Declaration for VDE-AR-N 4105_2018

Manufacturer's reference number		X3-Hybrid-x-y-z (x=5.0, 6.0, 8.0 or 10.0; y=D or N; z=E or C) X3-Fit-xy (x=8.0 or 10.0; y=E or C)	
Micro-generator technology		Grid Tied Inverter With Storage System	
Manufacturer name		SolaX Power Network Technology (Zhe jiang) Co. , Ltd.	
Address		No.288 Shizhu Road,Tonglu Economic Development Zone, Dongxing District,Tonglu City, Zhejiang Province, China.	
Tel	+86(0571)-56260011	Fax	+86(0571)-56075753
E-mail	info@solaxpower.com	Web site	www.solaxpower.com

Registered Capacity, use separate sheet if more than one connection option.	Connection Option	
	5.0	kW three phase system
	6.0	kW three phase system
	8.0	kW three phase system
	10.0	kW three phase system

Manufacturer Type Test declaration. - I certify that all products supplied by the company with the above **Type Tested** reference number will be manufactured and tested to ensure that they perform as stated in this document, prior to shipment to site and that no site modifications are required to ensure that the product meets all the requirements of VDE-AR-N 4105_2018.

Signed	Guo Huawei	On behalf of	SolaX Power Network Technology (Zhe jiang) Co. , Ltd.

Additional comments

Clause	Test description	Verdict
5.1	Principles for determining the network connection point	P
5.2	Rating of the network equipment	P
5.3	Permissible voltage change	P

5.4	Network Disturbances	P
5.5.1	General	P
5.5.3	Plug-in production plants	P
5.6	Three-phase converter systems	P
5.7.1	General	P
5.7.2	Static voltage maintenance / reactive power provision	P
5.7.2.1	General boundary conditions	P
5.7.2.2	Reactive power provision at Σ Semax	P
5.7.2.3	Reactive power supply below Pemax	P
5.7.2.4	Method for providing reactive power	P
5.7.4.1	General	P
5.7.4.2	Network Security Management	P
5.7.4.3	Active power adaptation for overfrequency and underfrequency	P
5.7.4.4	Voltage-dependent active power reduction	P
5.7.5	Short-circuit current contribution	P
6.1	General requirements	P
6.2	Central NA protection	P
6.3	Integrated NA protection	P
6.5.2	Protection functions	P
6.5.3	Islanding detection	P
8.3	Connection conditions and synchronization	P

Protection function	Setting value	Trip delay	Tripping value	Break time
Voltage drop protection U<<	0.45Un	≤300ms	102.8V	298ms
Voltage drop protection U<	0.8Un	≤3s	183.2 V	2.99s
Rise-in-voltage protection U>	1.1Un	≤100ms	253 V	90ms
Rise-in-voltage protection U>>	1.25Un	≤100ms	288.8 V	88ms
Frequency decrease protection f<	47.5Hz	≤100ms	47.51Hz	68ms
Frequency increase protection f>	51.5Hz	≤100ms	51,49Hz	74ms

Model

a) Q(U)

as required for under voltage and over voltage condition

P, setpoint (%P_{Emax})	V, setpoint	U_{1+} (Vac)	P_{1+}/P_{Emax} [%] Measured	Active power P_{1+} (W)	Apparent power S_{1+} (VA)	Reactive power Q_{1+}(Var)	Expected Q (Var)	shifting Q(Var) (dQ)[≤±4 % P_{Emax} = var]
20	0,91Vn	210.0	97.8%	1955	5551	5197	5000	197
	0,93Vn	214.2	97.8%	1956	5550	5195	5000	195
	0,95Vn	219.3	100%	2001	3396	2735	2500	235
	0,97Vn	223.9	100%	2012	2026	230	0	230
	0,99Vn	228.6	100%	2011	2017	150	0	150
	1,01Vn	233.1	100%	2009	2016	160	0	160
	1,03Vn	237.8	100%	2008	2015	170	0	170
	1,05Vn	242.6	99.1%	1981	3148	-2445	-2500	55
	1,07Vn	246.9	97.0%	1939	5188	-4813	-5000	87
	1,09Vn	251.0	96.9%	1937	5294	-4926	-5000	74
50	0,91Vn	209.8	100%	5023	7223	5191	5000	191

	0,93Vn	214.3	100%	5028	7227	5191	5000	191
	0,95Vn	218.9	100%	5065	5797	2817	2500	317
	0,97Vn	223.6	100%	5077	5088	329	0	329
	0,99Vn	228.2	100%	5077	5081	191	0	191
	1,01Vn	232.9	100%	5081	5084	197	0	197
	1,03Vn	237.5	100%	5080	5084	203	0	203
	1,05Vn	242.0	100%	5066	5519	-2208	-2500	292
	1,07Vn	246.6	100%	5033	6893	-4712	-5000	288
	1,09Vn	251.2	100%	5027	7041	-4930	-5000	70
100	0,91Vn	209.9	87.0%	8699	10128	5187	5000	187
	0,93Vn	214.5	87.2%	8722	10149	5190	5000	190
	0,95Vn	219.2	98.4%	9836	10207	2685	2500	185
	0,97Vn	223.8	99.4%	9944	9951	360	0	360
	0,99Vn	228.4	99.5%	9947	9953	346	0	346
	1,01Vn	232.9	99.5%	9946	9952	345	0	345
	1,03Vn	237.6	99.4%	9940	9946	346	0	346
	1,05Vn	242.1	98.6%	9861	10129	-2341	-2500	159
	1,07Vn	246.7	88.1%	8811	10056	-4815	-5000	185
	1,09Vn	251.3	87.9%	8792	10082	-4936	-5000	64
Remark: based on below curve								

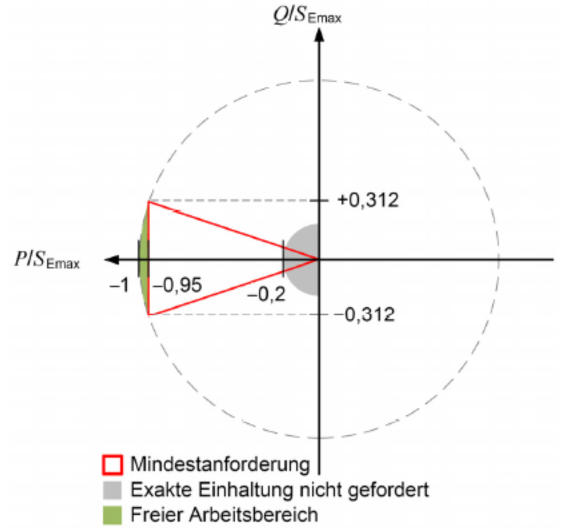

Bild 5 – *P*/*Q*-Diagramm für Typ 2 $\sum S_{Emax} \leq 4{,}6\,\text{kVA}$ sowie Typ 1, Stirlinggenerator, Brennstoffzelle $\sum S_{Emax} > 4{,}6\,\text{kVA}$ an den Generatorklemmen im Verbraucherzählpfeilsystem

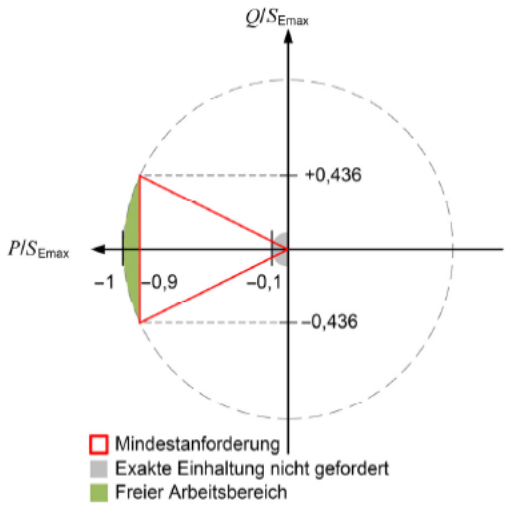

Bild 6 – *P*/*Q*-Diagramm für Typ 2 (nur Umrichter) $\sum S_{Emax} > 4{,}6\,\text{kVA}$ an den Generatorklemmen im Verbraucherzählpfeilsystem

b) cos φ (P)

Power step under applied cosφ(P)-curve setted through control panel	Measured cosφ	Active Power P_{1+} (W)	Apparent Power S_{1+} (VA)	Reactive Power Q_{1+} (Var)	Deviation of Q (Var)	Limit of Q [≤±4%P_{Emax} = Var]	Voltage V_{1+} (V)
Point 1: P = 10% P_{Emax};	0.9868	1065	1080	174	174	±4%	230.3
Point 2: P = 20% P_{Emax};	0.9969	2090	2097	165	165	±4%	230.4
Point 3: P = 30% P_{Emax} ;	0.9984	3038	3043	170	170	±4%	230.5
Point 4: P = 40% P_{Emax} ;	0.9990	4032	4036	179	179	±4%	230.6
Point 5: P = 50% P_{Emax} ;	0.9991	5044	5048	200	200	±4%	230.7
Point 6: P = 60% P_{Emax} ;	0.9851	6040	6132	-1048	170	±4%	230.6
Point 7: P = 70% P_{Emax} ;	0.9669	7047	7288	-1855	187	±4%	230.7
Point 8: P = 80% P_{Emax} ;	0.9484	8052	8490	-2690	213	±4%	230.7
Point 9: P = 90% P_{Emax} ;	0.9299	9034	9714	-3570	264	±4%	230.7
Point 10: P = 100% P_{Emax} ;	0.9255	9273	10020	-3794	7	±4%	230.8
Point 11: P = 90% P_{Emax} ;	0.9305	9003	9676	-3544	290	±4%	230.7

Point 12: P = 80% P_{Emax} ;	0.9492	8008	8436	-2652	251	±4%	230.7
Point 13: P = 70% P_{Emax} ;	0.9673	7033	7270	-1841	201	±4%	230.7
Point 14: P = 60% P_{Emax} ;	0.9854	6031	6121	-1037	175	±4%	230.6
Point 15: P = 50% P_{Emax} ;	0.9990	5073	5078	94	94	±4%	230.6
Point 16: P = 40% P_{Emax} ;	0.9990	4023	4027	178	178	±4%	230.6
Point 17: P = 30% P_{Emax} ;	0.9984	3011	3016	168	168	±4%	230.5
Point 18: P = 20% P_{Emax};	0.9968	2061	2067	164	164	±4%	230.4
Point 19: P = 10% P_{Emax};	0.9863	1044	1058	174	174	±4%	230.3

Reactive power transfer function – standard-cos φ-(p)-characteristic

Active power P/P_{Emax} [%]	10	20	30	40	50	60	70	80	90	100*
cos φ	0.9868	0.9969	0.9984	0.9990	0.9991	0.9851	0.9669	0.9484	0.9299	0.9255

"*":The maximum apparent power of the inverter is limited to S_{Emax}. If setting cos φ≠1, the maximum active power is reduced accordingly. The active power 100% P/P_{Emax} is therefore only achieved when cos φ = 1.

Response time measurement: Standard characteristic curve for cos φ (P)

Power step under applied cosφ(P)-curve setted through control panel	Voltage V_{1+} (Vac)	Measured cosφ	Active Power (W) P_{1+}	Apparent Power (VA) S_{1+}	Reactive Power (Var) Q_{1+}	Response time (s)
20% P_{Emax}, cosφ=1,0	230.4	0.9969	2064	2070	164	
50% P_{Emax}, cosφ=1,0	230.7	0.9992	5023	5027	195	60s
90% P_{Emax}, osφ=0,92	230.7	0.9303	9010	9686	-3552	83s
90% P_{Emax}, osφ=0,92	230.7	0.9304	9006	9680	-3547	
50% P_{Emax}, cosφ=1,0	230.6	0.9991	5063	5068	109	79s
20% P_{Emax}, cosφ=1,0	230.4	0.9966	2059	2066	166	60s

c) fixed cosφ:

Default in system control	0,900 ov	0,910 ov	0,920 ov	0,930 ov	0,940 ov	0,950 ov	0,960 ov	0,970 ov	0,980 ov	0,990 ov	1,000

Measured value at PGU terminals	0.9071	0.9168	0.9262	0.9357	0.9450	0.9543	0.9637	0.9729	0.9822	0.9913	0.9994
Default in system control	0,900 uV	0,910 uV	0,920 uV	0,930 uV	0,940 uV	0,950 uV	0,960 uV	0,970 uV	0,980 uV	0,990 uV	
Measured value at PGU terminals	0.8930	0.9034	0.9139	0.9242	0.9347	0.9453	0.9558	0.9664	0.9772	0.9877	

P_{Emax} with fixed cosφ	cosφ	Active Power P_{1+} (W)	Apparent Power S_{1+} (VA)	Reactive Power Q_{1+}(Var)	Deviation of Q (Var)	Limit of Q (≤±4%P_{Emax} =Var)
cosφ = 0,900 under-excited	0.9071	9108	10041	-4225	134	±4%
cosφ = 0,910 under-excited	0.9168	9194	10029	-4006	140	±4%
cosφ = 0,920 under-excited	0.9262	9287	10027	-3780	139	±4%
cosφ = 0,930 under-excited	0.9357	9370	10015	-3534	142	±4%
cosφ = 0,940 under-excited	0.9450	9459	10009	-3272	140	±4%
cosφ = 0,950 under-excited	0.9543	9557	10015	-2991	131	±4%
cosφ = 0,960 under-excited	0.9637	9657	10022	-2676	124	±4%
cosφ = 0,970 under-excited	0.9729	9845	10119	-2340	91	±4%
cosφ = 0,980 under-excited	0.9822	9871	10050	-1889	101	±4%
cosφ = 0,990 under-excited	0.9913	9875	9961	-1312	99	±4%
cosφ = 1	0.9994	9878	9884	-340	340	±4%
cosφ = 0,990 over-excited	0.9877	9878	10001	1565	154	±4%
cosφ = 0,980 over-excited	0.9772	9819	10049	2135	145	±4%
cosφ = 0,970 over-excited	0.9664	9709	10047	2582	151	±4%
cosφ = 0,960 over-excited	0.9558	9612	10056	2957	157	±4%

cosφ = 0,950 over-excited	0.9453	9508	10058	3281	159	±4%
cosφ = 0,940 over-excited	0.9347	9421	10078	3582	170	±4%
cosφ = 0,930 over-excited	0.9242	9352	10119	3864	188	±4%
cosφ = 0,920 over-excited	0.9139	9263	10136	4115	196	±4%
cosφ = 0,910 over-excited	0.9034	9159	10138	4347	201	±4%
cosφ = 0,900 over-excited	0.8930	9058	10143	4565	206	±4%

d) PT1 step response verification

	Time (s)	Active Power P_{1+} (W)	Apparent Power S_{1+} (VA)	Reactive Power Q_{1+} (Var)	Q_{1+}/P_{Emax}
50% Pn, Q=0 → $Q_{max.}$ over-excited	0	5084.1	5087.7	191.2	0.019
	0.2	5096.4	5104.6	288.0	0.029
	0.4	5100.1	5149.2	709.9	0.071
	0.6	5088.9	5207.0	1102.8	0.110
	0.8	5092.1	5300.2	1470.5	0.147
	1	5095.1	5404.7	1803.1	0.180
	1.2	5093.6	5514.2	2112.4	0.211
	1.4	5091.4	5624.2	2389.6	0.239
	1.6	5079.4	5727.8	2647.0	0.265
	1.8	5087.2	5847.0	2882.3	0.288
	2	5084.4	5953.3	3096.8	0.310
	2.2	5071.3	6047.1	3293.8	0.329
	2.4	5069.9	6146.4	3474.8	0.347
	2.6	5067.7	6238.5	3638.2	0.364
	2.8	5075.7	6333.9	3788.7	0.379
	3	5071.3	6413.8	3926.7	0.393
	3.2	5067.2	6488.5	4052.7	0.405

3.4	5060.1	6554.8	4166.6	0.417
3.6	5058.3	6617.5	4266.7	0.427
3.8	5057.9	6676.1	4357.6	0.436
4	5056.3	6729.3	4440.3	0.444
4.2	5060.8	6778.0	4508.8	0.451
4.4	5062.7	6824.0	4575.5	0.458
4.6	5054.9	6856.2	4632.0	0.463
4.8	5054.4	6889.9	4682.3	0.468
5	5056.9	6924.7	4730.6	0.473
5.2	5046.1	6944.8	4771.4	0.477
5.4	5057.2	6980.0	4810.9	0.481
5.6	5058.9	7006.4	4847.4	0.485
5.8	5050.3	7020.6	4876.9	0.488
6	5051.8	7042.5	4906.7	0.491
6.2	5046.2	7056.7	4932.9	0.493
6.4	5044.5	7072.6	4957.3	0.496
6.6	5058.3	7100.0	4982.4	0.498
6.8	5061.7	7117.1	5003.1	0.500
7	5056.1	7124.1	5018.8	0.502
7.2	5054.6	7138.4	5040.6	0.504
7.4	5043.4	7139.9	5053.8	0.505
7.6	5051.9	7155.7	5067.9	0.507
7.8	5048.4	7163.9	5082.8	0.508
8	5047.0	7170.5	5093.5	0.509
8.2	5045.3	7176.7	5103.8	0.510
8.4	5051.1	7188.7	5115.0	0.512

8.6	5051.7	7196.4	5125.3	0.513
8.8	5041.9	7193.7	5131.1	0.513
9	5049.7	7205.9	5140.5	0.514
9.2	5046.8	7209.1	5148.0	0.515
9.4	5046.6	7213.8	5154.7	0.515
9.6	5056.4	7225.7	5161.7	0.516
9.8	5053.2	7224.7	5163.5	0.516
10	5051.5	7228.3	5170.2	0.517
10.2	5046.9	7227.6	5173.6	0.517
10.4	5055.2	7234.7	5175.5	0.518
10.6	5047.4	7231.0	5178.0	0.518
10.8	5049.1	7235.0	5181.9	0.518
11	5045.4	7234.9	5185.4	0.519
11.2	5049.3	7240.0	5188.5	0.519
11.4	5050.0	7241.9	5190.7	0.519
11.6	5050.0	7244.3	5194.0	0.519
11.8	5042.0	7240.3	5196.2	0.520
12	5054.3	7251.2	5199.4	0.520
12.2	5054.9	7252.9	5201.2	0.520
12.4	5050.4	7250.2	5201.8	0.520
12.6	5052.2	7251.4	5201.7	0.520
12.8	5050.0	7251.1	5203.4	0.520
13	5055.3	7255.9	5205.0	0.521
13.2	5049.1	7252.0	5205.6	0.521
13.4	5049.9	7253.8	5207.4	0.521
13.6	5049.6	7253.7	5207.4	0.521

13.8	5048.7	7253.8	5208.4	0.521
14	5050.1	7256.0	5210.2	0.521
14.2	5053.7	7259.5	5211.5	0.521
14.4	5046.7	7254.5	5211.4	0.521
14.6	5053.1	7260.0	5212.8	0.521
14.8	5050.0	7255.4	5209.5	0.521
15	5043.5	7252.0	5211.0	0.521
15.2	5044.2	7252.2	5210.6	0.521
15.4	5048.1	7255.9	5211.9	0.521
15.6	5053.4	7261.3	5214.3	0.521
15.8	5044.7	7253.5	5211.9	0.521
16	5048.6	7256.6	5212.4	0.521
16.2	5038.2	7250.5	5214.1	0.521
16.4	5054.2	7262.4	5215.1	0.522
16.6	5055.0	7263.0	5215.2	0.522
16.8	5046.5	7254.9	5212.1	0.521
17	5047.3	7255.5	5212.2	0.521
17.2	5052.2	7259.9	5213.5	0.521
17.4	5048.7	7256.2	5211.8	0.521
17.6	5047.0	7255.3	5212.2	0.521
17.8	5041.5	7251.9	5212.8	0.521
18	5032.2	7245.8	5213.3	0.521
18.2	5051.7	7259.9	5214.0	0.521
18.4	5043.9	7253.9	5213.2	0.521
18.6	5052.3	7259.9	5213.5	0.521
18.8	5047.5	7257.7	5215.1	0.522

19	5048.0	7257.3	5214.1	0.521
19.2	5044.8	7255.3	5214.3	0.521
19.4	5041.0	7251.9	5213.3	0.521
19.6	5054.1	7261.8	5214.4	0.521
19.8	5050.6	7257.4	5211.7	0.521
20	5051.2	7258.2	5212.2	0.521
20.2	5048.3	7256.6	5212.8	0.521
20.4	5041.0	7251.2	5212.3	0.521
20.6	5047.8	7256.3	5212.9	0.521
20.8	5047.8	7256.3	5212.7	0.521
21	5042.0	7251.9	5212.3	0.521
21.2	5058.6	7264.3	5213.6	0.521
21.4	5048.8	7256.4	5211.9	0.521
21.6	5043.8	7253.2	5212.4	0.521
21.8	5051.0	7258.9	5213.3	0.521
22	5038.6	7250.4	5213.5	0.521
22.2	5046.3	7254.8	5212.2	0.521
22.4	5053.7	7260.6	5213.1	0.521
22.6	5042.8	7252.3	5212.1	0.521
22.8	5046.4	7256.5	5214.5	0.521
23	5039.2	7249.8	5212.1	0.521
23.2	5050.5	7259.2	5214.2	0.521
23.4	5051.9	7259.1	5212.7	0.521
23.6	5050.3	7257.1	5211.5	0.521
23.8	5046.5	7254.1	5210.9	0.521
24	5050.6	7257.9	5212.3	0.521

24.2	5044.9	7254.2	5212.7	0.521
24.4	5048.9	7257.0	5212.6	0.521
24.6	5042.5	7252.2	5212.2	0.521
24.8	5045.2	7253.9	5212.0	0.521
25	5040.0	7250.7	5212.6	0.521
25.2	5044.0	7258.6	5219.7	0.522
25.4	5054.3	7259.7	5211.3	0.521
25.6	5051.0	7256.8	5210.4	0.521
25.8	5042.3	7250.8	5210.5	0.521
26	5045.7	7252.5	5209.6	0.521
26.2	5046.6	7253.9	5210.7	0.521
26.4	5040.2	7249.1	5210.1	0.521
26.6	5040.5	7249.9	5211.0	0.521
26.8	5051.2	7257.0	5210.5	0.521
27	5047.4	7254.6	5210.8	0.521
27.2	5047.7	7255.3	5211.6	0.521
27.4	5043.3	7251.8	5210.8	0.521
27.6	5040.4	7249.4	5210.3	0.521
27.8	5050.2	7256.7	5211.0	0.521
28	5056.2	7260.1	5210.0	0.521
28.2	5047.7	7254.0	5209.7	0.521
28.4	5049.9	7256.0	5210.4	0.521
28.6	5053.3	7257.9	5209.8	0.521
28.8	5047.0	7254.7	5211.3	0.521
29	5049.4	7255.6	5210.3	0.521
29.2	5038.4	7248.1	5210.6	0.521

	29.4	5051.3	7257.7	5211.4	0.521
	29.6	5044.4	7252.6	5211.0	0.521
	29.8	5039.4	7248.1	5209.5	0.521
	30	5046.9	7254.3	5210.8	0.521
50% Pn, Q=0 → $Q_{max.}$ under-excited	0	5086.0	5089.3	183.8	0.018
	0.2	5071.8	5078.4	-81.4	-0.008
	0.4	5076.5	5118.5	-654.3	-0.065
	0.6	5067.7	5171.9	-1033.0	-0.103
	0.8	5073.2	5258.3	-1382.9	-0.138
	1	5065.9	5344.9	-1704.3	-0.170
	1.2	5064.5	5444.1	-1997.2	-0.200
	1.4	5061.2	5545.5	-2266.3	-0.227
	1.6	5068.7	5656.5	-2510.9	-0.251
	1.8	5063.5	5771.4	-2769.5	-0.277
	2	5065.9	5871.7	-2968.6	-0.297
	2.2	5060.2	5963.6	-3155.8	-0.316
	2.4	5055.9	6051.5	-3325.3	-0.333
	2.6	5066.0	6147.0	-3481.4	-0.348
	2.8	5055.3	6220.5	-3624.7	-0.362
	3	5055.2	6297.0	-3754.5	-0.375
	3.2	5045.6	6361.1	-3873.6	-0.387
	3.4	5053.7	6430.5	-3976.2	-0.398
	3.6	5051.5	6487.7	-4070.9	-0.407
	3.8	5050.9	6539.4	-4153.4	-0.415
	4	5039.9	6577.6	-4226.5	-0.423
	4.2	5032.6	6614.1	-4291.8	-0.429

4.4	5038.3	6657.5	-4351.8	-0.435
4.6	5035.2	6689.8	-4404.6	-0.440
4.8	5035.4	6747.3	-4491.1	-0.449
5	5033.4	6774.1	-4533.5	-0.453
5.2	5031.0	6797.0	-4570.2	-0.457
5.4	5036.9	6823.7	-4603.5	-0.460
5.6	5033.2	6842.6	-4635.5	-0.464
5.8	5034.2	6861.2	-4661.7	-0.466
6	5024.1	6873.0	-4689.9	-0.469
6.2	5031.1	6893.7	-4712.8	-0.471
6.4	5031.5	6908.6	-4734.2	-0.473
6.6	5029.4	6920.7	-4754.0	-0.475
6.8	5027.2	6931.6	-4772.2	-0.477
7	5036.5	6949.3	-4788.2	-0.479
7.2	5032.0	6957.0	-4804.0	-0.480
7.4	5034.3	6967.5	-4816.7	-0.482
7.6	5025.3	6972.1	-4832.9	-0.483
7.8	5034.0	6986.5	-4844.5	-0.484
8	5028.6	6989.6	-4854.6	-0.485
8.2	5026.0	6994.9	-4864.9	-0.486
8.4	5020.5	6996.1	-4872.3	-0.487
8.6	5032.5	7010.6	-4880.7	-0.488
8.8	5029.5	7012.4	-4886.4	-0.489
9	5028.0	7015.3	-4892.2	-0.489
9.2	5023.6	7017.5	-4899.8	-0.490
9.4	5025.0	7022.4	-4905.3	-0.491

9.6	5013.8	7017.7	-4910.1	-0.491
9.8	5032.5	7034.1	-4914.5	-0.491
10	5030.7	7032.9	-4914.6	-0.491
10.2	5030.6	7035.7	-4918.7	-0.492
10.4	5023.8	7033.8	-4922.9	-0.492
10.6	5016.0	7032.9	-4929.6	-0.493
10.8	5012.8	7032.3	-4932.1	-0.493
11	5025.9	7043.7	-4934.8	-0.493
11.2	5031.5	7045.9	-4932.4	-0.493
11.4	5029.1	7045.1	-4933.7	-0.493
11.6	5020.1	7039.6	-4935.0	-0.494
11.8	5022.3	7043.3	-4938.0	-0.494
12	5027.1	7047.7	-4939.3	-0.494
12.2	5026.3	7047.9	-4940.5	-0.494
12.4	5030.3	7052.1	-4942.3	-0.494
12.6	5024.5	7048.7	-4943.6	-0.494
12.8	5026.5	7050.7	-4944.4	-0.494
13	5025.0	7049.7	-4944.3	-0.494
13.2	5023.8	7050.8	-4947.1	-0.495
13.4	5025.2	7050.1	-4944.8	-0.494
13.6	5019.9	7047.3	-4946.0	-0.495
13.8	5029.2	7054.4	-4946.8	-0.495
14	5031.8	7057.6	-4948.7	-0.495
14.2	5028.3	7055.0	-4948.6	-0.495
14.4	5025.0	7052.7	-4948.7	-0.495
14.6	5016.8	7047.9	-4950.1	-0.495

14.8	5032.8	7058.9	-4949.7	-0.495
15	5027.1	7055.9	-4951.1	-0.495
15.2	5029.1	7057.4	-4951.2	-0.495
15.4	5026.3	7055.5	-4951.4	-0.495
15.6	5031.5	7058.7	-4950.6	-0.495
15.8	5021.7	7052.7	-4952.0	-0.495
16	5023.9	7053.8	-4951.3	-0.495
16.2	5016.6	7049.1	-4952.1	-0.495
16.4	5022.8	7054.1	-4952.9	-0.495
16.6	5020.4	7052.4	-4952.8	-0.495
16.8	5026.9	7056.0	-4951.5	-0.495
17	5024.3	7055.0	-4952.6	-0.495
17.2	5028.0	7058.6	-4954.1	-0.495
17.4	5026.0	7056.8	-4953.6	-0.495
17.6	5029.1	7058.7	-4953.0	-0.495
17.8	5029.8	7059.4	-4953.3	-0.495
18	5027.8	7058.2	-4953.7	-0.495
18.2	5029.2	7059.3	-4953.7	-0.495
18.4	5022.0	7054.9	-4954.8	-0.495
18.6	5026.7	7057.2	-4953.4	-0.495
18.8	5031.2	7061.0	-4954.2	-0.495
19	5021.3	7053.9	-4954.1	-0.495
19.2	5031.2	7060.7	-4953.8	-0.495
19.4	5027.8	7057.9	-4953.2	-0.495
19.6	5027.8	7058.7	-4954.3	-0.495
19.8	5030.4	7060.3	-4954.0	-0.495

20	5021.2	7054.4	-4954.9	-0.495
20.2	5023.8	7055.1	-4953.3	-0.495
20.4	5028.1	7058.5	-4953.8	-0.495
20.6	5028.7	7059.4	-4954.5	-0.495
20.8	5028.8	7059.5	-4954.6	-0.495
21	5026.2	7057.7	-4954.7	-0.495
21.2	5031.4	7060.4	-4953.2	-0.495
21.4	5033.6	7063.6	-4955.6	-0.496
21.6	5029.5	7060.7	-4955.5	-0.496
21.8	5029.1	7059.9	-4954.7	-0.495
22	5032.9	7062.1	-4954.0	-0.495
22.2	5023.1	7055.7	-4954.9	-0.495
22.4	5031.3	7061.0	-4954.1	-0.495
22.6	5029.3	7060.3	-4955.1	-0.496
22.8	5029.3	7059.9	-4954.5	-0.495
23	5023.5	7056.3	-4955.4	-0.496
23.2	5028.6	7059.1	-4954.2	-0.495
23.4	5030.3	7060.3	-4954.1	-0.495
23.6	5032.5	7062.2	-4954.6	-0.495
23.8	5027.3	7059.0	-4955.3	-0.496
24	5032.3	7062.6	-4955.3	-0.496
24.2	5032.5	7061.9	-4954.1	-0.495
24.4	5028.6	7059.8	-4955.1	-0.496
24.6	5028.6	7059.7	-4954.9	-0.495
24.8	5028.1	7059.3	-4954.8	-0.495
25	5026.5	7058.6	-4955.6	-0.496

	25.2	5030.4	7061.6	-4955.8	-0.496
	25.4	5032.1	7061.9	-4954.6	-0.495
	25.6	5028.0	7058.5	-4953.9	-0.495
	25.8	5031.3	7061.2	-4954.3	-0.495
	26	5030.6	7061.2	-4955.1	-0.496
	26.2	5027.4	7059.2	-4955.5	-0.496
	26.4	5034.1	7063.7	-4955.1	-0.496
	26.6	5024.3	7056.4	-4954.6	-0.495
	26.8	5028.4	7058.6	-4953.7	-0.495
	27	5019.4	7052.5	-4954.1	-0.495
	27.2	5032.5	7061.1	-4953.0	-0.495
	27.4	5029.3	7060.6	-4955.6	-0.496
	27.6	5029.1	7060.1	-4955.1	-0.496
	27.8	5021.0	7054.4	-4955.3	-0.496
	28	5024.9	7056.8	-4954.6	-0.495
	28.2	5028.7	7058.9	-4953.7	-0.495
	28.4	5024.2	7056.2	-4954.5	-0.495
	28.6	5028.9	7060.0	-4955.2	-0.496
	28.8	5024.8	7056.6	-4954.5	-0.495
	29	5023.6	7055.6	-4954.2	-0.495
	29.2	5024.5	7055.7	-4953.4	-0.495
	29.4	5022.3	7055.0	-4954.7	-0.495
	29.6	5027.2	7058.2	-4954.3	-0.495
	29.8	5037.9	7066.0	-4954.5	-0.495
	30	5031.5	7061.9	-4955.2	-0.496

Flicker			**P**
Rated voltage: 230V			
Reference impedance used:	0.24/0.16+0.15/0.10j	Angle of impedance:	30°
Plt	0.33	CΨk max	2.04
Test No.	Power Ouput [%]	Pst	CΨk
1	100	0.33	1.98
2	100	0.34	2.04
3	100	0.33	1.98
4	100	0.32	1.92
5	100	0.33	1.98
6	100	0.33	1.98
7	100	0.33	1.98
8	100	0.33	1.98
9	100	0.33	1.98
10	100	0.32	1.92
11	100	0.34	2.04
12	100	0.33	1.98
Remark: The worst case of three phases was selected.			

Harmonics and inter-harmonics											
Active power P/Pn [%]	0	10	20	30	40	50	60	70	80	90	100
Harmonic number	I[%]	I[%]	I[%]	I[%]	I[%]	I[%]	I[%]	I[%]	I[%]	I[%]	I[%]
2	0.441	0.267	0.169	0.237	0.285	0.326	0.407	0.435	0.419	0.464	0.649
3	1.476	1.288	0.953	0.789	0.807	0.854	0.960	1.156	1.407	1.716	2.143
4	0.178	0.088	0.048	0.037	0.037	0.033	0.056	0.049	0.046	0.062	0.060
5	0.686	0.699	0.646	0.372	0.283	0.195	0.155	0.116	0.165	0.296	0.443
6	0.058	0.039	0.034	0.046	0.032	0.031	0.036	0.036	0.035	0.030	0.027
7	0.646	0.546	0.554	0.419	0.320	0.261	0.255	0.272	0.265	0.263	0.306
8	0.051	0.029	0.019	0.029	0.026	0.026	0.042	0.032	0.027	0.035	0.025
9	0.312	0.261	0.213	0.219	0.180	0.142	0.140	0.139	0.111	0.104	0.093
10	0.023	0.019	0.014	0.014	0.029	0.020	0.030	0.029	0.027	0.025	0.020
11	0.313	0.320	0.242	0.277	0.225	0.179	0.167	0.172	0.159	0.142	0.136
12	0.020	0.016	0.011	0.014	0.017	0.023	0.026	0.022	0.027	0.025	0.018

13	0.226	0.241	0.224	0.225	0.200	0.164	0.161	0.162	0.141	0.115	0.109
14	0.018	0.016	0.013	0.016	0.013	0.021	0.031	0.026	0.020	0.018	0.013
15	0.147	0.148	0.146	0.136	0.119	0.099	0.090	0.090	0.085	0.074	0.056
16	0.018	0.013	0.010	0.011	0.013	0.017	0.027	0.024	0.023	0.020	0.014
17	0.143	0.168	0.166	0.150	0.151	0.134	0.134	0.135	0.123	0.086	0.066
18	0.021	0.040	0.049	0.012	0.013	0.016	0.025	0.021	0.020	0.019	0.050
19	0.131	0.153	0.148	0.136	0.138	0.115	0.104	0.104	0.091	0.073	0.062
20	0.018	0.012	0.008	0.008	0.013	0.016	0.028	0.023	0.018	0.016	0.012
21	0.102	0.098	0.097	0.088	0.101	0.094	0.098	0.097	0.085	0.065	0.048
22	0.018	0.012	0.010	0.009	0.013	0.016	0.029	0.024	0.020	0.014	0.012
23	0.125	0.121	0.117	0.101	0.112	0.096	0.089	0.087	0.076	0.061	0.053
24	0.020	0.013	0.009	0.010	0.026	0.075	0.038	0.037	0.036	0.068	0.012
25	0.091	0.097	0.099	0.100	0.101	0.098	0.102	0.106	0.092	0.071	0.068
26	0.021	0.036	0.011	0.009	0.011	0.019	0.031	0.029	0.021	0.018	0.013
27	0.136	0.125	0.127	0.110	0.117	0.115	0.108	0.107	0.093	0.068	0.058
28	0.024	0.015	0.011	0.012	0.014	0.021	0.034	0.031	0.023	0.017	0.013
29	0.100	0.091	0.090	0.092	0.093	0.097	0.100	0.100	0.090	0.074	0.063
30	0.024	0.016	0.013	0.011	0.013	0.024	0.048	0.039	0.026	0.018	0.020
31	0.094	0.088	0.082	0.085	0.085	0.085	0.078	0.076	0.073	0.061	0.058
32	0.023	0.017	0.011	0.011	0.012	0.021	0.036	0.040	0.029	0.021	0.019
33	0.070	0.079	0.082	0.090	0.091	0.106	0.113	0.120	0.114	0.093	0.082
34	0.022	0.015	0.011	0.011	0.011	0.028	0.034	0.035	0.039	0.022	0.025
35	0.084	0.071	0.070	0.075	0.073	0.082	0.085	0.091	0.085	0.070	0.060
36	0.032	0.025	0.028	0.022	0.022	0.028	0.032	0.034	0.025	0.018	0.028
37	0.090	0.074	0.065	0.078	0.075	0.089	0.096	0.096	0.081	0.066	0.053
38	0.046	0.030	0.026	0.039	0.030	0.056	0.045	0.045	0.030	0.025	0.027
39	0.051	0.047	0.043	0.042	0.041	0.039	0.037	0.045	0.044	0.041	0.041
40	0.037	0.032	0.025	0.031	0.036	0.044	0.054	0.045	0.041	0.032	0.028

Intern-harmonics											
Active Power P/Pn [%]	0	10	20	30	40	50	60	70	80	90	100
Frequency [Hz]	I[%]	I[%]	I[%]	I[%]	I[%]	I[%]	I[%]	I[%]	I[%]	I[%]	I[%]
75	0.031	0.126	0.153	0.198	0.195	0.195	0.205	0.238	0.242	0.270	0.221
125	0.016	0.026	0.029	0.031	0.028	0.033	0.047	0.039	0.044	0.065	0.065
175	0.016	0.024	0.028	0.025	0.020	0.025	0.033	0.026	0.032	0.043	0.041
225	0.012	0.018	0.020	0.018	0.018	0.021	0.026	0.022	0.025	0.032	0.031
275	0.012	0.017	0.016	0.016	0.017	0.020	0.023	0.019	0.023	0.031	0.025
325	0.014	0.017	0.015	0.017	0.018	0.021	0.023	0.020	0.022	0.028	0.022

375	0.011	0.014	0.014	0.014	0.014	0.017	0.019	0.017	0.018	0.022	0.018
425	0.012	0.013	0.013	0.014	0.014	0.018	0.019	0.017	0.018	0.021	0.018
475	0.011	0.011	0.011	0.012	0.012	0.015	0.017	0.015	0.016	0.018	0.015
525	0.011	0.011	0.010	0.011	0.011	0.014	0.016	0.014	0.016	0.016	0.014
575	0.011	0.011	0.010	0.011	0.011	0.014	0.015	0.013	0.014	0.015	0.013
625	0.011	0.011	0.009	0.010	0.010	0.012	0.014	0.012	0.013	0.013	0.012
675	0.010	0.011	0.009	0.010	0.010	0.013	0.014	0.013	0.014	0.013	0.011
725	0.010	0.011	0.009	0.009	0.009	0.012	0.013	0.013	0.015	0.013	0.013
775	0.010	0.010	0.009	0.009	0.009	0.012	0.012	0.011	0.012	0.013	0.010
825	0.011	0.011	0.009	0.010	0.011	0.014	0.020	0.023	0.020	0.020	0.019
875	0.012	0.013	0.013	0.051	0.056	0.016	0.012	0.011	0.012	0.044	0.023
925	0.054	0.056	0.013	0.010	0.011	0.010	0.012	0.013	0.015	0.017	0.019
975	0.011	0.011	0.010	0.009	0.010	0.011	0.012	0.010	0.010	0.011	0.010
1025	0.010	0.010	0.008	0.012	0.009	0.010	0.012	0.010	0.010	0.010	0.011
1075	0.009	0.009	0.009	0.010	0.009	0.010	0.012	0.010	0.010	0.009	0.010
1125	0.009	0.009	0.011	0.011	0.010	0.011	0.012	0.011	0.011	0.011	0.011
1175	0.009	0.009	0.011	0.012	0.012	0.038	0.087	0.084	0.081	0.017	0.012
1225	0.011	0.012	0.013	0.080	0.086	0.017	0.015	0.014	0.013	0.041	0.014
1275	0.012	0.082	0.097	0.014	0.011	0.012	0.014	0.012	0.012	0.011	0.085
1325	0.043	0.094	0.014	0.014	0.012	0.015	0.017	0.015	0.013	0.013	0.015
1375	0.033	0.014	0.014	0.015	0.014	0.017	0.017	0.015	0.015	0.012	0.015
1425	0.018	0.019	0.019	0.022	0.020	0.020	0.021	0.019	0.018	0.019	0.017
1475	0.014	0.015	0.018	0.015	0.017	0.016	0.018	0.015	0.014	0.015	0.018
1525	0.018	0.022	0.020	0.019	0.022	0.022	0.024	0.024	0.024	0.025	0.024
1575	0.014	0.017	0.015	0.014	0.015	0.018	0.020	0.019	0.018	0.019	0.018
1625	0.017	0.018	0.016	0.017	0.019	0.024	0.024	0.025	0.027	0.030	0.026
1675	0.016	0.015	0.015	0.014	0.015	0.018	0.036	0.039	0.037	0.020	0.026
1725	0.024	0.023	0.019	0.020	0.031	0.026	0.025	0.034	0.029	0.046	0.024
1775	0.024	0.021	0.018	0.026	0.017	0.019	0.022	0.026	0.025	0.023	0.030
1825	0.027	0.033	0.025	0.023	0.024	0.022	0.031	0.021	0.021	0.028	0.023
1875	0.023	0.021	0.021	0.020	0.020	0.026	0.033	0.031	0.037	0.037	0.041
1925	0.046	0.060	0.053	0.044	0.060	0.028	0.025	0.023	0.024	0.028	0.025
1975	0.025	0.025	0.022	0.023	0.025	0.025	0.028	0.039	0.051	0.052	0.056

Higher frequencies											
Active Power P/Pn [%]	0	10	20	30	40	50	60	70	80	90	100
Frequency [kHz]	I[%]	I[%]	I[%]	I[%]	I[%]	I[%]	I[%]	I[%]	I[%]	I[%]	I[%]
2.1	0.114	0.113	0.105	0.106	0.105	0.117	0.130	0.150	0.148	0.140	0.126
2.3	0.126	0.124	0.122	0.120	0.123	0.123	0.128	0.115	0.115	0.117	0.122
2.5	0.060	0.058	0.058	0.058	0.056	0.055	0.057	0.059	0.059	0.062	0.064
2.7	0.030	0.028	0.027	0.028	0.028	0.027	0.027	0.028	0.032	0.033	0.035
2.9	0.024	0.023	0.023	0.022	0.023	0.022	0.022	0.022	0.024	0.025	0.026
3.1	0.022	0.021	0.020	0.020	0.021	0.021	0.020	0.020	0.021	0.022	0.023
3.3	0.022	0.020	0.020	0.020	0.021	0.021	0.021	0.020	0.021	0.022	0.022
3.5	0.021	0.019	0.020	0.019	0.020	0.020	0.020	0.020	0.020	0.021	0.021
3.7	0.022	0.021	0.021	0.021	0.021	0.021	0.021	0.021	0.021	0.022	0.022
3.9	0.020	0.018	0.019	0.018	0.018	0.019	0.019	0.019	0.019	0.020	0.020
4.1	0.017	0.015	0.015	0.015	0.016	0.016	0.016	0.016	0.016	0.017	0.017
4.3	0.016	0.015	0.014	0.014	0.014	0.014	0.015	0.015	0.015	0.015	0.015
4.5	0.015	0.013	0.013	0.013	0.013	0.014	0.013	0.013	0.014	0.014	0.014
4.7	0.026	0.024	0.024	0.024	0.024	0.024	0.024	0.025	0.026	0.027	0.026
4.9	0.019	0.017	0.017	0.017	0.017	0.017	0.023	0.029	0.030	0.030	0.030
5.1	0.030	0.028	0.028	0.028	0.028	0.029	0.024	0.018	0.020	0.021	0.022
5.3	0.019	0.017	0.017	0.017	0.018	0.018	0.023	0.032	0.033	0.034	0.034
5.5	0.035	0.034	0.034	0.033	0.033	0.034	0.029	0.020	0.020	0.020	0.021
5.7	0.023	0.021	0.022	0.022	0.022	0.022	0.022	0.023	0.023	0.024	0.024
5.9	0.022	0.020	0.021	0.021	0.021	0.021	0.021	0.022	0.023	0.024	0.024
6.1	0.028	0.026	0.026	0.026	0.026	0.026	0.027	0.027	0.027	0.028	0.029
6.3	0.021	0.019	0.020	0.020	0.020	0.020	0.020	0.020	0.021	0.021	0.022
6.5	0.021	0.019	0.020	0.020	0.020	0.021	0.021	0.030	0.038	0.037	0.040
6.7	0.030	0.028	0.026	0.031	0.031	0.033	0.035	0.035	0.040	0.040	0.041
6.9	0.030	0.029	0.029	0.029	0.029	0.030	0.031	0.032	0.033	0.032	0.033
7.1	0.030	0.029	0.029	0.029	0.030	0.030	0.028	0.029	0.030	0.030	0.031
7.3	0.021	0.020	0.020	0.019	0.020	0.020	0.021	0.022	0.022	0.022	0.022
7.5	0.020	0.019	0.019	0.019	0.019	0.020	0.016	0.013	0.012	0.012	0.012
7.7	0.012	0.011	0.011	0.011	0.011	0.011	0.011	0.011	0.011	0.011	0.011
7.9	0.008	0.006	0.006	0.006	0.006	0.006	0.006	0.009	0.011	0.010	0.011
8.1	0.009	0.008	0.007	0.008	0.009	0.009	0.009	0.009	0.007	0.008	0.007
8.3	0.010	0.008	0.008	0.007	0.006	0.006	0.006	0.008	0.009	0.008	0.009
8.5	0.008	0.007	0.006	0.007	0.007	0.008	0.008	0.007	0.006	0.007	0.006
8.7	0.008	0.006	0.006	0.005	0.004	0.004	0.004	0.004	0.004	0.004	0.004
8.9	0.004	0.003	0.003	0.003	0.003	0.003	0.003	0.003	0.003	0.003	0.003