Verklaring van geen bezwaar

Aanvrager: **Delta Electronics, Inc.**
39, Sec.2, Huandong Road, Shanhua Dist.,
Tainan City74144
Taiwan

Product: **Fotovoltaïsche Omvormers**

Model: **RPI-H3**

Reglementair voorgeschreven gebruik:

Automatisch schakelstation met enkelfasige netwerkbewaking conform DIN V VDE V 0126-1-1:2006-02 (afwijkende grenswaarden voor Nederland op basis van EN 50438:2013, NEN-EN 50438:2013, Annex A*) voor fotovoltaïsche installaties met een enkelfasige parallelvoeding door middel van gelijkstroom-wisselstroommutator in het net van de openbare voorziening. Het automatische schakelstation vormt een integraal bestanddeel van de hoger vermelde gelijkstroom-wisselstroommutator. Deze dient als vervangmiddel voor een te allen tijde voor de distributienetexploitant (“VNB”) toegankelijk schakelstation met scheidingsfunctie.

Controlebasis:

EN 50438:2013, NEN-EN 50438:2013
Eisen voor het aansluiten van microgeneratoren op het openbare laagspanningsnet

DIN V VDE V 0126-1-1:2006-02 (Single fouttolerantie van de bescherming-interface systeem)
Automatisch schakelstation tussen een netparallelle zelfopwekinstallatie en het openbare laagspanningsnet

Een representatief testpatroon van het hoger vermelde product voldoet aan de op het moment van de uitreiking van dit attest geldende veiligheidstechnische eisen van de vermelde controlegrondbeginselen voor een reglementair voorgeschreven gebruik.

Rapportnummer: **PVNL150417C30-EN50438**
PVDE120613C24-VDE0126

Certificaatnummer: **U15-0172**

Datum: **2015-05-22**

Certificatie-instelling

Dieter Zitzmann

DAkkS Deutsche Akkreditierungsstelle D-ZE-12024-01-01

Órgão de certificação da Bureau Veritas Consumer Products Services Germany GmbH
Acreditado nos termos da norma EN 45011 - ISO/IEC Guia 65

Appendix E Type Verification Test Report	
Extract from test report according to EN 50438	**Nr. PVNL150417C30**

Type Approval and declaration of compliance with the requirements of EN 50438.	
Manufacturer / applicant:	Delta Electronics, Inc. 39, Sec.2, Huandong Road, Shanhua Dist., Tainan City74144 Taiwan
Micro-generator Type	Grid-tied photovoltaic inverter
Rated values	RPI-H3
Maximum rated capacity	3 kW
Rated voltage	230V
Firmware version	DSP: V0202 / RED: V0201 / COMM: V0200
Measurement period:	2015-04-23 to 2015-05-15

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

The power generation unit is equipped with a 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.

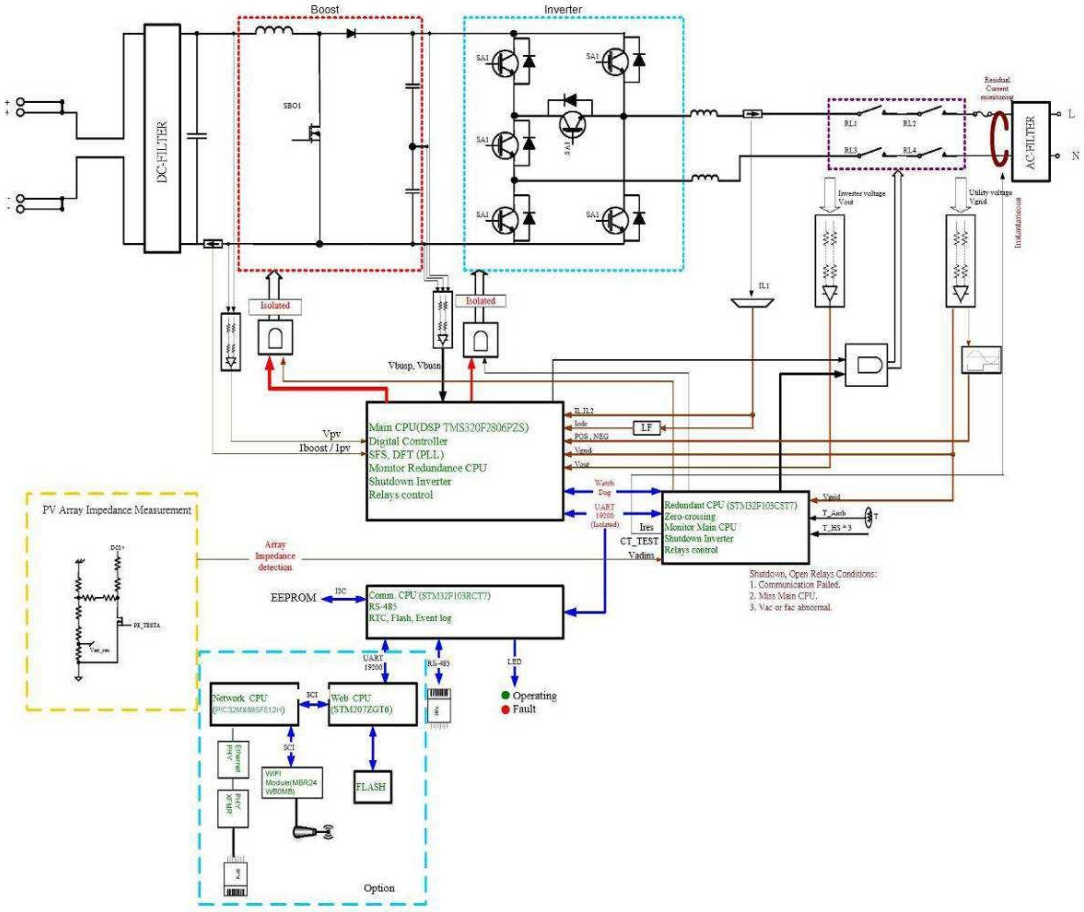

Figure 1 – Schematic structure of the power generation unit

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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Extract from test report according to EN 50438 **Nr. PVNL150417C30**

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	2	253	2	252,5	1,96
Under-voltage stage 1	184	2	184	2	183,2	1,96

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	51,00	2,0	51,00	2,0	51,00	1,987
Under-frequency	48,00	2,0	48,00	2,0	48,01	1,994

Note.

LoM test

Method used	EN 62116					
Balancing load on islanded network	33% of -5% Q Test 1	66% of -5% Q Test 1	100% of -5% P Test 9	33% of +5% Q Test 11	66% of +5% Q Test 11	100% of +5% P Test 18
Trip time. Phase 1 fuse removed	78	103	155	75	105	213

Indicate additional shut down time included in above results. (Integrated interface switch)	Type of switching equipment 1: Song Chuan Type 110 with 15ms Type of switching equipment 2: Song Chuan Type 110 with 15ms

Appendix E Type Verification Test Report

Extract from test report according to EN 50438 **Nr. PVNL150417C30**

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	195,71	47,55	2,832	0,999
2	253,01	51,45	2,934	0,997

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]:	2,942	2,938	2,942
ΔP/PM [%] per 1 Hz:			0,13

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% Pn							
Frequency [Hz]:	50,00	50,25	50,70	51,15	50,70	50,25	50,00
PM [kW]:	N/A	2,966	2,422	1,877	2,422	2,966	N/A
PE60 [kW]:	3,027	2,983	2,443	1,900	2,443	2,984	3,026
∆PE60/PM [%]:	N/A	0,57%	0,70	0,77	0,70	0,60	N/A
2. Measurement a) to g): Active power output 40% and 60% after freezing > 80% Pn							
Frequency [Hz]:	50,00	50,25	50,70	51,15	50,70	50,25	50,00
PM [kW]:	N/A	1,474	1,203	0,932	1,203	1,474	N/A
PE60 [kW]:	1,504	1,492	1,226	0,957	1,225	1,492	1,504
∆PE60/PM [%]:	N/A	0,60	0,77	0,83	0,73	0,60	N/A
Limit ΔP/P1min:	+ 10 % of P_M						

Reactive power

Uncontrollable reactive power

Test Voltage / Output power	211,6V	230V	248,4V
25% PN	0,990c	0,991c	0,991c
50% PN	0,994c	0,996c	0,995c
75% PN	0,998c	0,998c	0,998c
100% PN	0,999c	0,999c	0,999c
Limit	**>0,95**	**>0,95**	**>0,95**

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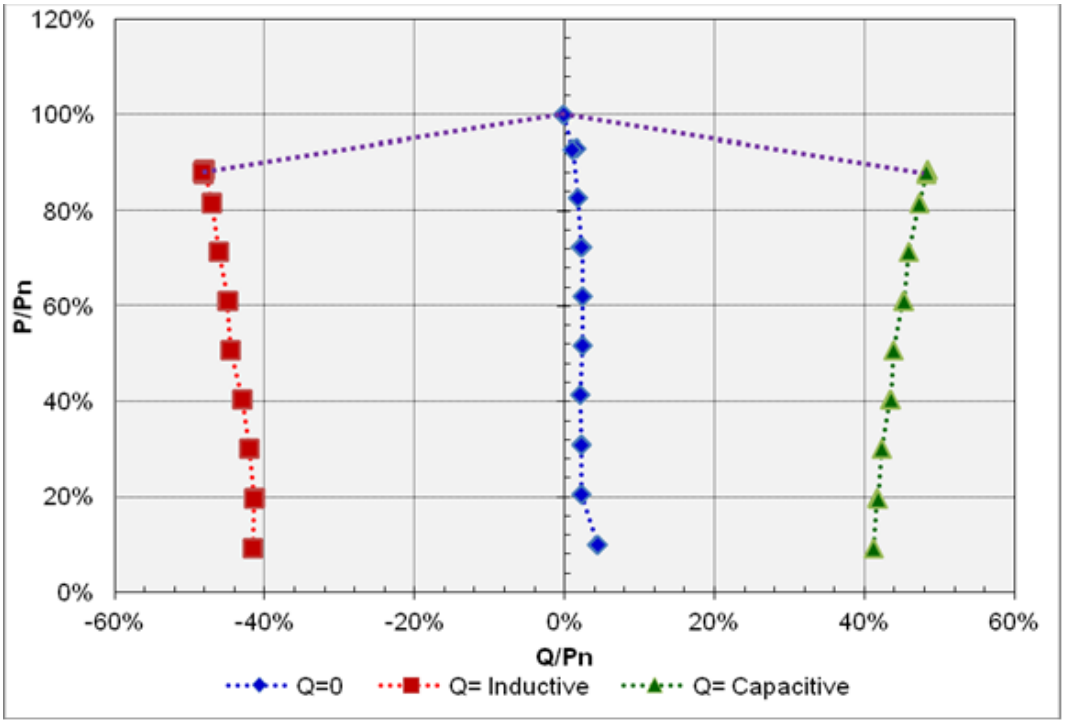
Controllable reactive power				
Inductive (supply reactive power)				
Power-BIN	**Active power [W]**	**Reactive power [Var]**	**Power factor (cos φ)**	**Voltage [V]**
0% - 10%	0,276	-1,248	0,212	230,28
10% - 20%	0,589	-1,240	0,427	230,37
20% - 30%	0,905	-1,262	0,582	230,42
30% - 40%	1,216	-1,288	0,686	230,48
40% - 50%	1,526	-1,336	0,752	230,52
50% - 60%	1,835	-1,348	0,805	230,50
60% - 70%	2,144	-1,382	0,840	230,54
70% - 80%	2,450	-1,411	0,866	230,57
80% - 90%	2,662	-1,443	0,879	230,58
90% - 100%	2,643	-1,448	0,876	230,58
Capacitive (supply reactive power)				
Power-BIN	**Active power [W]**	**Reactive power [Var]**	**Power factor (cos φ)**	**Voltage [V]**
0% - 10%	0,287	1,237	0,223	230,32
10% - 20%	0,601	1,253	0,431	230,37
20% - 30%	0,913	1,271	0,583	230,42
30% - 40%	1,225	1,305	0,684	230,48
40% - 50%	1,536	1,315	0,759	230,54
50% - 60%	1,844	1,357	0,805	230,55
60% - 70%	2,152	1,377	0,842	230,56
70% - 80%	2,459	1,421	0,865	230,62
80% - 90%	2,764	1,454	0,885	230,68
90% - 100%	2,788	1,447	0,887	230,69
Reactive power supply with set point Q=0				
Power-BIN	**Active power [W]**	**Reactive power [Var]**	**Power factor (cos φ)**	**Voltage [V]**
0% - 10%	0,297	0,130	0,915	230,33
10% - 20%	0,608	0,069	0,994	230,40
20% - 30%	0,919	0,065	0,997	230,42
30% - 40%	1,230	0,060	0,999	230,48
40% - 50%	1,538	0,071	0,998	230,53
50% - 60%	1,846	0,073	0,999	230,58
60% - 70%	2,152	0,071	0,999	230,57
70% - 80%	2,457	0,055	0,999	230,60
80% - 90%	2,762	0,049	0,999	230,67
90% - 100%	2,967	-0,007	0,999	230,72

Appendix E Type Verification Test Report

Extract from test report according to EN 50438 **Nr. PVNL150417C30**

Diagram of inductive reactive power absorption



Q adjustment				
Test: 100%Pn				
	Reactive power set point Q [Var]	**Measured reactive power Q [Var]**	**Measured cos φ**	**Deviation compared to setpoint ΔQ / PN [%]**
- Qmin	-1,320	-1,427	0,883	-3,56
0	0	-0,020	0,999	-0,68
+ Qmax	1,320	1,448	0,886	4,25
Test: 50%Pn				
	Reactive power set point Q [Var]	**Measured reactive power Q [Var]**	**Measured cos φ**	**Deviation compared to setpoint ΔQ / PN [%]**
- Qmin	-1,320	-1,321	0,742	-0,03
0	0	-0,020	0,999	-0,68
+ Qmax	1,320	1,293	0,751	-0,89

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Extract from test report according to EN 50438 **Nr. PVNL150417C30**

Connection and starting to generate electrical power		
	Voltage conditions	
a) Start up for voltage range	**<84% Un for twice of observation time**	**>111% Un for twice of observation time**
Connection:	no connection	no connection
Limit:	No connection allowed	
b) In voltage range at start-up	**85% Un within twice setting observation time**	**111% Un within twice setting observation time**
Reconnection time [s]	72	72
Limit:	Connected after setting observation time (≥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%Pn/min. For recorded gradient see diagram below.	
c) In voltage range after voltage failure	**≥84% Un for twice of setting observation time**	**≤111% Un for twice of setting observation time**
Reconnection time [s]	72	73
Limit:	Reconnection after setting observation time (≥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%Pn/min. For recorded gradient see diagram below.	
	Frequency conditions	
d) Start up for frequency range	**<47,95 Hz for twice of setting observation time**	**>50,05 Hz for twice of setting observation time**
Connection:	no connection	no connection
Limit	No connection allowed	
e) In frequency range at start-up	**≥47,95 Hz within twice of setting observation time**	**≤51,05 Hz within twice of setting observation time**
Reconnection time [s]	73	74
Limit:	Connected after setting delay time(≥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%Pn/min. For recorded gradient see diagram below.	
f) In frequency range after frequency failure	**≥47,95 Hz for twice of setting observation time**	**≤51,05 Hz for twice of setting observation time**
Reconnection time [s]	74	74
Limit:	Reconnection after setting observation time (≥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%Pn/min. For recorded gradient see diagram below.	

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Extract from test report according to EN 50438 **Nr. PVNL150417C30**

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	70,3	10,87
Initial Value of aperiodic current	A	N/A	100ms	70,3	4,82
Initial symmetrical short-circuit current*	I_k	N/A	250ms	70,3	3,27
Decaying (aperiodic) component of short circuit current*	i_{DC}	N/A	500ms	70,3	2,31
Reactance/Resistance Ratio of source*	X/R	N/A	**Time to trip**	0,73	In seconds

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Extract from test report according to EN 50438 **Nr. PVNL150417C30**

Power Quality. Harmonic current emission				
micro-generator		RPI-H3		
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	13,126	100,633	Single Phase	-
2nd	0,075	0,571	Single Phase	1,080
3rd	0,112	0,853	Single Phase	2,300
4th	0,044	0,335	Single Phase	0,430
5th	0,064	0,488	Single Phase	1,140
6th	0,030	0,229	Single Phase	0,300
7th	0,033	0,251	Single Phase	0,770
8th	0,024	0,183	Single Phase	0,230
9th	0,027	0,206	Single Phase	0,400
10th	0,020	0,152	Single Phase	0,184
11th	0,024	0,183	Single Phase	0,330
12th	0,020	0,152	Single Phase	0,153
13th	0,023	0,175	Single Phase	0,210
14th	0,020	0,152	Single Phase	0,131
15th	0,021	0,160	Single Phase	0,150
16th	0,020	0,152	Single Phase	0,115
17th	0,020	0,152	Single Phase	0,132
18th	0,021	0,160	Single Phase	0,102
19th	0,029	0,221	Single Phase	0,118
20th	0,022	0,168	Single Phase	0,092
21th	0,029	0,221	Single Phase	0,107
22th	0,022	0,168	Single Phase	0,084
23th	0,039	0,297	Single Phase	0,098
24th	0,022	0,168	Single Phase	0,077
25th	0,034	0,259	Single Phase	0,090
26th	0,020	0,152	Single Phase	0,071
27th	0,035	0,267	Single Phase	0,083
28th	0,017	0,130	Single Phase	0,066
29th	0,026	0,198	Single Phase	0,078
30th	0,013	0,099	Single Phase	0,061
31th	0,022	0,168	Single Phase	0,073
32th	0,011	0,084	Single Phase	0,058
33th	0,018	0,137	Single Phase	0,068
34th	0,010	0,076	Single Phase	0,054
35th	0,016	0,122	Single Phase	0,064
36th	0,008	0,061	Single Phase	0,051
37th	0,015	0,114	Single Phase	0,061
38th	0,008	0,061	Single Phase	0,048
39th	0,014	0,107	Single Phase	0,058
40th	0,008	0,061	Single Phase	0,046

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Extract from test report according to EN 50438 **Nr. PVNL150417C30**

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	0,32	0,32	0,00%	0,16%	0,76%

DC-Injection.				
Protection limit	Tested at four power levels limit 0,5% of I_{ACnom}			
Output power	**~20%**	**~50%**	**75%**	**~100%**
Max. test value (phase L1) [mA]	12,00	13,00	14,00	14,00