

C E R T I F I C A T E
of Conformity



Registration No.: AK 60104856 0001

Report No.: 28108202 001

Holder: Fronius International GmbH
Guenter Fronius-Str. 1
4600 Wels - Thalheim
Austria

Product: PV-Inverter
Solar grid tied inverter

Identification: Trademark: FRONIUS
Model: Fronius Primo 3.0-1 ; Fronius Primo 3.5-1
Fronius Primo 3.6-1 ; Fronius Primo 4.0-1
Fronius Primo 4.6-1 ; Fronius Primo 5.0-1
Fronius Primo 5.0-1 AUS
Fronius Primo 6.0-1 ; Fronius Primo 8.2-1

Attachment: Annex to Certificate

Tested acc. to: EN 50438:2013

The certificate of conformity refers to the above mentioned product. This is to certify that the specimen is in conformity with the assessment requirement mentioned above. This certificate does not imply assessment of the production of the product and does not permit the use of a TÜV Rheinland mark of conformity.

Date 29.09.2015

Certification Body


Marco Piva


TÜV Rheinland LGA Products GmbH - Tillystraße 2 - 90431 Nürnberg

Annex to Certificate



Registration No.: AK 60104856 0001

Report No.: 28108202 001

E.1 General Details

E.1.1 Micro-generator details

Models of the same family:

Fronius Primo 8.2-1
Fronius Primo 6.0-1
Fronius Primo 5.0-1
Fronius Primo 4.6-1
Fronius Primo 4.0-1
Fronius Primo 3.6-1
Fronius Primo 3.5-1
Fronius Primo 3.0-1

Fronius Primo 5.0-1 AUS.

FRONIUS International GmbH
Guenter Fronius-Str.1
A-4600 Wels-Thalheim _ Austria

E.1.2 Test house details

Name and address of test house	TÜV Rheinland Italia S.r.l. Via Mattei, 3 - 20010 Pogliano Milanese (MI) - Italy
Telephone number	Tel: +39.02.939 687
Facsimile number	Fax: +39.02.939 687 23
E-mail address	info@it.tuv.com

E.1.3 Test details

Date of test	See First Page
Name of test Engineer	Alessandro Luciani
Signature of test Engineer	See First Page
Test location (if different from above)	See above

Annex to Certificate



Registration No.: AK 60104856 0001

Report No.: 28108202 001

E.2 Type testing of the interface protection

E.2.1 General

If the interface protection is considered as a dedicated device external to the micro-generator, only the operate time of the interface protection can be evaluated. In this case, the opening time of the interface switch shall be taken into account when evaluating the compliance with this European Standard.

E.2.2 Over / Under frequency

Parameter	Under frequency		Over frequency	
	Frequency [Hz]	Time[s]	Frequency [Hz]	Time[s]
Protection Limit	47.00	0.5	51.00	0.5
Trip Value	46.99	0.47	51.04	0.47
Supplementary information: none				

Annex to Certificate



Registration No.: AK 60104856 0001

Report No.: 28108202 001

E.2.3 Over / Under voltage

Parameter	Under Voltage		Over Voltage	
	Voltage [V]	Time [s]	Voltage [V]	Time [s]
Protection Limit	195.5 (230 V -15%)	0.2	264.5 (230 V +15%)	0.2
Trip Value	195.4	0.174	260.4	0.166

Supplementary information: none

Parameter	Over Voltage		Remarks
	Voltage [V]	Time [s]	
Protection Limit	255.3 (230 V +11%)	60	--
Trip Value	255.3	53	--

Supplementary information: none

E.2.4 Loss of main (LoM)

No	P_{EUT}^1 (%) (% of EUT rating)	Reactive load (% of Q_L in 6.1.d)1)	P_{AC}^2 (%) (% of nominal)	Q_{AC}^3 (%) (% of nominal)	Run on time (ms)**	P_{EUT} (W)	V_{DC} (V)	Remarks ⁴⁾	Verdict
1	100	100	0	0	399	8200	624	Test A at BL	Pass
2	66	66	0	0	403	5412	479	Test B at BL	Pass
3	33	33	0	0	251	2706	412	Test C at BL	Pass
4	100	100	-5	-5	392	8200	624	Test A at IB	Pass
5	100	100	-5	0	130	8200	625	Test A at IB	Pass
6	100	100	-5	5	127	8200	625	Test A at IB	Pass
7	100	100	0	-5	201	8200	625	Test A at IB	Pass
8	100	100	0	5	74	8200	625	Test A at IB	Pass
9	100	66	5	-5	181	8200	624	Test A at IB	Pass
10	100	66	5	0	302	8200	623	Test A at IB	Pass
11	100	66	5	5	367	8200	624	Test A at IB	Pass
12	66	66	0	-3	195	5412	487	Test B at IB	Pass
13	66	66	0	-3	169	5412	483	Test B at IB	Pass
14	66	66	0	-2	373	5412	488	Test B at IB	Pass
15	66	66	0	-1	333	5412	485	Test B at IB	Pass
16	66	66	0	-1	218	5412	484	Test B at IB	Pass
17	66	66	0	1	309	5412	484	Test B at IB	Pass
18	66	66	0	1	175	5412	483	Test B at IB	Pass
19	66	66	0	2	361	5412	484	Test B at IB	Pass
20	66	66	0	3	234	5412	485	Test A at IB	Pass
21	66	66	0	3	135	5412	483	Test B at IB	Pass
22	33	33	0	-2	134	2706	412	Test C at IB	Pass
23	33	33	0	-1	190	2706	413	Test C at IB	Pass
24	33	33	0	-1	188	2706	413	Test C at IB	Pass
25	33	33	0	-1	116	2706	412	Test C at IB	Pass
26	33	33	0	0	180	2706	413	Test C at IB	Pass
27	33	33	0	0	153	2706	413	Test C at IB	Pass
28	33	33	0	1	152	2706	412	Test C at IB	Pass
29	33	33	0	1	221	2706	413	Test C at IB	Pass
30	33	33	0	1	69	2706	413	Test C at IB	Pass
31	33	33	0	2	233	2706	413	Test C at IB	Pass

¹⁾ P_{EUT} : EUT output power

²⁾ P_{AC} : Real power flow at S1 as in Figure 1. Positive value means the power from EUT to utility. Nominal value is the 0% test condition value.

³⁾ Q_{AC} : Reactive power flow at S1 as in Figure 1. Positive value means the power from EUT to utility. Nominal value is the 0% test condition value

⁴⁾ BL: Balance condition, IB: Imbalance condition

*: Needs to be measured if any of the recorded run-on times at imbalanced condition are longer than the one recorded for the rated balance condition at test condition A

** "Run on time" must be < 2s

The filled out switch-off time values the highest among the three phase

Test performed @ 50Hz

Annex to Certificate



Registration No.: AK 60104856 0001

Report No.: 28108202 001

E.3 Type testing of a micro-generator

E.3.1 Operating range

Test sequence	Voltage [V]	Frequency [Hz]	Output power [W]	Primary power Source [W]
Test 1	195.6	47.5	7309	7480
Test 2	253.3	51.5	7350	7580

E.3.2 Active power feed-in at under-frequency

Test sequence	Output Power [W]	Frequency [Hz]	Primary power Source [W]
Test a)	7238	50.00	7580
Test b)	7237	49.65	7460
Test c)	7238	47.55	7465

Annex to Certificate



Registration No.: AK 60104856 0001

Report No.: 28108202 001

E.3.3 Power response to over-frequency

Test sequence at power level >80%	Output Power [W]	Frequency [Hz]	Primary Power Source [W]	Power Gradient [W/Hz]
Test a)	7250	50.00	7500	-
Test b)	7130	50.25	7500	-
Test c)	5840	50.70	7500	-
Test d)	4520	51.15	7500	-
Test e)	4520	50.70	7500	-
Test f)	4520	50.25	7500	-
Test g)	7240	50.00	7500	9.6% P _n min ⁻¹

Test sequence at power level 40%-60%	Output Power [W]	Frequency [Hz]	Primary Power Source [W]	Power Gradient [W/Hz]
Test a)	3680	50.00	3800	-
Test b)	3600	50.25	3800	-
Test c)	2930	50.70	3800	-
Test d)	2280	51.15	3800	-
Test e)	2940	50.70	3800	-
Test f)	3596	50.25	3800	-
Test g)	3669	50.00	3800	9.6% P _n min ⁻¹

Annex to Certificate

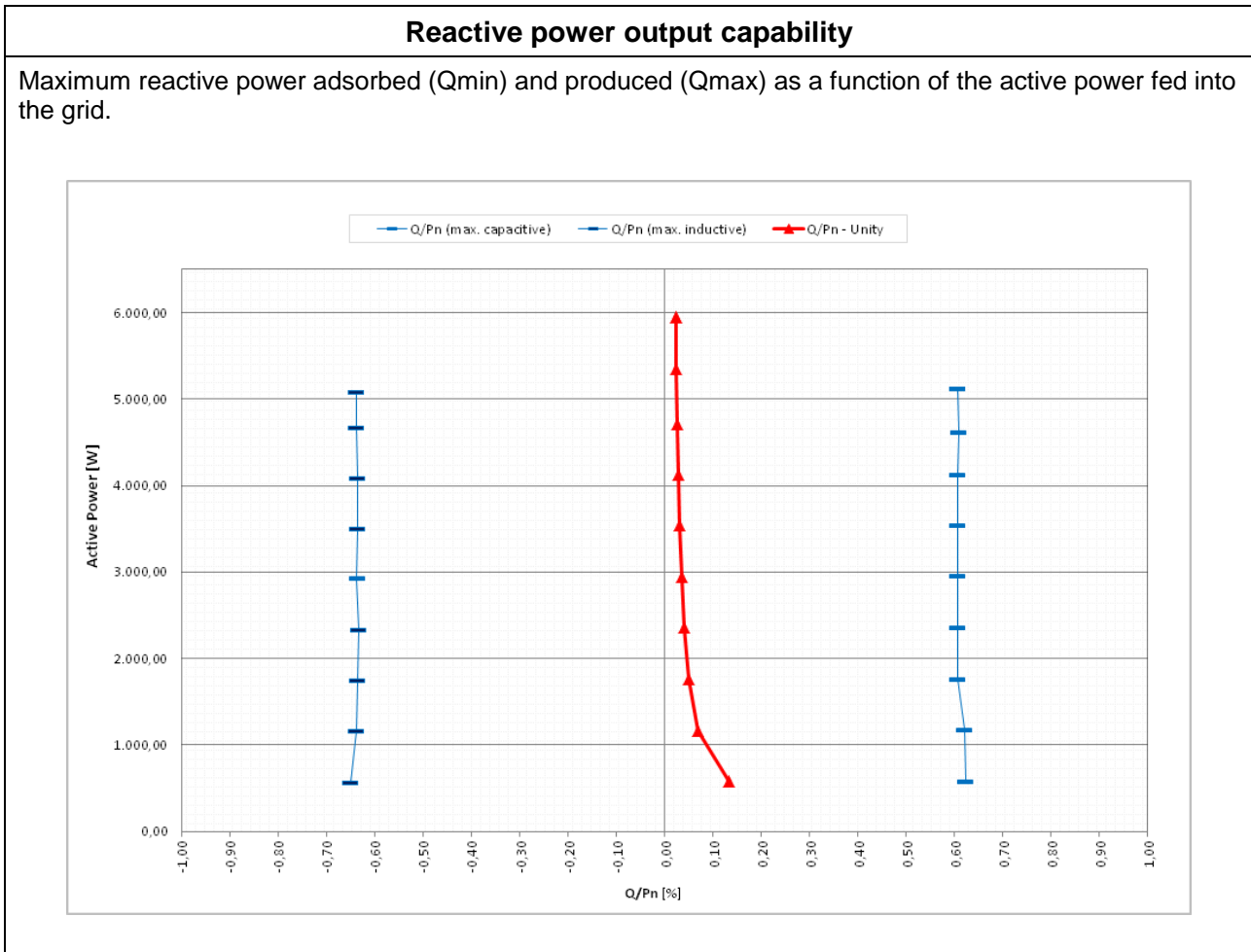


Registration No.: AK 60104856 0001

Report No.: 28108202 001

E.3.4 Reactive power capability

E.3.4.2 Reactive power output capability



Annex to Certificate



Registration No.: AK 60104856 0001

Report No.: 28108202 001

Adsorption of inductive reactive power

Power-Bin		Active power [W]	Reactive Power [VAr]	Power Factor (cosφ)	DC Power [W]
0 % - 10 %	no. 1	580	360	0.8495	650
	no. 2	579	362	0.8478	650
	no. 3	577	359	0.8493	650
10 % - 20 %	no. 1	1174	730	0.8501	1260
	no. 2	1178	732	0.8500	1260
	no. 3	1170	726	0.8502	1260
20 % - 30 %	no. 1	1769	1076	0.8542	1830
	no. 2	1768	1073	0.8547	1820
	no. 3	1770	1075	0.8564	1830
30 % - 40 %	no. 1	2362	1426	0.8550	2420
	no. 2	2360	1425	0.8552	2410
	no. 3	2355	1435	0.8537	2400
40 % - 50 %	no. 1	2950	1785	0.8542	3030
	no. 2	2953	1790	0.8567	3030
	no. 3	2951	1792	0.8568	3070
50 % - 60 %	no. 1	3540	2140	0.8538	3570
	no. 2	3541	2150	0.8540	3540
	no. 3	3542	2147	0.8538	3570
60 % - 70 %	no. 1	4130	2490	0.8555	4120
	no. 2	4128	2515	0.8538	4160
	no. 3	4130	2509	0.8549	4150
70 % - 80 %	no. 1	4720	2855	0.8537	4800
	no. 2	5717	2862	0.8541	4860
	no. 3	4715	2859	0.8558	4840
80 % - 90 %	no. 1	5120	3090	0.8555	5300
	no. 2	5122	3098	0.8540	5350
	no. 3	5117	3112	0.8557	5400
90 % - 100 %	no. 1	5116	3085	0.8540	5170
	no. 2	5126	3116	0.8564	5150
	no. 3	5128	3129	0.8542	5100

Adsorption of capacitive reactive power

Power-Bin		Active power [W]	Reactive Power [VAr]	Power Factor (cosφ)	DC Power [W]
0 % - 10 %	no. 1	575	-370	0.8369	650
	no. 2	572	-378	0.8374	640
	no. 3	576	-373	0.8388	650
10 % - 20 %	no. 1	1160	-740	0.8444	1220
	no. 2	1162	-747	0.8416	1230
	no. 3	1164	-742	0.8429	1230
20 % - 30 %	no. 1	1750	-1115	0.8445	1860
	no. 2	1748	-1111	0.8440	1860
	no. 3	1751	-1117	0.8422	1860
30 % - 40 %	no. 1	2336	-1478	0.8444	2420
	no. 2	2337	-1473	0.8446	2420
	no. 3	2330	-1480	0.8436	2410
40 % - 50 %	no. 1	2922	-1870	0.8450	3120
	no. 2	2921	-1855	0.8423	3110
	no. 3	2918	-1859	0.8447	3120
50 % - 60 %	no. 1	3508	-2230	0.8437	3740
	no. 2	3506	-2227	0.8442	3700
	no. 3	3507	-2231	0.8435	3750
60 % - 70 %	no. 1	4090	-2600	0.8434	4310
	no. 2	4088	-2611	0.8432	4290
	no. 3	4091	-2605	0.8430	4290
70 % - 80 %	no. 1	4670	-2971	0.8425	4840
	no. 2	4667	-2985	0.8440	4800
	no. 3	4673	-2973	0.8443	4810
80 % - 90 %	no. 1	5083	-3240	0.8420	5400
	no. 2	5089	-3237	0.8434	5270
	no. 3	5085	-3252	0.8414	5310
90 % - 100 %	no. 1	5084	-3260	0.8413	5038
	no. 2	5088	-3245	0.8421	5400
	no. 3	5087	-3241	0.8420	5420

Annex to Certificate



Registration No.: AK 60104856 0001

Report No.: 28108202 001

Reactive power production with set point Q = 0

Power-Bin		Active power [W]	Reactive Power [VAr]	Power Factor (cosφ)	DC Power [W]
0 % - 10 %	no. 1	572	77	0.9915	640
	no. 2	580	75	0.9914	650
	no. 3	578	76	0.9912	650
10 % - 20 %	no. 1	1170	79	0.9977	1240
	no. 2	1173	79	0.9976	1250
	no. 3	1165	80	0.9977	1250
20 % - 30 %	no. 1	1765	85	0.9988	1840
	no. 2	1764	86	0.9988	1840
	no. 3	1762	87	0.9988	1820
30 % - 40 %	no. 1	2355	94	0.9992	2470
	no. 2	2352	96	0.9992	2450
	no. 3	2356	93	0.9992	2460
40 % - 50 %	no. 1	2945	105	0.9994	3100
	no. 2	2947	105	0.9994	3080
	no. 3	2946	103	0.9994	3110
50 % - 60 %	no. 1	3538	110	0.9995	3590
	no. 2	3534	111	0.9995	3550
	no. 3	3537	110	0.9995	3600
60 % - 70 %	no. 1	4126	115	0.9996	4140
	no. 2	4124	117	0.9996	4240
	no. 3	4125	118	0.9996	4180
70 % - 80 %	no. 1	4711	125	0.9997	4780
	no. 2	4715	125	0.9997	4710
	no. 3	4713	126	0.9997	4780
80 % - 90 %	no. 1	5355	128	0.9997	5460
	no. 2	5350	126	0.9997	5460
	no. 3	5354	127	0.9997	5500
90 % - 100 %	no. 1	5940	131	0.9998	6200
	no. 2	5942	137	0.9997	6250
	no. 3	5941	138	0.9997	6130

Annex to Certificate

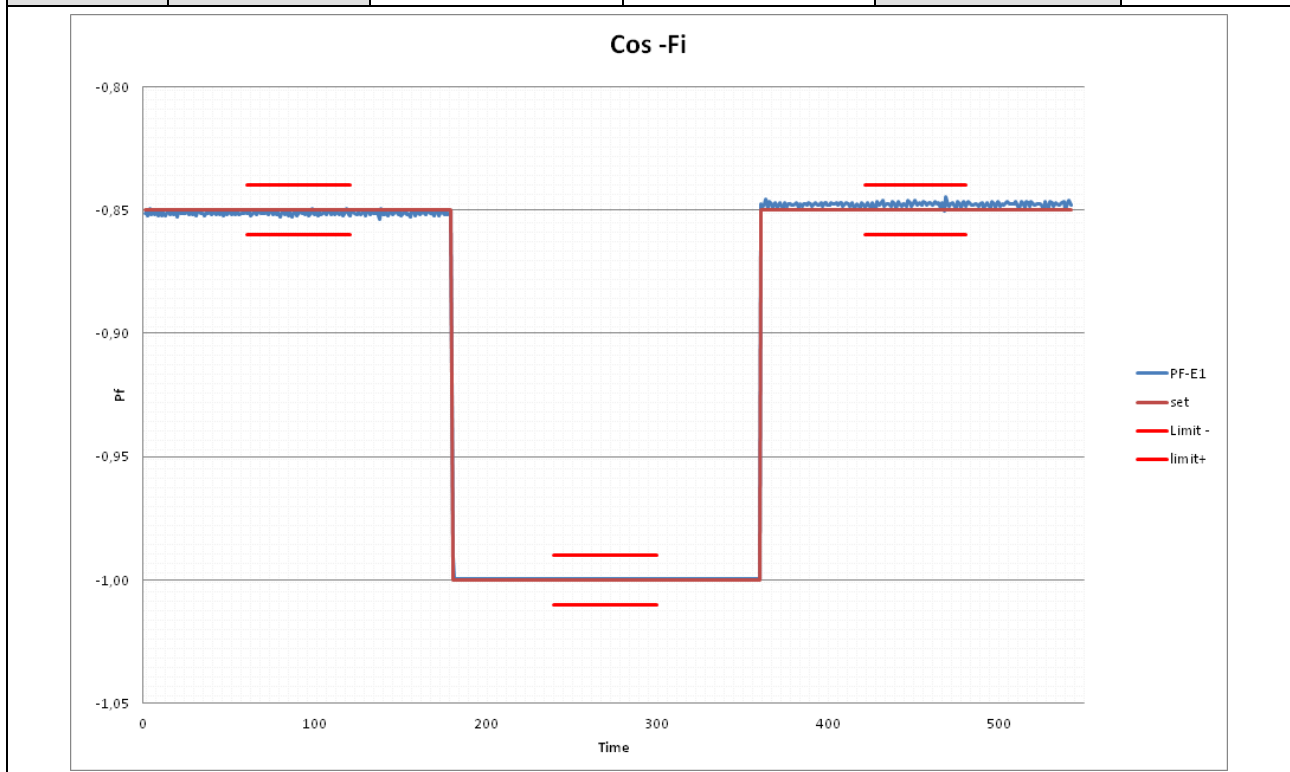


Registration No.: AK 60104856 0001

Report No.: 28108202 001

Reactive power Output according to an assigned level

Set-Point Cos Fi		Cos Fi	Deviation Cos Fi	Limt [%]	RESULT
-0.85	no. 1	0.85 ind.	0.000	≤0.01	PASS
	no. 2	0.85 ind.	0.000	≤0.01	PASS
	no. 3	0.85 ind.	0.000	≤0.01	PASS
0	no. 1	1.00	0.000	≤0.01	PASS
	no. 2	0.999	0.001	≤0.01	PASS
	no. 3	0.999	0.001	≤0.01	PASS
+0.85	no. 1	0.848 cap.	0.002	≤0.01	PASS
	no. 2	0.848 cap.	0.002	≤0.01	PASS
	no. 3	0.848 cap.	0.002	≤0.01	PASS



Annex to Certificate



Registration No.: AK 60104856 0001

Report No.: 28108202 001

E.3.5 Connection and starting to generate electrical power

Connection after trip of interface protection

Test sequence after trip	Connection	Connection allowed	Primary power source	Power gradient after connection
Step a)	No	No	-	-
Step b)	Yes	Yes	7380	9.6% P _n min ⁻¹
Step c)	No	No	-	-
Step d)	Yes	Yes	7333	9.6% P _n min ⁻¹
Step e)	No	No	-	-
Step f)	Yes	Yes	7340	9.6% P _n min ⁻¹
Step g)	No	No	-	-
Step h)	Yes	Yes	7340	9.6% P _n min ⁻¹

NOTE 1 It is sufficient to evaluate the power gradient after connection only at one test out of b). d). f). h).

Start of generating electrical power

Test sequence start of generation	Connection	Connection allowed	Primary power source	Power gradient after connection
Step a)	No	No	-	-
Step b)	Yes	Yes	7380	9.6% P _n min ⁻¹
Step c)	No	No	-	-
Step d)	Yes	Yes	7333	9.6% P _n min ⁻¹
Step e)	No	No	-	-
Step f)	Yes	Yes	7340	9.6% P _n min ⁻¹
Step g)	No	No	-	-
Step h)	Yes	Yes	7340	9.6% P _n min ⁻¹

Annex to Certificate



Registration No.: AK 60104856 0001

Report No.: 28108202 001

E.3.6 Short-circuit current contribution

E.3.6.1 Short circuit current at micro-generator terminals

Fault level contribution		
Time after fault [ms]	Voltage [V]	Current [A]
20	22.9	95.6
100	22.7	43.7
250	22.8	28.2
500	22.8	20.7

Note:
Trip Time: 5.3ms

Annex to Certificate



Registration No.: AK 60104856 0001

Report No.: 28108202 001

E.3.7 Power quality

Harmonic current emission

Total Harmonic Distortion (up to 50 th harmonic)	Limits [%]	Measurements Phase A [%]	Measurements Phase B [%]	Measurements Phase C [%]	Verdict
	5.00	0.021	--	--	
ODD HARMONIC CURRENTS					
Order number	Limits [%]	Measurements Phase A [%]	Measurements Phase B [%]	Measurements Phase C [%]	Verdict
3rd	4.00	0,017	--	--	P
5th	4.00	0,006	--	--	P
7th	4.00	0.004	--	--	P
9th	4.00	0.004	--	--	P
11th	2.00	0.002	--	--	P
13th	2.00	0.003	--	--	P
15th	2.00	0.002	--	--	P
17th	1.50	0.002	--	--	P
19th	1.50	0.001	--	--	P
21st	1.50	0.001	--	--	P
23rd	0.60	0.001	--	--	P
25th	0.60	0.001	--	--	P
27th	0.60	0.001	--	--	P
29th	0.60	0.002	--	--	P
31st	0.60	0.001	--	--	P
33rd	0.60	0.002	--	--	P

(continues on next page)

Annex to Certificate



Registration No.: AK 60104856 0001

Report No.: 28108202 001

EVEN HARMONIC CURRENTS					
Order number	Limits [%]	Measurements Phase A [%]	Measurements Phase B [%]	Measurements Phase C [%]	Verdict
2nd	1.00	0.005	--	--	P
4th	1.00	0.003	--	--	P
6th	1.00	0.002	--	--	P
8th	1.00	0.001	--	--	P
10th	0.50	0.001	--	--	P
12th	0.50	0.001	--	--	P
14th	0.50	0.001	--	--	P
16th	0.50	0.001	--	--	P
18th	0.50	0.001	--	--	P
20th	0.50	0.001	--	--	P
22nd	0.50	0.000	--	--	P
24th	0.50	0.000	--	--	P
26th	0.50	0.000	--	--	P
28th	0.50	0.000	--	--	P
30th	0.50	0.000	--	--	P
32nd	0.50	0.000	--	--	P

Annex to Certificate



Registration No.: AK 60104856 0001

Report No.: 28108202 001

Voltage fluctuations and flicker

Parameter	Measured Value	Limit	Verdict
P_{st}	0,462	1,000	P
P_{lt}	0,281	0,650	P
d_c	1,26%	3,30%	P
d_{max}	0,89%	4,00%	P
$d(t) > 3,3\%_{(limit)} = 0,5s$; $d(t) > 3,3\%_{(max)} = 0,0s$			

End of the Annex