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

TÜVRheinland®

Registration No.: AK 60104855 0001

Report No.: 28108200 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 8.2-3-M ; FRONIUS SYMO 8.0-3-M
FRONIUS SYMO 7.0-3-M ; FRONIUS SYMO 6.7-3-M
FRONIUS SYMO 6.0-3-M ; FRONIUS SYMO 5.5-3-M
FRONIUS SYMO 5.0-3-M ; FRONIUS SYMO 4.5-3-M
FRONIUS SYMO 3.7-3-M ; FRONIUS SYMO 3.0-3-M
FRONIUS SYMO 3.0-3-S ; FRONIUS SYMO 3.7-3-S
FRONIUS SYMO 4.5-3-S
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 • TÜV Rheinland • Zertifizierungsstelle

Date 29.09.2015

TÜV Rheinland LGA Products GmbH - Tillystraße 2 - 90431 Nürnberg

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E.1 General Details
E.1.1 Micro-generator details

Models of the same family: FRONIUS SYMO 3.0-3-M; FRONIUS SYMO 3.7-3-M; FRONIUS SYMO 4.5-3-M; FRONIUS SYMO 5.0-3-M; FRONIUS SYMO 5.5-3-M; FRONIUS SYMO 6.0-3-M; FRONIUS SYMO 6.7-3-M; FRONIUS SYMO 7.0-3-M; FRONIUS SYMO 8.0-3-M; FRONIUS SYMO 8.2-3-M; FRONIUS SYMO 3.0-3-S; FRONIUS SYMO 3.7-3-S; FRONIUS SYMO 4.5-3-S
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	0.44	51.02	0.46
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	197	0.154	262.3	0.154
Supplementary information: none				

	Over Voltage		Remarks
Parameter	**Voltage [V]**	**Time [s]**	
Protection Limit	255.3 (230 V +11%)	60	--
Trip Value	255.3	50	--
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	214	0	-5	91
-10	5	-	0	-5	202	0	-4	353
-10	0	-	0	-4	302	0	-3	321
-10	-5	-	0	-3	400	0	-2	318
-10	-10	-	0	-2	317	0	-1	208
-5	10	-	0	-1	129	0	0	93
-5	5	216	0	0	352	0	1	128
-5	0	272	0	1	391	0	2	272
-5	-5	95	0	2	540	0	3	183
-5	-10	-	0	3	300	0	4	282
0	10	76	0	4	413	0	5	489
0	5	233	0	5	151	0	10	308
0	0	207	0	10	390			
0	-5	244						
0	-10	180						
5	10	365						
5	5	425						
5	0	282						
5	-5	-						
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 see SGS Report No.:2213/0642-4-IEC

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	47.50	7900	8200
Test 2	253.3	51.5	8118	8300

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

Test sequence	Output Power [W]	Frequency [Hz]	Primary power Source [W]
Test a)	8130	50.00	8300
Test b)	8133	49.65	8300
Test c)	8127	47.55	8300

E.3.3Power response to over-frequency

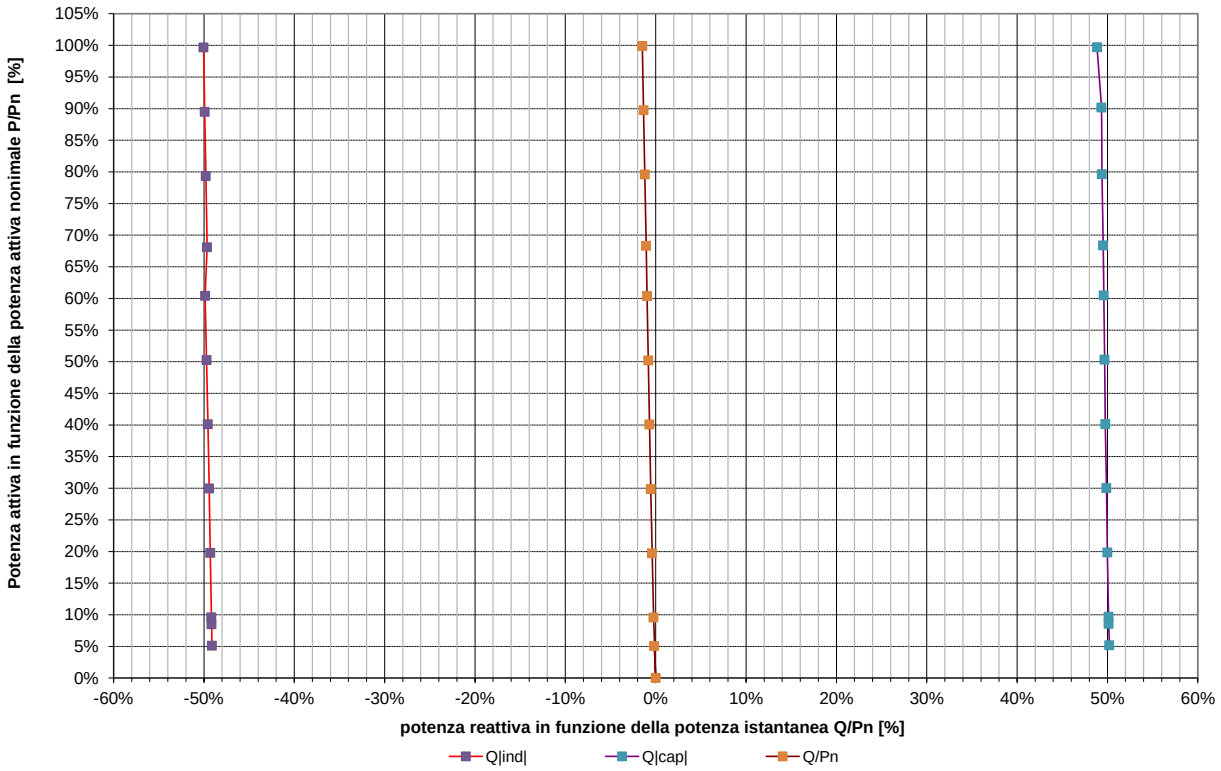
Test sequence at power level >80%	Output Power [W]	Frequency [Hz]	Primary Power Source [W]	Power Gradient [W/Hz]
Test a)	8130	50.00	8500	-
Test b)	8130	50.25	8500	-
Test c)	6550	50.70	8500	-
Test d)	5040	51.15	8500	-
Test e)	5040	50.70	8500	-
Test f)	5040	50.25	8500	-
Test g)	8130	50.00	8500	9.6% P_n min^{-1}

Test sequence at power level 40%-60%	Output Power [W]	Frequency [Hz]	Primary Power Source [W]	Power Gradient [W/Hz]
Test a)	4050	50.00	4200	-
Test b)	4000	50.25	4200	-
Test c)	6550	50.70	4200	-
Test d)	5040	51.15	4200	-
Test e)	5040	50.70	4200	-
Test f)	5040	50.25	4200	-
Test g)	4040	50.00	4200	9.6% P_n min^{-1}

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.



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Adsorption of inductive reactive power

Power-Bin	Active power [W]	Reactive Power [VAr]	DC Power [W]	Power Factor (cosφ)
0 % - 10 %	378,12	-3634,76	503,23	0,10
0 % - 10 %	627,41	-3637,02	754,32	0,17
0 % - 10 %	710,77	-3638,89	840,33	0,19
10 % - 20 %	1464,17	-3648,17	1603,02	0,37
20 % - 30 %	2215,71	-3657,67	2366,95	0,52
30 % - 40 %	2967,48	-3667,93	3132,34	0,63
40 % - 50 %	3718,87	-3678,21	3899,98	0,71
50 % - 60 %	4470,02	-3690,16	4671,40	0,77
60 % - 70 %	5038,23	-3673,99	5193,70	0,81
70 % - 80 %	5870,52	-3684,58	6045,59	0,85
80 % - 90 %	6621,86	-3693,78	6816,68	0,87
90 % - 100 %	7374,52	-3703,33	7589,28	0,89

Adsorption of capacitive reactive power

Power-Bin	Active power [W]	Reactive Power [VAr]	DC Power [W]	Power Factor (cosφ)
0 % - 10 %	382,16	3.714,91	490,04	0,10
0 % - 10 %	632,30	3.710,14	741,35	0,17
0 % - 10 %	716,89	3.709,24	828,45	0,19
10 % - 20 %	1.468,13	3.699,25	1.589,30	0,37
20 % - 30 %	2.220,26	3.691,48	2.354,08	0,52
30 % - 40 %	2.970,73	3.682,40	3.118,88	0,63
40 % - 50 %	3.722,89	3.676,34	3.887,64	0,71
50 % - 60 %	4.473,49	3.669,51	4.659,31	0,77
60 % - 70 %	5.059,00	3.664,48	5.260,85	0,81
70 % - 80 %	5.891,95	3.654,86	6.118,15	0,85
80 % - 90 %	6.672,90	3.650,97	6.933,14	0,88
90 % - 100 %	7.376,68	3.614,56	7.578,38	0,90

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Reactive power production with set point Q = 0

Power-Bin	Active power [W]	Reactive Power [VAr]	DC Power [W]	Power Factor (cosφ)
0 % - 10 %	372,28	-12,06	406,99	0,98
0 % - 10 %	706,47	-17,13	746,71	0,99
10 % - 20 %	1458,55	-29,53	1505,26	1,00
20 % - 30 %	2209,37	-40,26	2265,47	1,00
30 % - 40 %	2965,36	-50,85	3035,61	1,00
40 % - 50 %	3714,93	-60,65	3801,38	1,00
50 % - 60 %	4467,43	-70,57	4570,54	1,00
60 % - 70 %	5053,98	-78,61	5170,36	1,00
70 % - 80 %	5890,61	-89,35	6025,56	1,00
80 % - 90 %	6640,75	-99,27	6798,54	1,00
90 % - 100 %	7391,86	-109,31	7571,57	1,00

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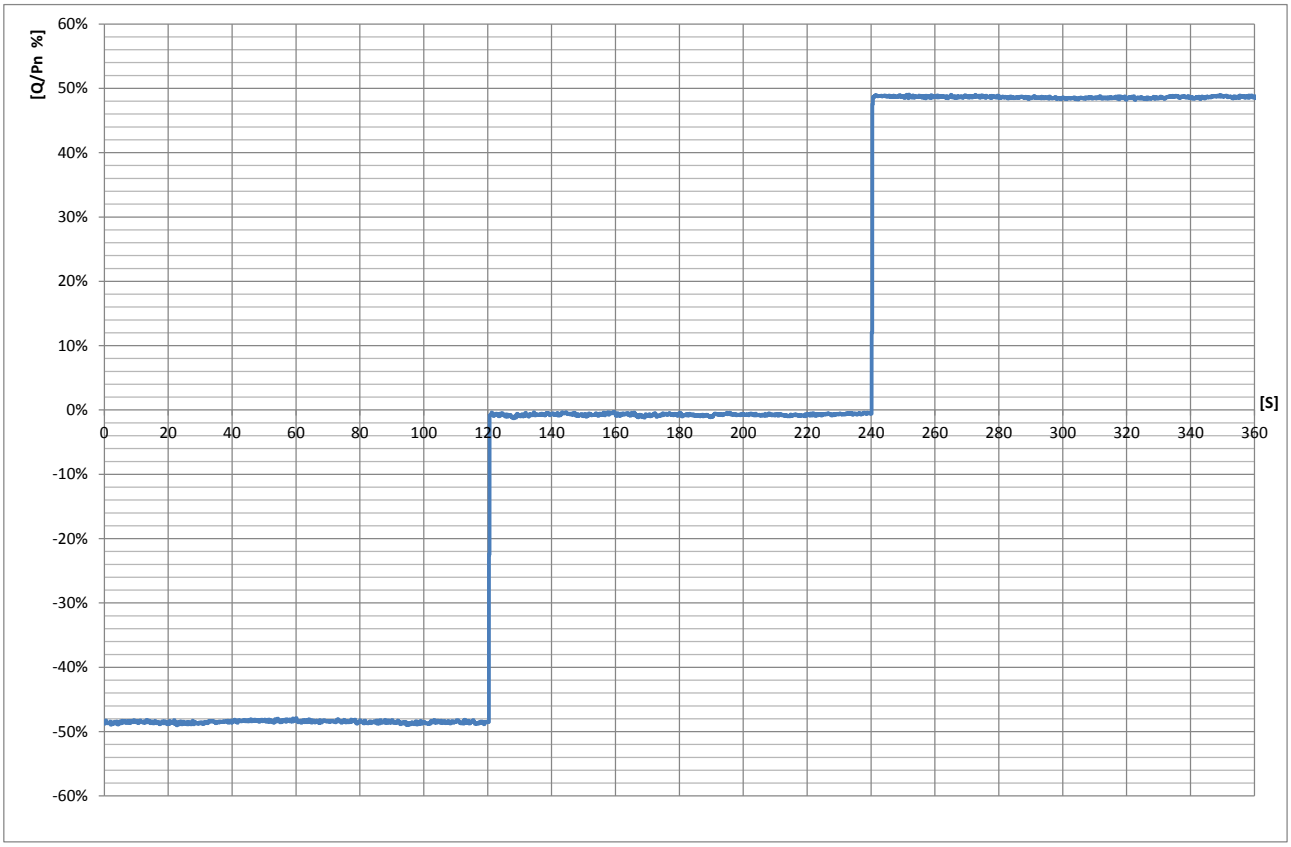
Reactive power Output according to an assigned level

Set-Point Q/Pn [%]	Measured Q/Pn [%]	Deviation ΔQ/Pn [%]	Limt [%]	RESULT
-48,43%	-48,47	-0,04	≤2.5%	PASS
0	-0,74	-0,74	≤2.5%	PASS
+48,43%	48.58	+0.15	≤2.5%	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	-	-
Step b)	Yes	Yes	8500	9.6% P_n min^{-1}
Step c)	No	No	-	-
Step d)	Yes	Yes	8500	9.6% P_n min^{-1}
Step e)	No	No	-	-
Step f)	Yes	Yes	8500	9.6% P_n min^{-1}
Step g)	No	No	-	-
Step h)	Yes	Yes	8500	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	8500	9.6% P_n min^{-1}
Step c)	No	No	-	-
Step d)	Yes	Yes	8500	9.6% P_n min^{-1}
Step e)	No	No	-	-
Step f)	Yes	Yes	8500	9.6% P_n min^{-1}
Step g)	No	No	-	-
Step h)	Yes	Yes	8500	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	65.5	13.7
100	30.0	11.3
250	19.7	12.4
500	14.8	12.4
Note: Trip Time: 537.8ms		

E.3.7 Power quality
Harmonic current emission

Average harmonic current results - Phase 1				
Hn	Ieff [A]	% of Limit	Limit [A]	Result
1	11.508			
2	22.525E-3	2.317	972.00E-3	PASS
3	75.151E-3	3.631	2.07	PASS
4	15.243E-3	3.939	387.00E-3	PASS
5	111.020E-3	10.821	1.03	PASS
6	10.026E-3	3.713	270.00E-3	PASS
7	19.398E-3	2.799	693.00E-3	PASS
8	8.906E-3	4.303	207.00E-3	PASS
9	55.798E-3	15.500	360.00E-3	PASS
10	7.162E-3	4.325	165.60E-3	PASS
11	21.895E-3	7.372	297.00E-3	PASS
12	6.505E-3	4.714	138.00E-3	PASS
13	58.726E-3	31.072	189.00E-3	PASS
14	5.634E-3	4.763	118.29E-3	PASS
15	25.206E-3	18.671	135.00E-3	PASS
16	4.954E-3			PASS
17	41.852E-3	35.136	119.11E-3	PASS
18	3.914E-3			PASS
19	9.349E-3	8.772	106.58E-3	PASS
20	3.717E-3			PASS
21	19.051E-3	19.757	96.43E-3	PASS
22	3.366E-3			PASS
23	6.952E-3	7.896	88.05E-3	PASS
24	3.358E-3			PASS
25	15.543E-3	19.188	81.00E-3	PASS
26	3.291E-3			PASS
27	4.405E-3			PASS
28	2.950E-3			PASS
29	10.791E-3	15.453	69.83E-3	PASS
30	2.972E-3			PASS
31	11.168E-3	17.097	65.32E-3	PASS
32	3.069E-3			PASS
33	4.097E-3			PASS
34	2.832E-3			PASS
35	12.473E-3	21.556	57.86E-3	PASS
36	2.804E-3			PASS
37	5.063E-3	9.251	54.73E-3	PASS
38	2.709E-3			PASS
39	8.031E-3	15.468	51.92E-3	PASS
40	2.672E-3			PASS

Average harmonic current results - Phase 2				
Hn	Ieff [A]	% of Limit	Limit [A]	Result
1	11.605			
2	19.431E-3	1.999	972.00E-3	PASS
3	29.385E-3	1.420	2.07	PASS
4	13.310E-3	3.439	387.00E-3	PASS
5	47.803E-3	4.659	1.03	PASS
6	8.705E-3	3.224	270.00E-3	PASS
7	44.377E-3	6.404	693.00E-3	PASS
8	7.757E-3	3.747	207.00E-3	PASS
9	8.873E-3	2.465	360.00E-3	PASS
10	6.475E-3	3.910	165.60E-3	PASS
11	22.352E-3	7.526	297.00E-3	PASS
12	5.276E-3	3.823	138.00E-3	PASS
13	23.420E-3	12.391	189.00E-3	PASS
14	4.716E-3			PASS
15	5.551E-3	4.112	135.00E-3	PASS
16	4.311E-3			PASS
17	13.387E-3	11.239	119.11E-3	PASS
18	3.313E-3			PASS
19	13.985E-3	13.122	106.58E-3	PASS
20	3.773E-3			PASS
21	4.742E-3			PASS
22	3.361E-3			PASS
23	8.732E-3	9.917	88.05E-3	PASS
24	3.104E-3			PASS
25	8.970E-3	11.074	81.00E-3	PASS
26	2.880E-3			PASS
27	4.145E-3			PASS
28	2.737E-3			PASS
29	8.431E-3	12.073	69.83E-3	PASS
30	2.574E-3			PASS
31	6.670E-3	10.211	65.32E-3	PASS
32	2.689E-3			PASS
33	4.015E-3			PASS
34	2.535E-3			PASS
35	7.864E-3	13.591	57.86E-3	PASS
36	2.507E-3			PASS
37	5.384E-3	9.837	54.73E-3	PASS
38	2.402E-3			PASS
39	3.635E-3			PASS
40	2.355E-3			PASS

Average harmonic current results - Phase 3				
Hn	Ieff [A]	% of Limit	Limit [A]	Result
1	11.532			
2	19.403E-3	1.996	972.00E-3	PASS
3	42.180E-3	2.038	2.07	PASS
4	12.832E-3	3.316	387.00E-3	PASS
5	66.610E-3	6.492	1.03	PASS
6	8.889E-3	3.292	270.00E-3	PASS
7	34.304E-3	4.950	693.00E-3	PASS
8	7.135E-3	3.447	207.00E-3	PASS
9	10.085E-3	2.801	360.00E-3	PASS
10	6.315E-3	3.813	165.60E-3	PASS
11	27.588E-3	9.289	297.00E-3	PASS
12	5.450E-3	3.949	138.00E-3	PASS
13	19.979E-3	10.571	189.00E-3	PASS
14	4.359E-3			PASS
15	5.983E-3	4.432	135.00E-3	PASS
16	3.882E-3			PASS
17	17.274E-3	14.502	119.11E-3	PASS
18	3.959E-3			PASS
19	12.672E-3	11.890	106.58E-3	PASS
20	3.304E-3			PASS
21	4.714E-3			PASS
22	3.196E-3			PASS
23	9.375E-3	10.647	88.05E-3	PASS
24	3.104E-3			PASS
25	8.700E-3	10.740	81.00E-3	PASS
26	2.781E-3			PASS
27	4.060E-3			PASS
28	2.521E-3			PASS
29	6.578E-3	9.420	69.83E-3	PASS
30	2.746E-3			PASS
31	7.864E-3	12.038	65.32E-3	PASS
32	2.700E-3			PASS
33	4.044E-3			PASS
34	2.637E-3			PASS
35	4.370E-3			PASS
36	2.472E-3			PASS
37	6.345E-3	11.594	54.73E-3	PASS
38	2.493E-3			PASS
39	3.762E-3			PASS
40	2.386E-3			PASS

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Voltage fluctuations and flicker

	L1	L2	L3	Limit	Result
Pst	0.158	0.158	0.148	1.00	PASS
Plt	0.157	0.158	0.148	0.65	PASS
dc [%]	0.024	0.023	0.022	3.30	PASS
dmax [%]	0.146	0.146	0.113	4.00	PASS
dt [s]	0.000	0.000	0.000	0.50	PASS

End of the Annex