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

TÜVRheinland®

Registration No.: AK 60104854 0001

Report No.: 28108199 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 SYMO 20.0-3-M
FRONIUS SYMO 17.5-3-M
FRONIUS SYMO 15.0-3-M
FRONIUS SYMO 12.5-3-M
FRONIUS SYMO 10.0-3-M

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.

Certification Body

Marco Piva

TÜV Rheinland LGA Products GmbH • Zertifizierungsstelle

Date 29.09.2015

TÜV Rheinland LGA Products GmbH - Tillystraße 2 - 90431 Nürnberg

Annex to Certificate

Registration No.: AK 60104854 0001

Report No.: 28108199 001

E.1 General Details

E.1.1 Micro-generator details

Models of the same family: Fronius Symo 10.0-3-M, Fronius Symo 12.5-3-M, Fronius Symo 15.0-3-M, Fronius Symo 17.5-3-M, Fronius Symo 20.0-3-M.

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

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

	Under frequency		Over frequency	
Parameter	**Frequency [Hz]**	**Time[s]**	**Frequency [Hz]**	**Time[s]**
Protection Limit	47.00	0.5	51.00	0.5
Trip Value	46.99	0.43	51.02	0.43
Supplementary information: none				

E.2.3 Over / Under voltage

	Under Voltage		Over Voltage	
Parameter	**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	196.2	0.14	259.9	0.12
Supplementary information: none				

	Over Voltage		Remarks
Parameter	**Voltage [V]**	**Time [s]**	
Protection Limit	255.3 (230 V +11%)	60	--
Trip Value	255.3	52.25	--
Supplementary information: none			

E.2.4 Loss of main (LoM)

Balanced load								
Test A			**Test B**			**Test C**		
M (%)	**N(%)**	**Trip Time [ms]**	**M (%)**	**N(%)**	**Trip Time [ms]**	**M (%)**	**N(%)**	**Trip Time [ms]**
-10	10	-	0	-10	196	0	-10	104
-10	5	-	0	-5	280	0	-5	130
-10	0	-	0	-4	300	0	-4	178
-10	-5	-	0	-3	308	0	-3	324
-10	-10	-	0	-2	222	0	-2	392
-5	10	-	0	-1	120	0	-1	372
-5	5	305	0	0	364	0	0	284
-5	0	530	0	1	320	0	1	158
-5	-5	192	0	2	146	0	2	158
-5	-10	-	0	3	324	0	3	224
0	10	-	0	4	302	0	4	164
0	5	269	0	5	394	0	5	110
0	0	430	0	10	68			
0	-5	313						
0	-10	-						
5	10	-						
5	5	96						
5	0	370						
5	-5	268						
5	-10							
10	10							
10	5							
10	0							
10	-5							
10	-10							

Test A is at full power.

Test B is at 65%Pn

Test C is at 33% Pn

Tested in accordance with IEC62116. Table from SGS Report No.: 2213-0864-S1

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	19440	21000
Test 2	253.3	51.5	2016	21000

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

Test sequence	Output Power [W]	Frequency [Hz]	Primary power Source [W]
Test a)	20106	50	21000
Test b)	20047	49.65	21000
Test c)	20057	47.55	21000

E.3.3Power 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)	20060	50.00	21000	-
Test b)	19640	50.25	21000	-
Test c)	15970	50.70	21000	-
Test d)	12340	51.15	21000	-
Test e)	12350	50.70	21000	-
Test f)	12340	50.25	21000	-
Test g)	20050	50.00	21000	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)	10000	50.00	10500	-
Test b)	9690	50.25	10500	-
Test c)	7869	50.70	10500	-
Test d)	6070	51.15	10500	-
Test e)	6070	50.70	10500	-
Test f)	6060	50.25	10500	-
Test g)	10030	50.00	10500	9.6% P_n min^{-1}

Annex to Certificate

Registration No.: AK 60104854 0001

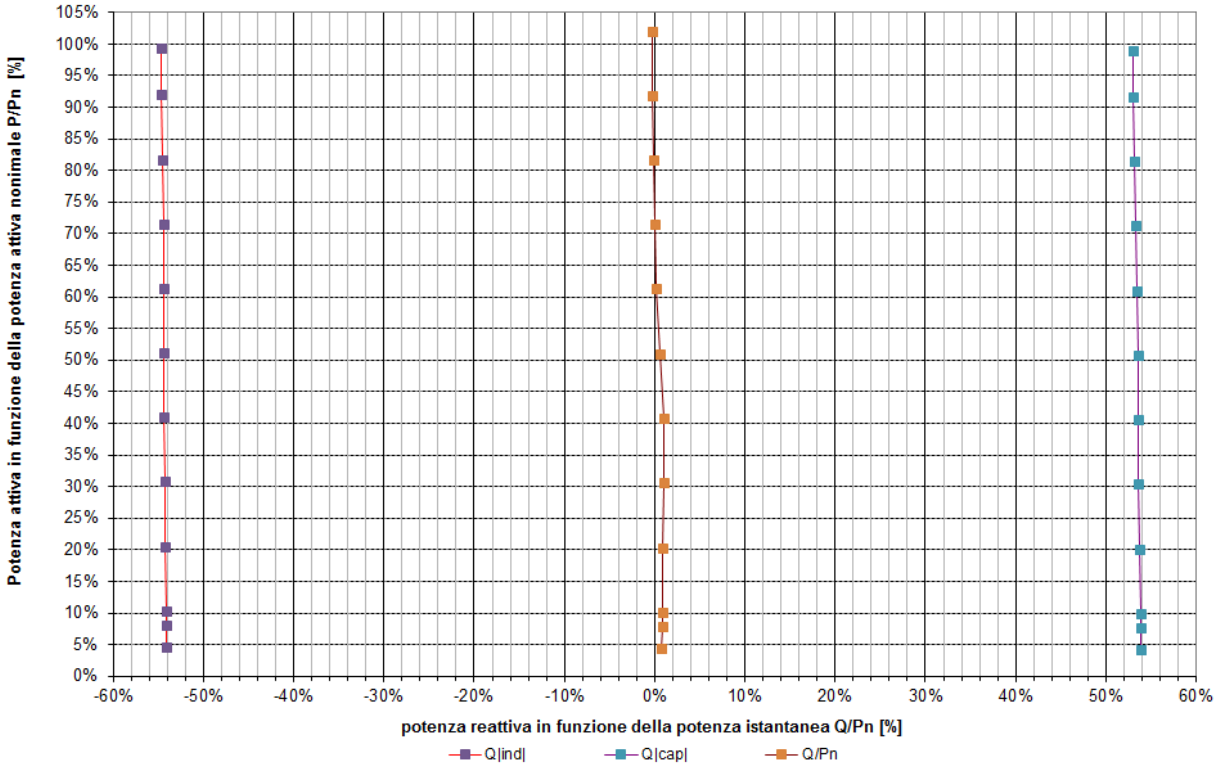
Report No.: 28108199 001

E.3.4Reactive power capability

E.3.4.2 Reactive power output capability

Reactive power output capability

Maximum reactive power adsorbed (Qmin) and produced (Qmax) as a function of the active power fed into the grid.



Annex to Certificate

Registration No.: AK 60104854 0001

Report No.: 28108199 001

Adsorption of inductive reactive power

Power-Bin	Active power [W]	Reactive Power [VAr]	DC Power [W]	Power Factor (cosφ)
0 % - 10 %	831,21	-9739,01	1028,94	0,09
0 % - 10 %	1443,52	-9743,55	1642,61	0,15
0 % - 10 %	1854,02	-9745,53	2055,41	0,19
10 % - 20 %	3692,30	-9759,99	3906,10	0,35
20 % - 30 %	5534,10	-9773,40	5766,50	0,49
30 % - 40 %	7371,71	-9790,66	7628,32	0,60
40 % - 50 %	9213,52	-9796,99	9500,10	0,68
50 % - 60 %	11038,93	-9790,71	11357,11	0,75
60 % - 70 %	12874,75	-9802,29	13233,09	0,80
70 % - 80 %	14713,30	-9816,98	15112,10	0,83
80 % - 90 %	16554,69	-9831,13	16999,99	0,86
90 % - 100 %	17893,44	-9842,89	18373,29	0,88

Adsorption of capacitive reactive power

Power-Bin	Active power [W]	Reactive Power [VAr]	DC Power [W]	Power Factor (cosφ)
0 % - 10 %	770,91	9.692,07	961,41	0,08
0 % - 10 %	1.381,18	9.687,12	1.573,24	0,14
0 % - 10 %	1.790,62	9.684,14	1.984,43	0,18
10 % - 20 %	3.630,28	9.669,48	3.836,48	0,35
20 % - 30 %	5.469,37	9.654,48	5.694,08	0,49
30 % - 40 %	7.304,07	9.644,65	7.553,18	0,60
40 % - 50 %	9.142,48	9.633,09	9.421,39	0,69
50 % - 60 %	10.981,59	9.612,05	11.293,53	0,75
60 % - 70 %	12.820,65	9.589,18	13.171,33	0,80
70 % - 80 %	14.656,80	9.566,02	15.047,41	0,84
80 % - 90 %	16.490,01	9.546,69	16.926,62	0,87
90 % - 100 %	17.827,80	9.534,35	18.298,70	0,88

Reactive power production with set point Q = 0

Annex to Certificate

Registration No.: AK 60104854 0001

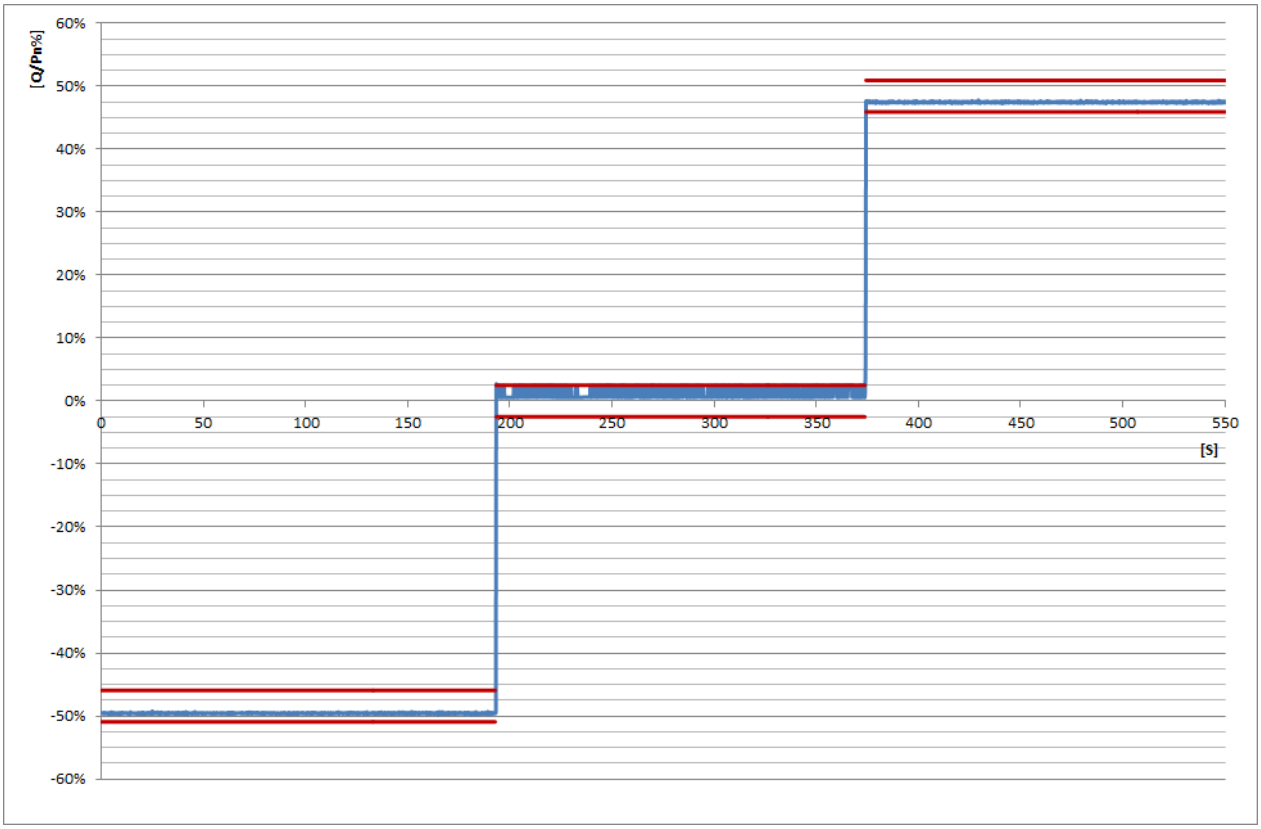
Report No.: 28108199 001

Power-Bin	Active power [W]	Reactive Power [VAr]	DC Power [W]	Power Factor (cosφ)
0 % - 10 %	803,45	139,97	853,96	0,98
0 % - 10 %	1414,14	145,70	1472,56	0,99
0 % - 10 %	1825,29	149,52	1889,88	1,00
10 % - 20 %	3665,08	166,00	3757,73	1,00
20 % - 30 %	5509,68	180,33	5634,16	1,00
30 % - 40 %	7345,84	192,75	7504,54	1,00
40 % - 50 %	9183,78	106,40	9380,04	1,00
50 % - 60 %	11023,43	25,61	11258,81	1,00
60 % - 70 %	12860,62	-3,33	13139,44	1,00
70 % - 80 %	14697,26	-25,46	15020,47	1,00
80 % - 90 %	16531,97	-36,58	16904,91	1,00
90 % - 100 %	18366,70	-57,36	18790,18	1,00

Set-Point Q/Pn [%]	Measured Q/Pn [%]	Deviation ΔQ/Pn [%]	Limt [%]	RESULT
-48,43%	-49,56%	-1.13%	≤2.5% Pn	PASS
0	+1,34%	+1,34%	≤2.5% Pn	PASS
+48,43%	+47,46%	+0,97%	≤2.5% Pn	PASS

Grafico Erogazione di potenza reattiva secondo un livello assegnato

/Graph - reactive power production according to an assigned level



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	-	9.6% P_n min^{-1}
Step b)	Yes	Yes	20500	9.6% P_n min^{-1}
Step c)	No	No	-	9.6% P_n min^{-1}
Step d)	Yes	Yes	20500	9.6% P_n min^{-1}
Step e)	No	No	-	9.6% P_n min^{-1}
Step f)	Yes	Yes	20500	9.6% P_n min^{-1}
Step g)	No	No	-	9.6% P_n min^{-1}
Step h)	Yes	Yes	20500	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	20500	9.6% P_n min^{-1}
Step c)	No	No	-	-
Step d)	Yes	Yes	20500	9.6% P_n min^{-1}
Step e)	No	No	-	-
Step f)	Yes	Yes	20500	9.6% P_n min^{-1}
Step g)	No	No	-	-
Step h)	Yes	Yes	20500	9.6% P_n min^{-1}

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	12.7	32.2
100	9.38	25.4
250	8.80	16.5
500	8.55	12.1
Note: Trip Time: 66.1ms		

E.3.7 Power quality

Harmonic current emission

Average harmonic current results Phase 1				
Hn	Ieff [mA]	Value [% I/In]	Limit [%I/In]	Result
1	29.049 [A]			
2	313.852	1.077	8.00	PASS
3	314.191			PASS
4	115.698	0.397	4.00	PASS
5	229.933	0.789	10.70	PASS
6	65.703	0.255	2.67	PASS
7	78.159	0.268	7.20	PASS
8	46.394	0.159	2.00	PASS
9	112.506			PASS
10	50.080	0.171	1.60	PASS
11	55.140	0.192	3.10	PASS
12	38.021	0.143	1.33	PASS
13	120.212	0.440	2.00	PASS
14	28.633			PASS
15	27.901			PASS
16	30.245			PASS
17	98.067			PASS
18	36.468			PASS
19	31.111			PASS
20	29.543			PASS
21	51.967			PASS
22	16.918			PASS
23	42.704			PASS
24	16.778			PASS
25	48.687			PASS
26	14.973			PASS
27	27.818			PASS
28	13.053			PASS
29	42.115			PASS
30	13.864			PASS
31	38.129			PASS
32	13.481			PASS
33	30.397			PASS
34	11.704			PASS
35	35.142			PASS
36	11.265			PASS
37	30.893			PASS
38	10.911			PASS
39	33.767			PASS
40	10.228			PASS

Annex to Certificate

Registration No.: AK 60104854 0001

Report No.: 28108199 001

Average harmonic current results Phase 2				
Hn	Ieff [mA]	Value [% I/In]	Limit [%I/In]	Result
1	29.068 [A]			
2	262.985	1.077	8.00	PASS
3	154.588			PASS
4	81.005	0.397	4.00	PASS
5	148.695	0.789	10.70	PASS
6	52.015	0.225	2.67	PASS
7	110.627	0.268	7.20	PASS
8	37.642	0.159	2.00	PASS
9	48.208			PASS
10	36.617	0.172	1.60	PASS
11	59.140	0.189	3.10	PASS
12	21.393	0.130	1.33	PASS
13	63.347	0.412	2.00	PASS
14	23.246			PASS
15	43.540			PASS
16	23.554			PASS
17	59.698			PASS
18	37.260			PASS
19	33.603			PASS
20	26.854			PASS
21	25.382			PASS
22	13.614			PASS
23	37.597			PASS
24	14.327			PASS
25	22.232			PASS
26	11.557			PASS
27	18.240			PASS
28	11.747			PASS
29	24.390			PASS
30	10.478			PASS
31	19.517			PASS
32	11.442			PASS
33	9.076			PASS
34	17.929			PASS
35	9.537			PASS
36	17.081			PASS
37	17.081			PASS
38	9.870			PASS
39	19.525			PASS
40	9.220			PASS

Annex to Certificate

Registration No.: AK 60104854 0001

Report No.: 28108199 001

Average harmonic current results Phase 3				
Hn	Ieff [mA]	Value [% I/In]	Limit [%I/In]	Result
1	29.403			
2	260.563	1.065	8.00	PASS
3	112.866			PASS
4	80.139	0.392	4.00	PASS
5	189.715	0.780	10.70	PASS
6	53.080	0.223	2.67	PASS
7	78.861	0.265	7.20	PASS
8	37.131	0.157	2.00	PASS
9	3.691			PASS
10	30.160	0.170	1.60	PASS
11	70.660	0.187	3.10	PASS
12	30.519	0.129	1.33	PASS
13	51.103	0.408	2.00	PASS
14	19.618			PASS
15	34.029			PASS
16	19.014			PASS
17	56.852			PASS
18	36.539			PASS
19	28.288			PASS
20	29.159			PASS
21	25.630			PASS
22	14.523			PASS
23	25.484			PASS
24	13.570			PASS
25	31.528			PASS
26	10.850			PASS
27	19.397			PASS
28	10.598			PASS
29	20.369			PASS
30	9.694			PASS
31	25.888			PASS
32	10.214			PASS
33	16.098			PASS
34	9.010			PASS
35	18.549			PASS
36	9.305			PASS
37	21.033			PASS
38	8.604			PASS
39	15.871			PASS
40	9.036			PASS

Annex to Certificate

Registration No.: AK 60104854 0001

Report No.: 28108199 001

Voltage fluctuations and flicker

	EUT values	Limit	Result
Pst	0.05	1.00	PASS
Plt	0.48	0.65	PASS
dc [%]	2.97	3.30	PASS
dmax [%]	0.88	4.00	PASS
dt [s]	0	0.50	PASS

End of the Annex