erzeugungseinheiten

Hersteller

FRONIUS International GmbH
Günter Fronius Straße 1
4600 Wels-Thalheim
Austria

Erzeugungseinheit

Netzgekoppelter Photovoltaikwechselrichter

Typ Erzeugungseinheit	Nennwirkleistung	Nennscheinleistung	Bemessungsspannung
SYMO 3.0-3-M	3000 W	3000 VA	3/N/PE AC 400/230 V
SYMO 3.7-3-M	3700 W	3700 VA	
SYMO 4.5-3-M	4500 W	4500 VA	
SYMO 5.0-3-M	5000 W	5000 VA	
SYMO 5.5-3-M	5500 W	5500 VA	
SYMO 6.0-3-M	6000 W	6000 VA	
SYMO 6.7-3-M	6700 W	6700 VA	
SYMO 7.0-3-M	7000 W	7000 VA	
SYMO 8.0-3-M	8000 W	8000 VA	
SYMO 8.2-3-M	8200 W	8200 VA	

Weitere Informationen

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Firmwareversion

SymoPS V0.0.5.8 ; RECERBO V0.1.1.4 ; SymoFIL V0.0.3.6

Netzanschlussregel

VDE-AR-N 4105:2011-08
Erzeugungsanlagen am Niederspannungsnetz -
Technische Mindestanforderungen für Anschluss und Parallelbetrieb
von Erzeugungsanlagen am Niederspannungsnetz

Prüfgrundlage

DIN VDE V 0124-100 (VDE V 0124-100):2012-07
Netzintegration von Erzeugungsanlagen - Niederspannung -
Prüfanforderungen an Erzeugungseinheiten vorgesehen zum
Anschluss und Parallelbetrieb am Niederspannungsnetz

Prüfbericht

245569-TL4-5 vom 2018-02-07

ID Nummer

40038443, Revision 2

Dieser Konformitätsnachweis bestätigt, dass die oben bezeichneten Erzeugungseinheiten den Anforderungen der Netzanschlussregel VDE-AR-N 4105:2011-08 und der Norm DIN VDE V 0124-100 (VDE V 0124-100):2012-07 erfüllt.

- Nachweis zulässiger Netzzrückwirkungen
- Nachweis des Verhalten der Erzeugungseinheit am Netz
- Nachweis des Symmetrieverhaltens von Drehstromumrichter-Einheiten

Dieser Konformitätsnachweis beinhaltet folgende Angaben:

- technische Daten der Erzeugungseinheit, der eingesetzten Hilfseinrichtungen und der verwendeten Softwareversion;
- den schematischen Aufbau der Erzeugungseinheit;
- zusammengefasste Angaben zu den Eigenschaften der Erzeugungseinheit (Wirkungsweise).

Dieser Konformitätsnachweis berechtigt nicht zur Nutzung eines markenrechtlich geschützten Zeichens des VDE.

VDE Prüf- und Zertifizierungsinstitut GmbH

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2018.02.07

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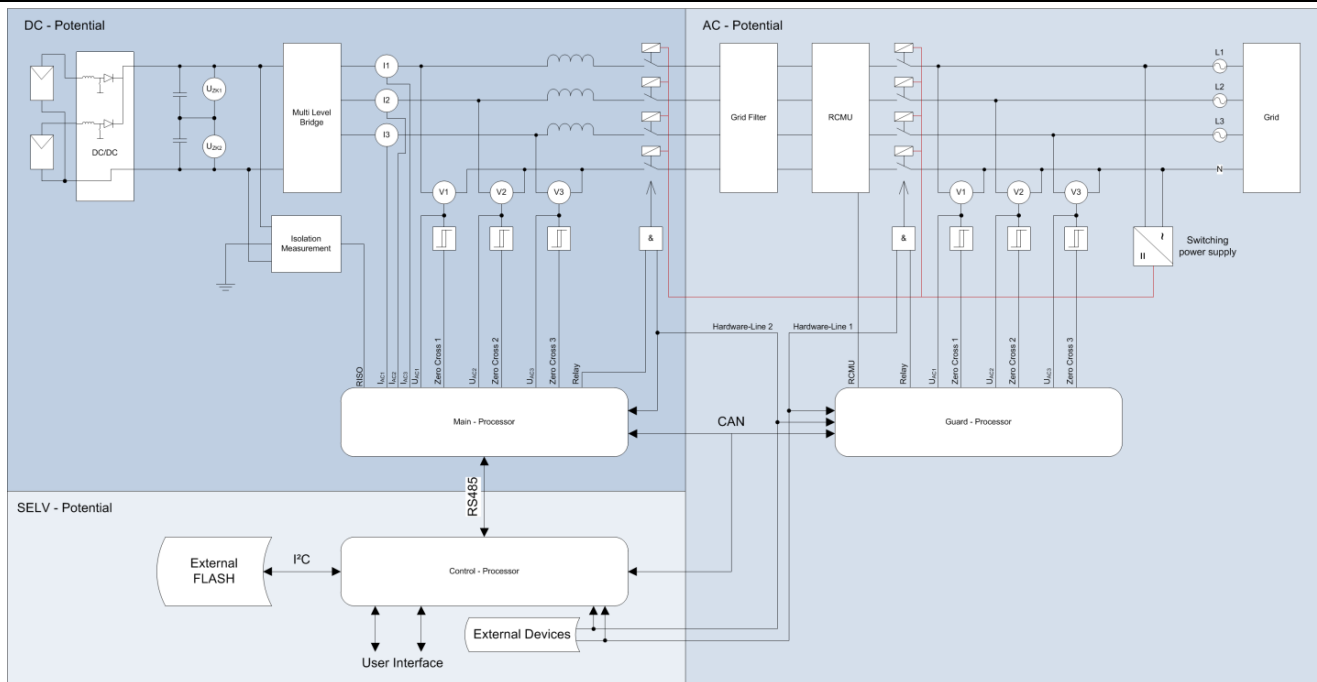
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Beschreibung der Erzeugungseinheit

Hersteller	FRONIUS International GmbH Günter Fronius Straße 1 4600 Wels-Thalheim Austria				
Typ Erzeugungseinheit	Netzgekoppelter Photovoltaikwechselrichter				
Bemessungswerte	SYMO 3.0-3-M	SYMO 3.7-3-M	SYMO 4.5-3-M	SYMO 5.0-3-M	SYMO 5.5-3-M
Nennwirkleistung	3000 W	3700 W	4500 W	5000 W	5500 W
Nennscheinleistung	3000 VA	3700 VA	4500 VA	5000 VA	5500 VA
Bemessungswerte	SYMO 6.0-3-M	SYMO 6.7-3-M	SYMO 7.0-3-M	SYMO 8.0-3-M	SYMO 8.2-3-M
Nennwirkleistung	6000 W	6700 W	7000 W	8000 W	8200 W
Nennscheinleistung	6000 VA	6700 VA	7000 VA	8000 VA	8200 VA
Bemessungsspannung	3/N/PE AC 400/230 V				
Firmware Version	SymoPS V0.0.5.8 ; RECERBO V0.1.1.4 ; SymoFIL V0.0.3.6;				
Messzeitraum	08.07.2013 bis 23.07.2013				


Schematischer Aufbau der Erzeugungseinheit (EZE)

Die Modelle **Fronius SYMO 3.0-3-M, 3.7-3-M, 4.5-3-M, 5.0-3-M, 5.5-3-M, 6.0-3-M, 6.7-3-M, 7.0-3-M, 8.0-3-M und 8.2-3-M** sind bezüglich des Erzeugungs- und Einspeiseverhaltens identisch aufgebaut. Sie unterscheiden sich nur in der Softwarebegrenzung der maximalen Wirkleistung.

Die Prüfungen wurden am Typ **Fronius SYMO 8.2-3-M** durchgeführt und sind stellvertretend für die Geräte **Fronius SYMO 3.0-3-M, 3.7-3-M, 4.5-3-M, 5.0-3-M, 5.5-3-M, 6.0-3-M, 6.7-3-M, 7.0-3-M, 8.0-3-M und 8.2-3-M** gültig.

Wirkleistung; DIN VDE V 0124-100:2012-07; 5.3.2.1

Maximale Wirkleistung $P_{E_{max}}$	-8,328 kW
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Maximale Scheinleistung $S_{E_{max}}$	8,336 kVA
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Blindleistungsbezug; DIN VDE V 0124-100:2012-07; 5.3.2.1

Wirkleistung P / P _n [%]	10	20	30	40	50	60	70	80	90	100
Maximale möglicher $\cos \varphi$ untererregt	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	-0,701
Maximale möglicher $\cos \varphi$ übererregt	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	-0,695

Einhaltung eines fest vorgegeben Verschiebungsfaktor $\cos \varphi$ DIN VDE V 0124-100:2012-07; 5.3.6.1

Vorgabe in der Anlagesteuerung	-0,900 _{üb}	-0,950 _{üb}	-1,000	-0,950 _{un}	-0,900 _{un}
Messwert an den Klemmen der EZE	-0,897	N/A	N/A	N/A	-0,902

Blindleistungsübergangsfunktion – Standard- $\cos \varphi$ (P)-Kennlinie; DIN VDE V 0124-100:2012-07; 5.3.6.4

Wirkleistung P / P _n [%]	10	20	30	40	50	60	70	80	90	100
$\cos \varphi$	-1,000	-1,000	-1,000	-1,000	-0,999	-0,981	-0,964	-0,946	-0,929	-0,903

Die Standard- $\cos \varphi$ -(P)-Kennlinie wird eingehalten

Schalthandlungen; Schnelle Spannungsänderungen; DIN VDE V 0124-100:2012-07; 5.1.2

Einschalten ohne Vorgabe (zum Primärenergieträgers)	k_i	0,99
Ungünstigster Fall	k_i	1,11
Einschalten bei Nennbedingungen (des Primärenergie-trägers)	k_i	0,93
Ausschalten bei Nennleistung	k_i	1,05
Schlechtester Wert aller Schaltvorgänge	$k_{i_{max}}$	1,11
Flicker (worst case)	Netzimpedanzwinkel ψ_k :	32°
	Anlagenflickerbeiwert c_{ψ} :	14,36

Oberschwingungsmessungen (Harmonics) nach EN 61000-3-12 und VDE-AR-N 4105:2011-08 Anhang F.3
 (Phase L1);

Harmonic Order	I _H _mean	I _H _max	I _H _mean	(Average/Ref Fund) ²	n*(Average/Ref Fund) ²	I _H _max	Stage 1 Limit (EN 61000-3-12)	PASS /FAIL
	(A)	(A)	(%H01)			(%H01)		
1	11.9408	12.0041	100.00%			100.00%	Inf%	N/A
2	0.0631	0.0995	0.53%	3.37E-05		0.83%	4.00%	P
3	0.077	0.09	0.65%	4.21E-05		0.75%	21.60%	P
4	0.026	0.0395	0.22%	5.44E-06		0.33%	2.00%	P
5	0.1093	0.1187	0.92%	8.41E-05		1.00%	10.70%	P
6	0.0156	0.0278	0.13%	2.08E-06		0.23%	1.30%	P
7	0.0345	0.0485	0.29%	8.45E-06		0.41%	7.20%	P
8	0.0103	0.0194	0.09%	9.02E-07		0.16%	1.00%	P
9	0.0572	0.0687	0.48%	2.31E-05		0.58%	3.80%	P
10	0.0097	0.0175	0.08%	7.59E-07		0.15%	0.80%	P
11	0.0333	0.0414	0.28%	7.89E-06		0.35%	3.10%	P
12	0.007	0.0128	0.06%	4.18E-07		0.11%	0.70%	P
13	0.0519	0.0576	0.43%	1.89E-05		0.48%	2.00%	P
14	0.0061	0.0108	0.05%	3.07E-07	4.30E-06	0.09%	Inf%	N/A
15	0.0295	0.0389	0.25%	6.13E-06	9.20E-05	0.32%	Inf%	N/A
16	0.0056	0.0111	0.05%	2.54E-07	4.07E-06	0.09%	Inf%	N/A
17	0.0359	0.0442	0.30%	9.08E-06	1.54E-04	0.37%	Inf%	N/A
18	0.0047	0.0084	0.04%	1.90E-07	3.41E-06	0.07%	Inf%	N/A
19	0.0174	0.0231	0.15%	2.18E-06	4.14E-05	0.19%	Inf%	N/A
20	0.0046	0.0091	0.04%	1.76E-07	3.52E-06	0.08%	Inf%	N/A
21	0.0184	0.0219	0.15%	2.37E-06	4.98E-05	0.18%	Inf%	N/A
22	0.0038	0.0071	0.03%	1.21E-07	2.65E-06	0.06%	Inf%	N/A
23	0.0108	0.0146	0.09%	8.48E-07	1.95E-05	0.12%	Inf%	N/A
24	0.0039	0.0074	0.03%	1.27E-07	3.04E-06	0.06%	Inf%	N/A
25	0.0143	0.019	0.12%	1.46E-06	3.64E-05	0.16%	Inf%	N/A
26	0.0037	0.008	0.03%	1.16E-07	3.01E-06	0.07%	Inf%	N/A
27	0.0046	0.0093	0.04%	1.65E-07	4.45E-06	0.08%	Inf%	N/A
28	0.0032	0.0064	0.03%	8.25E-08	2.31E-06	0.05%	Inf%	N/A
29	0.0112	0.0165	0.09%	9.05E-07	2.62E-05	0.14%	Inf%	N/A
30	0.0035	0.0065	0.03%	9.74E-08	2.92E-06	0.06%	Inf%	N/A
31	0.01	0.0138	0.08%	7.18E-07	2.23E-05	0.12%	Inf%	N/A
32	0.0032	0.0064	0.03%	8.54E-08	2.73E-06	0.05%	Inf%	N/A
33	0.0047	0.0081	0.04%	1.63E-07	5.39E-06	0.07%	Inf%	N/A
34	0.0029	0.006	0.02%	6.83E-08	2.32E-06	0.05%	Inf%	N/A
35	0.0118	0.0169	0.10%	1.01E-06	3.55E-05	0.14%	Inf%	N/A
36	0.003	0.0058	0.03%	7.44E-08	2.68E-06	0.05%	Inf%	N/A
37	0.0058	0.009	0.05%	2.39E-07	8.83E-06	0.08%	Inf%	N/A
38	0.0029	0.0055	0.03%	7.02E-08	2.67E-06	0.05%	Inf%	N/A
39	0.0086	0.0123	0.07%	5.34E-07	2.08E-05	0.10%	Inf%	N/A
40	0.0027	0.0057	0.02%	5.80E-08	2.32E-06	0.05%	Inf%	N/A
THD(%)				1.60%			23.00%	P
PWHD(%)					2.40%		23.00%	P

Oberschwingungsmessungen (Harmonics) nach EN 61000-3-12 und VDE-AR-N 4105:2011-08 Anhang F.3 (Phase L2);

Harmonic Order	I _H _mean	I _H _max	I _H _mean	(Average/Ref Fund) ²	n*(Average/Ref Fund) ²	I _H _max	Stage 1 Limit (EN 61000-3-12)	PASS /FAIL
	(A)	(A)	(%H01)			(%H01)		
1	12.0682	12.166	100.00%			100.00%	Inf%	N/A
2	0.0536	0.0818	0.44%	2.20E-05		0.68%	4.00%	P
3	0.0348	0.0594	0.29%	9.30E-06		0.49%	21.60%	P
4	0.0205	0.029	0.17%	2.99E-06		0.24%	2.00%	P
5	0.0466	0.0626	0.39%	1.50E-05		0.52%	10.70%	P
6	0.0126	0.0232	0.10%	1.20E-06		0.19%	1.30%	P
7	0.0345	0.039	0.29%	8.18E-06		0.32%	7.20%	P
8	0.0079	0.0147	0.07%	4.77E-07		0.12%	1.00%	P
9	0.0081	0.0156	0.07%	5.10E-07		0.13%	3.80%	P
10	0.0078	0.0132	0.06%	4.51E-07		0.11%	0.80%	P
11	0.0182	0.023	0.15%	2.31E-06		0.19%	3.10%	P
12	0.0048	0.0094	0.04%	1.73E-07		0.08%	0.70%	P
13	0.0171	0.0237	0.14%	2.05E-06		0.20%	2.00%	P
14	0.0052	0.0104	0.04%	2.05E-07	2.86E-06	0.09%	Inf%	N/A
15	0.005	0.0092	0.04%	1.85E-07	2.78E-06	0.08%	Inf%	N/A
16	0.0044	0.0084	0.04%	1.46E-07	2.34E-06	0.07%	Inf%	N/A
17	0.0117	0.0181	0.10%	9.71E-07	1.65E-05	0.15%	Inf%	N/A
18	0.0031	0.0055	0.03%	7.39E-08	1.33E-06	0.05%	Inf%	N/A
19	0.0112	0.0152	0.09%	8.81E-07	1.67E-05	0.13%	Inf%	N/A
20	0.0039	0.0071	0.03%	1.17E-07	2.34E-06	0.06%	Inf%	N/A
21	0.0045	0.0071	0.04%	1.47E-07	3.08E-06	0.06%	Inf%	N/A
22	0.0029	0.0058	0.02%	6.72E-08	1.48E-06	0.05%	Inf%	N/A
23	0.0093	0.0133	0.08%	6.13E-07	1.41E-05	0.11%	Inf%	N/A
24	0.0028	0.0049	0.02%	5.63E-08	1.35E-06	0.04%	Inf%	N/A
25	0.008	0.0115	0.07%	4.39E-07	1.10E-05	0.10%	Inf%	N/A
26	0.0029	0.0057	0.02%	6.57E-08	1.71E-06	0.05%	Inf%	N/A
27	0.0046	0.0072	0.04%	1.50E-07	4.06E-06	0.06%	Inf%	N/A
28	0.0025	0.0043	0.02%	4.77E-08	1.33E-06	0.04%	Inf%	N/A
29	0.0076	0.0106	0.06%	4.10E-07	1.19E-05	0.09%	Inf%	N/A
30	0.0024	0.0045	0.02%	4.21E-08	1.26E-06	0.04%	Inf%	N/A
31	0.0061	0.0094	0.05%	2.63E-07	8.14E-06	0.08%	Inf%	N/A
32	0.0023	0.0046	0.02%	4.11E-08	1.32E-06	0.04%	Inf%	N/A
33	0.0042	0.0067	0.04%	1.29E-07	4.27E-06	0.06%	Inf%	N/A
34	0.0023	0.0042	0.02%	3.87E-08	1.32E-06	0.04%	Inf%	N/A
35	0.0065	0.01	0.05%	3.03E-07	1.06E-05	0.08%	Inf%	N/A
36	0.002	0.0038	0.02%	3.14E-08	1.13E-06	0.03%	Inf%	N/A
37	0.0047	0.0072	0.04%	1.54E-07	5.70E-06	0.06%	Inf%	N/A
38	0.0021	0.0039	0.02%	3.20E-08	1.21E-06	0.03%	Inf%	N/A
39	0.004	0.0065	0.03%	1.16E-07	4.52E-06	0.05%	Inf%	N/A
40	0.002	0.004	0.02%	3.00E-08	1.20E-06	0.03%	Inf%	N/A
THD(%)				0.80%			23.00%	PA
PWHD(%)					1.20%		23.00%	P

Oberschwingungsmessungen (Harmonics) nach EN 61000-3-12 und VDE-AR-N 4105:2011-08 Anhang F.3
(Phase L3);

Harmonic Order	I _H _mean	I _H _max	I _H _mean	(Average/Ref Fund) ²	n*(Average/Ref Fund) ²	I _H _max	Stage 1 Limit (EN 61000-3-12)	PASS /FAIL
	(A)	(A)	(%H01)			(%H01)		
1	12.0316	12.117	100.00%			100.00%	Inf%	N/A
2	0.0515	0.0872	0.43%	2.03E-05		0.72%	4.00%	P
3	0.0315	0.0415	0.26%	6.93E-06		0.35%	21.60%	P
4	0.0159	0.0298	0.13%	2.08E-06		0.25%	2.00%	P
5	0.06	0.0689	0.50%	2.49E-05		0.57%	10.70%	P
6	0.0116	0.0183	0.10%	1.03E-06		0.15%	1.30%	P
7	0.0303	0.0364	0.25%	6.38E-06		0.30%	7.20%	P
8	0.007	0.0123	0.06%	3.65E-07		0.10%	1.00%	P
9	0.0078	0.0135	0.07%	4.42E-07		0.11%	3.80%	P
10	0.0048	0.0098	0.04%	1.89E-07		0.08%	0.80%	P
11	0.0222	0.0282	0.18%	3.41E-06		0.23%	3.10%	P
12	0.0063	0.0114	0.05%	3.09E-07		0.10%	0.70%	P
13	0.0159	0.0197	0.13%	1.77E-06		0.16%	2.00%	P
14	0.0032	0.0069	0.03%	8.37E-08	1.17E-06	0.06%	Inf%	N/A
15	0.0046	0.0085	0.04%	1.53E-07	2.29E-06	0.07%	Inf%	N/A
16	0.0031	0.0061	0.03%	7.50E-08	1.20E-06	0.05%	Inf%	N/A
17	0.0133	0.0157	0.11%	1.23E-06	2.08E-05	0.13%	Inf%	N/A
18	0.0041	0.0079	0.03%	1.34E-07	2.42E-06	0.07%	Inf%	N/A
19	0.0119	0.016	0.10%	1.01E-06	1.92E-05	0.13%	Inf%	N/A
20	0.0026	0.0053	0.02%	5.35E-08	1.07E-06	0.04%	Inf%	N/A
21	0.0031	0.0071	0.03%	7.22E-08	1.52E-06	0.06%	Inf%	N/A
22	0.0026	0.0051	0.02%	4.99E-08	1.10E-06	0.04%	Inf%	N/A
23	0.009	0.0118	0.08%	5.63E-07	1.30E-05	0.10%	Inf%	N/A
24	0.0028	0.0057	0.02%	6.55E-08	1.57E-06	0.05%	Inf%	N/A
25	0.0092	0.0123	0.08%	6.03E-07	1.51E-05	0.10%	Inf%	N/A
26	0.0025	0.0045	0.02%	4.67E-08	1.21E-06	0.04%	Inf%	N/A
27	0.0026	0.0052	0.02%	5.01E-08	1.35E-06	0.04%	Inf%	N/A
28	0.0022	0.0043	0.02%	3.57E-08	1.00E-06	0.04%	Inf%	N/A
29	0.0069	0.0102	0.06%	3.44E-07	9.97E-06	0.09%	Inf%	N/A
30	0.0024	0.0046	0.02%	4.53E-08	1.36E-06	0.04%	Inf%	N/A
31	0.0076	0.0101	0.06%	4.03E-07	1.25E-05	0.08%	Inf%	N/A
32	0.0022	0.0043	0.02%	3.82E-08	1.22E-06	0.04%	Inf%	N/A
33	0.0028	0.0051	0.02%	5.52E-08	1.82E-06	0.04%	Inf%	N/A
34	0.0019	0.004	0.02%	2.80E-08	9.54E-07	0.03%	Inf%	N/A
35	0.005	0.0071	0.04%	1.77E-07	6.20E-06	0.06%	Inf%	N/A
36	0.0021	0.004	0.02%	3.38E-08	1.22E-06	0.03%	Inf%	N/A
37	0.0065	0.0096	0.05%	2.96E-07	1.10E-05	0.08%	Inf%	N/A
38	0.0019	0.0039	0.02%	2.96E-08	1.12E-06	0.03%	Inf%	N/A
39	0.0028	0.0048	0.02%	5.63E-08	2.19E-06	0.04%	Inf%	N/A
40	0.0017	0.0036	0.01%	2.26E-08	9.05E-07	0.03%	Inf%	N/A
THD(%)				0.90%			23.00%	P
PWHD(%)					1.20%		23.00%	P

Oberschwingungen bis 2 kHz											
Maximale Mittelwerte der harmonischen Ströme bezogen auf den Nennstrom der EZE											
P _{bin} (%)	0	10	20	30	40	50	60	70	80	90	100
Nr./ Order	I _h /I _n (%)	I _h /I _n (%)	I _h /I _n (%)	I _h /I _n (%)	I _h /I _n (%)	I _h /I _n (%)	I _h /I _n (%)	I _h /I _n (%)	I _h /I _n (%)	I _h /I _n (%)	I _h /I _n (%)
2	0.01%	0.07%	0.13%	0.18%	0.21%	0.26%	0.32%	0.37%	0.42%	0.47%	0.53%
3	0.26%	0.43%	0.45%	0.47%	0.48%	0.50%	0.53%	0.56%	0.60%	0.64%	0.64%
4	0.01%	0.04%	0.06%	0.09%	0.09%	0.12%	0.15%	0.16%	0.18%	0.20%	0.22%
5	0.25%	0.37%	0.54%	0.66%	0.74%	0.79%	0.83%	0.86%	0.90%	0.92%	0.91%
6	0.01%	0.02%	0.03%	0.05%	0.05%	0.08%	0.08%	0.08%	0.10%	0.11%	0.13%
7	0.25%	0.47%	0.49%	0.45%	0.40%	0.34%	0.32%	0.30%	0.31%	0.30%	0.29%
8	0.01%	0.02%	0.02%	0.04%	0.04%	0.06%	0.05%	0.06%	0.07%	0.08%	0.09%
9	0.22%	0.38%	0.39%	0.40%	0.42%	0.44%	0.45%	0.46%	0.48%	0.49%	0.48%
10	0.01%	0.01%	0.02%	0.03%	0.03%	0.04%	0.05%	0.05%	0.06%	0.07%	0.08%
11	0.22%	0.28%	0.28%	0.32%	0.33%	0.32%	0.31%	0.30%	0.30%	0.30%	0.28%
12	0.01%	0.01%	0.02%	0.02%	0.03%	0.03%	0.04%	0.04%	0.05%	0.05%	0.06%
13	0.18%	0.31%	0.34%	0.32%	0.33%	0.35%	0.38%	0.41%	0.43%	0.44%	0.43%
14	0.01%	0.01%	0.01%	0.02%	0.03%	0.03%	0.03%	0.04%	0.04%	0.04%	0.05%
15	0.17%	0.23%	0.24%	0.24%	0.24%	0.24%	0.24%	0.25%	0.26%	0.26%	0.25%
16	0.00%	0.01%	0.01%	0.02%	0.02%	0.03%	0.03%	0.03%	0.04%	0.04%	0.05%
17	0.14%	0.21%	0.23%	0.26%	0.27%	0.27%	0.28%	0.29%	0.30%	0.30%	0.30%
18	0.01%	0.01%	0.01%	0.02%	0.02%	0.02%	0.03%	0.03%	0.03%	0.04%	0.04%
19	0.13%	0.19%	0.19%	0.18%	0.16%	0.15%	0.15%	0.15%	0.15%	0.15%	0.15%
20	0.01%	0.01%	0.01%	0.02%	0.02%	0.02%	0.03%	0.03%	0.03%	0.03%	0.04%
21	0.11%	0.15%	0.14%	0.15%	0.15%	0.16%	0.16%	0.16%	0.16%	0.16%	0.15%
22	0.00%	0.01%	0.01%	0.01%	0.02%	0.02%	0.02%	0.02%	0.03%	0.03%	0.03%
23	0.09%	0.12%	0.10%	0.10%	0.10%	0.08%	0.08%	0.08%	0.08%	0.08%	0.09%
24	0.00%	0.01%	0.01%	0.01%	0.02%	0.02%	0.02%	0.02%	0.03%	0.03%	0.03%
25	0.07%	0.07%	0.09%	0.09%	0.11%	0.11%	0.12%	0.11%	0.12%	0.12%	0.12%
26	0.00%	0.01%	0.01%	0.01%	0.02%	0.02%	0.02%	0.02%	0.03%	0.03%	0.03%
27	0.05%	0.02%	0.02%	0.02%	0.02%	0.02%	0.02%	0.03%	0.03%	0.03%	0.04%
28	0.00%	0.01%	0.01%	0.01%	0.01%	0.02%	0.02%	0.02%	0.02%	0.02%	0.03%
29	0.04%	0.06%	0.06%	0.07%	0.08%	0.09%	0.09%	0.08%	0.08%	0.09%	0.09%
30	0.00%	0.01%	0.01%	0.01%	0.01%	0.02%	0.02%	0.02%	0.02%	0.03%	0.03%
31	0.03%	0.03%	0.04%	0.05%	0.05%	0.06%	0.06%	0.07%	0.07%	0.08%	0.08%
32	0.01%	0.01%	0.01%	0.01%	0.01%	0.02%	0.02%	0.02%	0.02%	0.02%	0.03%
33	0.02%	0.02%	0.02%	0.02%	0.02%	0.03%	0.03%	0.03%	0.03%	0.04%	0.04%
34	0.00%	0.01%	0.01%	0.01%	0.01%	0.02%	0.02%	0.02%	0.02%	0.02%	0.02%
35	0.02%	0.05%	0.05%	0.06%	0.07%	0.08%	0.08%	0.08%	0.09%	0.10%	0.10%
36	0.01%	0.01%	0.01%	0.01%	0.01%	0.02%	0.02%	0.02%	0.02%	0.02%	0.03%
37	0.02%	0.03%	0.04%	0.03%	0.04%	0.04%	0.05%	0.05%	0.05%	0.05%	0.05%
38	0.01%	0.01%	0.01%	0.01%	0.01%	0.02%	0.02%	0.02%	0.02%	0.02%	0.02%
39	0.02%	0.05%	0.05%	0.05%	0.06%	0.06%	0.06%	0.06%	0.06%	0.07%	0.07%
40	0.00%	0.01%	0.01%	0.01%	0.01%	0.02%	0.02%	0.02%	0.02%	0.02%	0.02%
41	0.02%	0.02%	0.02%	0.03%	0.04%	0.04%	0.04%	0.04%	0.04%	0.04%	0.05%

Oberschwingungen bis 2 kHz

Maximale Mittelwerte der harmonischen Ströme bezogen auf den Nennstrom der EZE

42	0.01%	0.01%	0.01%	0.01%	0.01%	0.02%	0.02%	0.02%	0.02%	0.02%	0.02%
43	0.03%	0.04%	0.04%	0.04%	0.05%	0.05%	0.05%	0.06%	0.06%	0.06%	0.06%
44	0.00%	0.01%	0.01%	0.01%	0.01%	0.02%	0.02%	0.02%	0.02%	0.02%	0.02%
45	0.03%	0.02%	0.02%	0.02%	0.03%	0.03%	0.03%	0.03%	0.03%	0.04%	0.04%
46	0.01%	0.01%	0.01%	0.01%	0.01%	0.01%	0.02%	0.02%	0.02%	0.02%	0.02%
47	0.03%	0.04%	0.03%	0.04%	0.05%	0.05%	0.05%	0.05%	0.05%	0.06%	0.06%
48	0.01%	0.01%	0.01%	0.01%	0.01%	0.01%	0.02%	0.02%	0.02%	0.02%	0.02%
49	0.02%	0.03%	0.03%	0.03%	0.04%	0.04%	0.05%	0.04%	0.05%	0.05%	0.06%
50	0.01%	0.01%	0.01%	0.01%	0.01%	0.01%	0.02%	0.02%	0.02%	0.02%	0.02%
THC (%)	0.65%	1.03%	1.14%	1.22%	1.27%	1.32%	1.38%	1.43%	1.50%	1.56%	1.57%

Zwischenharmonische

Maximale Mittelwerte der zwischenharmonischen Ströme bezogen auf den Nennstrom der EZE

P_{bin} (%)	0	10	20	30	40	50	60	70	80	90	100
f (Hz)	I_h/I_n (%)	I_h/I_n (%)	I_h/I_n (%)	I_h/I_n (%)	I_h/I_n (%)	I_h/I_n (%)	I_h/I_n (%)	I_h/I_n (%)	I_h/I_n (%)	I_h/I_n (%)	I_h/I_n (%)
75	0.03%	0.26%	0.41%	0.57%	0.75%	0.90%	1.06%	1.17%	1.36%	1.49%	1.70%
125	0.02%	0.08%	0.13%	0.18%	0.25%	0.29%	0.33%	0.36%	0.41%	0.46%	0.52%
175	0.02%	0.05%	0.09%	0.12%	0.16%	0.19%	0.21%	0.23%	0.26%	0.29%	0.33%
225	0.01%	0.04%	0.06%	0.10%	0.13%	0.15%	0.18%	0.20%	0.22%	0.24%	0.27%
275	0.01%	0.05%	0.06%	0.08%	0.09%	0.11%	0.12%	0.13%	0.15%	0.16%	0.19%
325	0.01%	0.06%	0.08%	0.09%	0.10%	0.12%	0.14%	0.13%	0.16%	0.16%	0.20%
375	0.01%	0.04%	0.05%	0.06%	0.08%	0.09%	0.08%	0.09%	0.10%	0.12%	0.13%
425	0.01%	0.03%	0.04%	0.05%	0.07%	0.07%	0.08%	0.09%	0.10%	0.11%	0.13%
475	0.01%	0.02%	0.03%	0.04%	0.06%	0.06%	0.07%	0.08%	0.09%	0.10%	0.11%
525	0.01%	0.03%	0.03%	0.04%	0.05%	0.06%	0.07%	0.08%	0.09%	0.10%	0.11%
575	0.01%	0.03%	0.04%	0.04%	0.06%	0.06%	0.07%	0.08%	0.07%	0.08%	0.08%
625	0.01%	0.03%	0.04%	0.05%	0.05%	0.06%	0.06%	0.07%	0.08%	0.08%	0.09%
675	0.01%	0.02%	0.03%	0.03%	0.05%	0.05%	0.05%	0.06%	0.06%	0.08%	0.07%
725	0.01%	0.02%	0.02%	0.03%	0.04%	0.04%	0.05%	0.05%	0.06%	0.07%	0.08%
775	0.01%	0.02%	0.02%	0.03%	0.04%	0.04%	0.04%	0.05%	0.06%	0.06%	0.07%
825	0.00%	0.02%	0.02%	0.03%	0.03%	0.04%	0.04%	0.05%	0.05%	0.06%	0.07%
875	0.00%	0.02%	0.03%	0.03%	0.04%	0.04%	0.05%	0.06%	0.05%	0.06%	0.06%
925	0.01%	0.03%	0.03%	0.03%	0.04%	0.04%	0.04%	0.04%	0.05%	0.05%	0.06%
975	0.01%	0.02%	0.02%	0.03%	0.03%	0.04%	0.04%	0.04%	0.05%	0.05%	0.06%
1025	0.01%	0.02%	0.02%	0.02%	0.03%	0.03%	0.04%	0.04%	0.04%	0.05%	0.05%
1075	0.00%	0.02%	0.02%	0.02%	0.03%	0.03%	0.03%	0.03%	0.04%	0.04%	0.05%
1125	0.00%	0.02%	0.02%	0.02%	0.02%	0.03%	0.03%	0.03%	0.04%	0.04%	0.05%
1175	0.01%	0.02%	0.02%	0.03%	0.03%	0.03%	0.04%	0.04%	0.04%	0.05%	0.05%
1225	0.00%	0.02%	0.02%	0.02%	0.03%	0.03%	0.03%	0.04%	0.04%	0.04%	0.05%
1275	0.00%	0.02%	0.02%	0.02%	0.03%	0.03%	0.03%	0.04%	0.04%	0.04%	0.05%
1325	0.00%	0.03%	0.02%	0.02%	0.03%	0.03%	0.03%	0.03%	0.04%	0.04%	0.04%
1375	0.01%	0.03%	0.02%	0.03%	0.03%	0.03%	0.03%	0.03%	0.03%	0.03%	0.04%
1425	0.00%	0.02%	0.02%	0.02%	0.02%	0.03%	0.03%	0.03%	0.03%	0.03%	0.04%
1475	0.00%	0.02%	0.02%	0.02%	0.03%	0.03%	0.04%	0.03%	0.04%	0.04%	0.05%
1525	0.00%	0.02%	0.02%	0.02%	0.02%	0.02%	0.03%	0.03%	0.03%	0.04%	0.04%
1575	0.00%	0.02%	0.02%	0.02%	0.03%	0.03%	0.03%	0.03%	0.04%	0.04%	0.04%
1625	0.00%	0.02%	0.02%	0.02%	0.03%	0.03%	0.03%	0.03%	0.04%	0.03%	0.04%
1675	0.00%	0.02%	0.02%	0.02%	0.03%	0.03%	0.03%	0.03%	0.03%	0.03%	0.04%
1725	0.00%	0.02%	0.02%	0.02%	0.02%	0.02%	0.02%	0.02%	0.03%	0.03%	0.04%
1775	0.00%	0.02%	0.02%	0.02%	0.03%	0.03%	0.03%	0.03%	0.03%	0.04%	0.04%
1825	0.00%	0.02%	0.02%	0.02%	0.02%	0.02%	0.03%	0.03%	0.03%	0.03%	0.04%
1875	0.00%	0.01%	0.02%	0.02%	0.02%	0.03%	0.03%	0.03%	0.03%	0.03%	0.04%
1925	0.00%	0.01%	0.02%	0.02%	0.02%	0.02%	0.03%	0.03%	0.03%	0.03%	0.03%
1975	0.00%	0.01%	0.02%	0.02%	0.02%	0.02%	0.02%	0.02%	0.03%	0.03%	0.03%

Höhere Frequenzen

Maximale Mittelwerte der Ströme im Frequenzbereich von 2 kHz bis 9 kHz bezogen auf den Nennstrom der EZE

P_{bin} (%)	0	10	20	30	40	50	60	70	80	90	100
f (kHz)	I_h/I_n (%)	I_h/I_n (%)	I_h/I_n (%)	I_h/I_n (%)	I_h/I_n (%)	I_h/I_n (%)	I_h/I_n (%)	I_h/I_n (%)	I_h/I_n (%)	I_h/I_n (%)	I_h/I_n (%)
2.1	0.04%	0.06%	0.06%	0.06%	0.08%	0.08%	0.09%	0.09%	0.10%	0.10%	0.11%
2.3	0.04%	0.05%	0.05%	0.06%	0.07%	0.08%	0.09%	0.08%	0.09%	0.09%	0.10%
2.5	0.04%	0.05%	0.05%	0.05%	0.06%	0.07%	0.08%	0.07%	0.09%	0.09%	0.10%
2.7	0.03%	0.06%	0.06%	0.06%	0.07%	0.08%	0.08%	0.08%	0.09%	0.10%	0.10%
2.9	0.02%	0.06%	0.06%	0.06%	0.07%	0.08%	0.08%	0.08%	0.09%	0.09%	0.10%
3.1	0.03%	0.06%	0.05%	0.06%	0.06%	0.07%	0.08%	0.07%	0.08%	0.09%	0.10%
3.3	0.03%	0.07%	0.07%	0.07%	0.07%	0.08%	0.08%	0.08%	0.08%	0.09%	0.10%
3.5	0.03%	0.06%	0.06%	0.06%	0.07%	0.08%	0.08%	0.08%	0.08%	0.09%	0.10%
3.7	0.02%	0.05%	0.06%	0.06%	0.07%	0.08%	0.08%	0.07%	0.08%	0.08%	0.09%
3.9	0.02%	0.05%	0.06%	0.06%	0.07%	0.07%	0.08%	0.07%	0.07%	0.08%	0.09%
4.1	0.02%	0.05%	0.06%	0.06%	0.07%	0.07%	0.07%	0.07%	0.07%	0.08%	0.09%
4.3	0.02%	0.04%	0.05%	0.05%	0.06%	0.07%	0.07%	0.06%	0.07%	0.07%	0.08%
4.5	0.02%	0.05%	0.05%	0.05%	0.06%	0.07%	0.07%	0.06%	0.06%	0.07%	0.09%
4.7	0.02%	0.04%	0.04%	0.05%	0.06%	0.06%	0.06%	0.06%	0.06%	0.06%	0.11%
4.9	0.02%	0.04%	0.04%	0.04%	0.05%	0.05%	0.05%	0.05%	0.05%	0.06%	0.09%
5.1	0.02%	0.04%	0.04%	0.04%	0.05%	0.05%	0.05%	0.05%	0.05%	0.05%	0.08%
5.3	0.01%	0.03%	0.03%	0.04%	0.04%	0.05%	0.05%	0.04%	0.05%	0.05%	0.07%
5.5	0.01%	0.03%	0.03%	0.03%	0.04%	0.04%	0.04%	0.04%	0.04%	0.04%	0.07%
5.7	0.01%	0.03%	0.03%	0.03%	0.04%	0.04%	0.04%	0.04%	0.04%	0.04%	0.05%
5.9	0.01%	0.03%	0.03%	0.03%	0.04%	0.04%	0.04%	0.03%	0.04%	0.05%	0.04%
6.1	0.01%	0.03%	0.03%	0.03%	0.03%	0.04%	0.04%	0.03%	0.03%	0.05%	0.04%
6.3	0.01%	0.03%	0.03%	0.03%	0.03%	0.03%	0.03%	0.03%	0.03%	0.05%	0.03%
6.5	0.01%	0.02%	0.03%	0.03%	0.03%	0.03%	0.03%	0.03%	0.03%	0.05%	0.03%
6.7	0.01%	0.02%	0.02%	0.02%	0.03%	0.03%	0.03%	0.03%	0.03%	0.05%	0.03%
6.9	0.02%	0.02%	0.02%	0.02%	0.03%	0.03%	0.03%	0.03%	0.03%	0.04%	0.03%
7.1	0.02%	0.03%	0.02%	0.02%	0.03%	0.03%	0.03%	0.02%	0.04%	0.03%	0.03%
7.3	0.02%	0.08%	0.03%	0.02%	0.03%	0.03%	0.03%	0.02%	0.06%	0.03%	0.03%
7.5	0.03%	0.04%	0.07%	0.03%	0.03%	0.03%	0.03%	0.02%	0.06%	0.02%	0.02%
7.7	0.02%	0.02%	0.05%	0.08%	0.03%	0.03%	0.03%	0.04%	0.04%	0.02%	0.03%
7.9	0.02%	0.02%	0.02%	0.05%	0.09%	0.05%	0.04%	0.09%	0.02%	0.02%	0.03%
8.1	0.02%	0.02%	0.02%	0.02%	0.05%	0.09%	0.10%	0.04%	0.02%	0.02%	0.02%
8.3	0.02%	0.02%	0.02%	0.02%	0.03%	0.03%	0.04%	0.02%	0.02%	0.02%	0.02%
8.5	0.02%	0.02%	0.02%	0.02%	0.03%	0.03%	0.03%	0.02%	0.02%	0.02%	0.02%
8.7	0.01%	0.02%	0.02%	0.02%	0.03%	0.03%	0.03%	0.02%	0.02%	0.02%	0.03%
8.9	0.01%	0.02%	0.02%	0.02%	0.03%	0.03%	0.03%	0.02%	0.02%	0.02%	0.03%