



Certificate of compliance

Applicant: **IMEON ENERGY**
10 Rue Amiral Romain Desfosses
29200 Brest
France

Product: **Inverter**

Model: **IMEON 3.6**

Use in accordance with regulations:

Automatic disconnection device with single-phase mains surveillance in accordance with EN 50438:2013 for photovoltaic systems with a single-phase parallel coupling via an inverter in the public mains supply. The automatic disconnection device is an integral part of the aforementioned inverter.

Applied rules and standards:

EN 50438:2013

Requirements for micro-generating plants to be connected in parallel with public low-voltage distribution networks

DIN V VDE V 0126-1-1:2006-02 (Functional safety)

Automatic disconnection device between a generator and the public low-voltage grid

At the time of issue of this certificate the safety concept of an aforementioned representative product corresponds to the valid safety specifications for the specified use in accordance with regulations.

Report number: **PV171127N015-R1**

Certificate number: **U18-0514**

Date of issue: **2018-09-13**

Certification body



Holger Schaffer

Certification body of Bureau Veritas Consumer Products Services Germany GmbH
Accredited according to DIN EN ISO/IEC 17065



Deutsche
Akkreditierungsstelle
D-ZE-12024-01-00

Appendix E Type Verification Test Report

Extract from test report according to EN 50438

Nr. PV171127N015-R1

Type Approval and declaration of compliance with the requirements of EN 50438.

Manufacturer / applicant:	IMEON ENERGY 10 Rue Amiral Romain Desfosses 29200 Brest France
Micro-generator Type	Inverter
Rated values	IMEON 3.6
Maximum rated capacity	3000VA
Rated voltage	230Vac, 50Hz
Firmware version	00
Measurement period:	2017-11-27 to 2018-09-03

Description of the structure of the power generation unit (Figure 1):

The power generation unit is equipped with a PV and line-side EMC filter. The power generation unit has no galvanic isolation between DC input and AC output. Output switch-off is performed with single-fault tolerance based on two series-connected relays in line and neutral. This enables a safe disconnection of the power generation unit from the network in case of error.

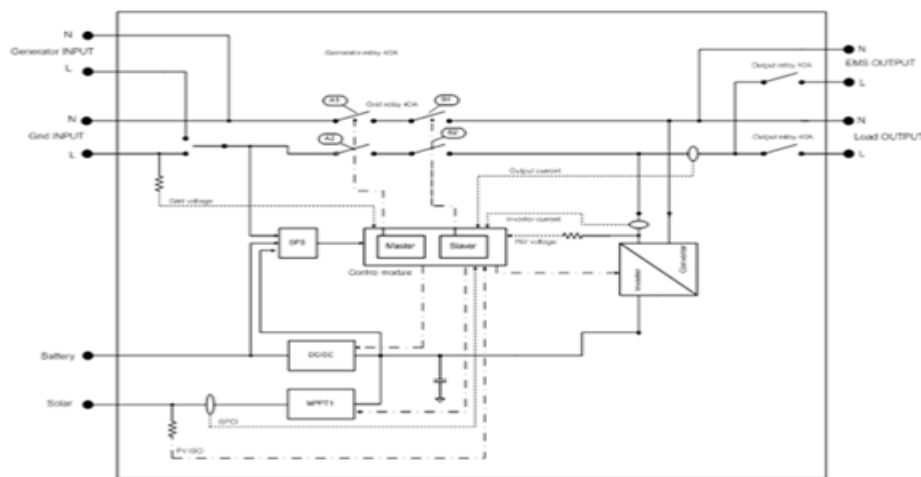


Figure 1 – Schematic structure of the power generation unit

The above stated micro-generators are tested according to the requirements in the EN 50438. Any modification that affects the stated tests must be named by the manufacturer/supplier of the product to ensure that the product meets all requirements of the EN 50438.

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Type testing of the interface protection

Over-/under-voltage tests						
Parameter	Protection limit		Actual setting		Trip value (test result)	
	Voltage [V]	Disconnection time [s]	Voltage [V]	Disconnection time [s]	Voltage [V]	Disconnection time [s]
Over-voltage stage 1	253,0	3 / 600*	253,0	3 / 600*	253,0	0,075 / 499*
Over-voltage stage 2	264,5	0,2	264,5	0,2	264,5	0,155
Under-voltage stage 1	195,5	1,5	195,5	1,5	194,3	1,350

Note.
Minimum operation time according to default interface protection:
Over-voltage stage 1 -
Over-voltage stage 2 0,1s
Under-voltage 1,2s

* The over-voltage-stage 1 is a 10-min-mean-value according to EN 50160. The disconnection after detection of an overvoltage at the 10-min-mean-value takes place within 200ms.

Over-/under-frequency tests						
Parameter	Protection limit		Actual setting		Trip value (test result)	
	Frequency [Hz]	Disconnection time [s]	Frequency [Hz]	Disconnection time [s]	Frequency [Hz]	Disconnection time [s]
Over-frequency	52,0	0,5	52,0	0,5	52,03	0,393
Under-frequency	47,5	0,5	47,5	0,5	47,48	0,439

Note.
Minimum operation time according to default interface protection:
Over-frequency 0,5 s
Under-frequency 0,5 s

LoM test						
Method used	EN 62116					
	33% of -5% Q Test 22	66% of -5% Q Test 12	100% of -5% P Test 5	33% of +5% Q Test 31	66% of +5% Q Test 21	100% of +5% P Test 10
Trip time. Phase 1 fuse removed [ms]	150	224	253	69	73	297

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Type testing of a micro-generator

Operating range

Test 1: U = 195,5 V; f = 47,5 Hz; P = 1,00 Sn; cosφ = 1

Test 2: U = 253,0 V; f = 51,5 Hz; P = 1,00 Sn; cosφ = 1

Test sequence	Voltage [V]	Frequency [Hz]	Output power [W]	Cos φ [1]
1	195,6	47,50	2,988	0,9995
2	253,1	51,50	2,996	0,9998

Active power at under-frequency

5-min mean value (each)	a) 50 ± 0,01 [Hz]	b) - 0,4 to - 0,5 [Hz]	c) - 2,4 to - 2,5 [Hz]
Frequency [Hz]:	50,00	49,50	47,55
Active power [kW]:	2,990	2,990	2,970
ΔP/PM [%] per 1 Hz:			<0,67

Power response to over-frequency

1-min mean value [Hz]:	a) 50,00	b) 50,25	c) 50,70	d) 51,15	e) 50,70	f) 50,25	g) 50,00
1. Measurement a) to g): Active power output > 80% P_n							
Frequency [Hz]:	50,00	50,25	50,70	51,15	50,70	50,25	50,00
PM [kW]:	N/A	2,929	2,391	1,853	2,391	2,929	N/A
PE60 [kW]:	2,989	2,960	2,429	1,916	2,397	2,911	2,990
ΔPE60/PM [%]:	N/A	1,03	1,26	2,09	0,19	-0,61	N/A
2. Measurement a) to g): Active power output 40% and 60% after freezing > 80% P_n							
Frequency [Hz]:	50,00	50,25	50,70	51,15	50,70	50,25	N/A
PM [kW]:	N/A	1,473	1,202	0,932	1,202	1,473	N/A
PE60 [kW]:	1,503	1,492	1,236	0,977	1,223	1,482	N/A
ΔPE60/PM [%]:	N/A	0,64	1,12	1,50	0,69	0,30	N/A
Limit ΔP/P _{1min} :	+ 10 % of P _M						

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Reactive power				
Uncontrollable reactive power				
Test Voltage	211,6V	230V	248,4V	
Output power				
25% PN	0,998i	0,999i	0,999i	
50% PN	0,999i	0,999i	0,999i	
75% PN	0,999i	0,999i	0,999i	
100% PN	0,999i	0,999i	0,999i	
Limit	>0,95	>0,95	>0,95	

Controllable reactive power

Inductive (supply reactive power)

Power-BIN	Active power [kW]	Reactive power [kVar]	Power factor (cos φ)	DC power [kW]
0% - 10%	0,298	-0,118	0,9026	0,352
10% - 20%	0,754	-0,546	0,8098	0,826
20% - 30%	0,897	-0,658	0,8063	0,974
30% - 40%	1,198	-0,882	0,8053	1,288
40% - 50%	1,498	-1,106	0,8044	1,602
50% - 60%	1,795	-1,335	0,8026	1,916
60% - 70%	2,104	-1,561	0,8030	2,243
70% - 80%	2,398	-1,769	0,8047	2,558
80% - 90%	2,429	-1,801	0,8033	2,594
90% - 100%	2,429	-1,801	0,8032	2,592

Capacitive (supply reactive power)

Power-BIN	Active power [kW]	Reactive power [kVar]	Power factor (cos φ)	DC power [kW]
0% - 10%	0,300	0,217	0,8104	0,352
10% - 20%	0,598	0,458	0,7941	0,659
20% - 30%	0,839	0,636	0,7968	0,908
30% - 40%	1,201	0,903	0,7992	1,284
40% - 50%	1,500	1,134	0,7977	1,597
50% - 60%	1,798	1,357	0,7982	1,911
60% - 70%	2,101	1,569	0,8011	2,231
70% - 80%	2,397	1,779	0,8030	2,546
80% - 90%	2,400	1,787	0,8020	2,556
90% - 100%	2,413	1,796	0,8022	2,568

Reactive power supply with set point Q=0

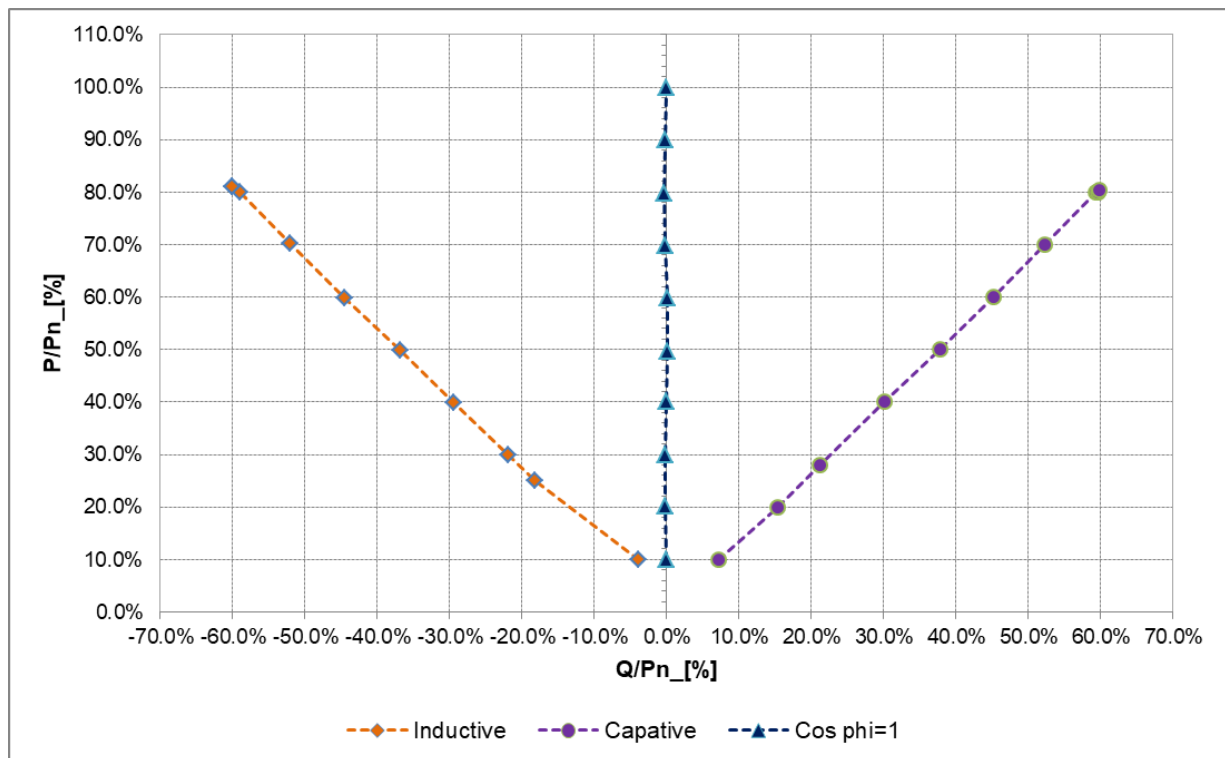
Power-BIN	Active power [kW]	Reactive power [kVar]	Power factor (cos φ)	DC power [kW]
0% - 10%	0,299	-0,004	0,9999	0,352
10% - 20%	0,602	-0,004	0,9999	0,664
20% - 30%	0,896	-0,008	0,9999	0,968
30% - 40%	1,202	0,000	0,9999	1,280
40% - 50%	1,491	0,003	0,9999	1,581
50% - 60%	1,794	0,001	0,9999	1,897
60% - 70%	2,095	-0,004	0,9999	2,214
70% - 80%	2,396	-0,010	0,9999	2,531
80% - 90%	2,697	-0,008	0,9999	2,846
90% - 100%	2,999	-0,002	0,9999	3,164

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Diagram of inductive reactive power absorption



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Connection and starting to generate electrical power		
Test according EN 50438 with standard setting	Min. voltage for connection to grid:	197,8 V
	Max. voltage for connection to grid:	250,7V
	Min. frequency for connection to grid:	49,90 Hz
	Max. frequency for connection to grid:	50,10 Hz
	Observation time ($\geq 60s$)	60,0 s
Test		
	Voltage conditions	
a) Start up for voltage range	<84% U_n for twice of observation time	>111% U_n for twice of observation time
Connection:	No connection	No connection
Limit:	No connection allowed	
b) In voltage range at start-up	$\geq 84\% U_n$ within twice setting observation time	$\leq 111\% U_n$ within twice setting observation time
Reconnection time [s]	64	64
Limit:	Connected after setting observation time ($\geq 60s$)	
Gradient:	For adjustable micro generators the maximum occurring active power gradient after connection respectively start generating electrical power is less than the configured maximum active power per minute Max gradient: 10% P_n /min..	
c) In voltage range after voltage failure	$\geq 84\% U_n$ for twice of setting observation time	$\leq 111\% U_n$ for twice of setting observation time
Reconnection time [s]	71	69
Limit:	Reconnection after setting observation time ($\geq 60s$)	
Gradient:	For adjustable micro generators the maximum occurring active power gradient after connection respectively start generating electrical power is less than the configured maximum active power per minute Max gradient: 10% P_n /min..	
	Frequency conditions	
d) Start up for frequency range	<47,45 Hz for twice of setting observation time	>50,15 Hz for twice of setting observation time
Connection:	No connection	No connection
Limit:	No connection allowed	
e) In frequency range at start-up	$\geq 47,45$ Hz within twice of setting observation time	$\leq 50,10$ Hz within twice of setting observation time
Reconnection time [s]	61	63
Limit:	Connected after setting delay time ($\geq 60s$)	
Gradient:	For adjustable micro generators the maximum occurring active power gradient after connection respectively start generating electrical power is less than the configured maximum active power per minute Max gradient: 10% P_n /min..	
f) In frequency range after frequency failure	$\geq 47,45$ Hz for twice of setting observation time	$\leq 50,10$ Hz for twice of setting observation time
Reconnection time [s]	63	63
Limit:	Reconnection after setting observation time ($\geq 60s$)	
Gradient:	For adjustable micro generators the maximum occurring active power gradient after connection respectively start generating electrical power is less than the configured maximum active power per minute Max gradient: 10% P_n /min..	

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Short-circuit current contribution					
Short-circuit current parameters					
For a directly coupled micro-generator			For a Inverter micro-generator		
Parameter	Symbol	Value	Time after fault	Volts	Amps
Peak Short Circuit current	I_p	N/A	20ms	28,54	3,094
Initial Value of aperiodic current	A	N/A	100ms	27,40	2,221
Initial symmetrical short-circuit current*	I_k	N/A	250ms	27,17	1,473
Decaying (aperiodic) component of short circuit current*	i_{dc}	N/A	500ms	--	--
Reactance/Resistance Ratio of source*	X/R	N/A	Time to trip	0,113	In seconds

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Power Quality. Harmonic current emission				
micro-generator		IMEON 3.6		
Harmonic order n	Current Magnitude [A] at 100% rated output power	% of Fundamental	Phase	Harmonic current limit EN 61000-3-2, Class A [A]
1st	13,031	--	Single Phase	-
2nd	0,098	0,751	Single Phase	1,080
3rd	0,230	1,767	Single Phase	2,300
4th	0,028	0,217	Single Phase	0,430
5th	0,067	0,511	Single Phase	1,140
6th	0,020	0,157	Single Phase	0,300
7th	0,064	0,493	Single Phase	0,770
8th	0,016	0,119	Single Phase	0,230
9th	0,041	0,317	Single Phase	0,400
10th	0,011	0,081	Single Phase	0,184
11th	0,036	0,276	Single Phase	0,330
12th	0,010	0,076	Single Phase	0,153
13th	0,032	0,247	Single Phase	0,210
14th	0,008	0,060	Single Phase	0,131
15th	0,033	0,251	Single Phase	0,150
16th	0,006	0,048	Single Phase	0,115
17th	0,032	0,243	Single Phase	0,132
18th	0,006	0,044	Single Phase	0,102
19th	0,025	0,190	Single Phase	0,118
20th	0,006	0,044	Single Phase	0,092
21th	0,023	0,173	Single Phase	0,107
22th	0,005	0,042	Single Phase	0,084
23th	0,019	0,148	Single Phase	0,098
24th	0,005	0,040	Single Phase	0,077
25th	0,020	0,150	Single Phase	0,090
26th	0,005	0,040	Single Phase	0,071
27th	0,015	0,115	Single Phase	0,083
28th	0,006	0,043	Single Phase	0,066
29th	0,016	0,126	Single Phase	0,078
30th	0,007	0,050	Single Phase	0,061
31th	0,014	0,107	Single Phase	0,073
32th	0,007	0,056	Single Phase	0,058
33th	0,014	0,110	Single Phase	0,068
34th	0,007	0,055	Single Phase	0,054
35th	0,014	0,109	Single Phase	0,064
36th	0,006	0,049	Single Phase	0,051
37th	0,015	0,116	Single Phase	0,061
38th	0,006	0,048	Single Phase	0,048
39th	0,016	0,119	Single Phase	0,058
40th	0,007	0,053	Single Phase	0,046

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Voltage fluctuation and Flicker.					
	Maximum permissible flicker and voltage fluctuation as per EN 61000-3-3				
Value	Pst	Plt 2 hours	d(t) _{500ms}	dc	dmax
Limit	1,0	0,65	3,3%	3,3%	4%
Test value	0,22	0,22	0,00%	0,07%	0,45%

DC-Injection.				
Protection limit	Tested at four power levels, limit 0,5% of IAC _{nom} (65,2mA)			
Output power	~20%	~50%	75%	~100%
Max. test value (phase L1) [mA]	-63	-49	-63	-28