

CERTIFICATE OF COMPLIANCE

Certificate Number 20171208-E476615
Report Reference E476615-20171207
Issue Date 2017-DECEMBER-08

Issued to: Ideal Power Inc
4120 Freidrich Lane
Ste 100
Austin TX 78744.

**This is to certify that
representative samples of**

STATIC INVERTERS, CONVERTERS AND
ACCESSORIES FOR USE IN INDEPENDENT POWER
SYSTEMS
SEE ADDENDUM PAGE

Have been investigated by UL in accordance with the
Standard(s) indicated on this Certificate.

Standard(s) for Safety: SEE ADDENDUM PAGE

Additional Information: See the UL Online Certifications Directory at
www.ul.com/database for additional information

Only those products bearing the UL Certification Mark should be considered as being covered by UL's
Certification and Follow-Up Service.

Look for the UL Certification Mark on the product.



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This is to certify that representative samples of the product as specified on this certificate were tested according to the current UL requirements.

All units with serial numbers having digits after the first 8 positions {Example - A3917030 118} which are equal to 118 or lower have not been evaluated for UL 1741 SA compliance

All units with serial numbers having digits after the first 8 positions {Example - A3917030 119} which are equal to 119 or higher have been evaluated for UL 1741 SA compliance.

Once 999 has been exceeded, then increments of the 4th and 5th most significant unit number digit would be implemented to allow up to 99,999 units in a family to be recorded.

Standards for Safety:

UL 1741, Standard for Safety for Inverters, Converters, Controllers and Interconnection System Equipment for Use With Distributed Energy Resources, UL 1741, Second Edition, dated January 28, 2010. Including the requirements in UL 1741 Supplement SA, sections as noted in the Technical considerations.

IEEE 1547, IEEE Standard for Interconnecting Distributed Resources with Electric Power Systems.
IEEE 1547.1, IEEE Standard for Conformance Test Procedures for Equipment Interconnecting Distributed Resources with Electric Power Systems.

CSA C22.2 No. 107.1-3, General Use Power Supplies.



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Components covered by this certificate provide functionality in compliance with UL 1741 Supplement A (SA) when used in a UL Listed end product which has been evaluated by UL for its intended purpose. Compliance testing was conducted on samples of the products according to the test methods in the following sections of UL 1741 with compliant results:

Certified functions. Cross Reference table – UL 1741 SA to SRD	Source Requirement Document(s)	Test Standard(s) and Section(s)	Report Date
ANTI-ISLANDING PROTECTION - UNINTENTIONAL ISLANDING WITH GRID SUPPORT FUNCTIONS ENABLED	Electric Rule No. 21 Hh.1a	UL 1741 SA 8	2017-12-07
LOW/HIGH VOLTAGE RIDE THROUGH	Electric Rule No. 21 Table Hh.1	UL 1741 SA 9	2017-12-07
LOW/HIGH FREQUENCY RIDE THROUGH	Electric Rule No. 21 Table Hh.2	UL 1741 SA10	2017-12-07
RAMP RATES	Electric Rule No. 21 Table Hh.2k	UL 1741 SA 11	2017-12-07
RECONNECT BY "SOFT START"	Electric Rule No. 21 Hh.2k	UL 1741 SA 11	2017-12-07
SPECIFIED POWER FACTOR	Electric Rule No. 21 Hh.2i	UL 1741 SA 12	2017-12-07
DYNAMIC VOLT/VAR OPERATIONS	Electric Rule No. 21 Hh.2J	UL 1741 SA 13	2017-12-07

Testing conducted to the requirements of UL 1741 SA corresponds to the minimum requirements for CA Rule 21, 2015. An enumeration of functions tested, including complete ratings, and available certified settings for the Grid Support functions, are recorded in the appendix to this document. Test data and detailed results of compliance testing are retained in the complete UL Report for this product.

Report prepared by:



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 Energy Systems & eMobility



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Appendix

Detailed Testing Summary	Test Standard(s) and Section(s)	Fixed / Adjustable	Pass / Fail
UNINTENTIONAL ISLANDING WITH GRID SUPPORT FUNCTIONS ENABLED	UL 1741 SA 8	Adjustable	Pass
HIGH VOLTAGE RIDE-THROUGH DURATION	UL 1741 SA 9.1	Adjustable	Pass
HIGH VOLTAGE RIDE-THROUGH / MUST TRIP MAGNITUDES	UL 1741 SA 9.2	Adjustable	Pass
HIGH VOLTAGE MUST TRIP CLEARING TIMES	UL 1741 SA 9.2	Adjustable	Pass
LOW VOLTAGE RIDE-THROUGH DURATION	UL 1741 SA 9.1	Adjustable	Pass
LOW VOLTAGE RIDE-THROUGH / MUST TRIP MAGNITUDES	UL 1741 SA 9.2	Adjustable	Pass
LOW VOLTAGE MUST TRIP CLEARING TIMES	UL 1741 SA 9.2	Adjustable	Pass
HIGH FREQUENCY RIDE-THROUGH DURATION	UL 1741 SA10.1	Adjustable	Pass
HIGH FREQUENCY RIDE-THROUGH / MUST TRIP MAGNITUDES	UL 1741 SA10.2	Adjustable	Pass
HIGH FREQUENCY MUST TRIP CLEARING TIMES	UL 1741 SA10.2	Adjustable	Pass
LOW FREQUENCY RIDE-THROUGH DURATION	UL 1741 SA10.1	Adjustable	Pass
LOW FREQUENCY RIDE-THROUGH / MUST TRIP MAGNITUDES	UL 1741 SA10.2	Adjustable	Pass
LOW FREQUENCY MUST TRIP CLEARING TIMES	UL 1741 SA10.2	Adjustable	Pass
NORMAL RAMP RATE	UL 1741 SA 11.2	Adjustable	Pass
"SOFT START" RAMP RATE	UL 1741 SA 11.4	Adjustable	Pass
SPECIFIED POWER FACTOR	UL 1741 SA 12	Adjustable	Pass
VOLT/VAR MODE (Q(V))	UL 1741 SA 13	Adjustable	Pass
FREQUENCY-WATT (FW)	UL 1741 SA 14	N/A	N/A
VOLT-WATT (VW)	UL 1741 SA 15	N/A	N/A



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Inverter Firmware Version:		
UL 1998	Date	Version/CRC
Compliant	11/30/2017	3.2.37 / 0x0CBDF8CF
Compliant	12/14/2017	3.2.42 / 0xF0A9D6B1

Inverter Ratings - Output	30XXX	NX15
Output phase configuration	3-Phase Delta	
Nominal (line to line) output voltage V ac	480	
Operating voltage range V ac	422-528	
Line Synchronization Characteristics	Type 2	
Normal out frequency Hz	60	
Rated output current (A ac)	36	18
Rated output power, (kW)	30	15
Max. Branch Circuit overcurrent protection (A ac)	50	30
Maximum Air Ambient (°C)	60°C	60°C

Other ratings:	
Max. output fault current (A) / duration (ms)	1.15 / 385
Max. utility backfeed current to PV input (A)	1.76 / 687
Line Synchronization Characteristics / In-rush current	Type 2 / 0.5A
Limits of accuracy of voltage measurement	+/- 3%
Limits of accuracy of frequency measurement	+ /- 0.05Hz
Manufacturers stated accuracy of time response for voltage trips	+/- 3%
Manufacturers stated accuracy of time response for frequency trips	+/- 3%
Enclosure Ratings	Type 3R

INTERCONNECTION INTEGRITY TEST CATEGORIES:	
C62.42.2 Ring Wave Surge Category	B (6.0kV / 0.5kA)
C62.42.2 Combination Wave Surge Category	B (6.0kV / 3.0kA)
C37.90.1 RF Immunity - compliance	Yes
C37.90.2 Communication circuit - compliance	N/A



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<u>Magnitude and time Limits</u> - Utility interconnection voltage magnitude limits, Ride Through time limits and trip times:						
Nominal voltage	480Vac 3-Phase					
UL 1741 SA9:	Magnitudes (% of nominal)		Ride Through (Seconds) (+)		Must Trip (Seconds)	
Boundary designation (++)	Min	Max	Min	Max	Min	Max
HV3	100	130	0.06	590.00	0.10	600.00
HV2	100	130	0.06	590.00	0.16	600.00
HV1	100	130	0.06	590.00	0.16	600.00
LV1	45	100	0.06	590.00	0.16	600.00
LV2	45	100	0.06	590.00	0.16	600.00
LV3	45	100	0.06	590.00	0.16	600.00

<u>Magnitude and time Limits</u> - Utility interconnection Frequency magnitude limits, Ride Through time limits and trip times:						
Nominal Frequency:	60 Hz					
UL 1741 SA10:	Magnitudes (Frequency)		Ride Through (Seconds) (+)		Must Trip (Seconds)	
Boundary designation	Min	Max	Min	Max	Min	Max
HF3	60	65	0.04	590.00	0.16	600.00
HF2	60	65	0.04	590.00	0.16	600.00
HF1	60	65	0.04	590.00	0.16	600.00
LF1	55	60	0.04	590.00	0.16	600.00
LF2	55	60	0.04	590.00	0.16	600.00
LF3	55	60	0.04	590.00	0.16	600.00

SA11 Ramp Rate test ratings (RR/SSRR)		
Minimum normal ramp-up rate	1.00%	%Irated/SEC
Maximum normal ramp-up rate	25.0%	%Irated/SEC
Minimum soft start ramp-up rate	1.00%	%Irated /SEC
Maximum soft start ramp-up rate	25.0%	%Irated /SEC



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SA12 SPF Specified Power Factor (INV3)	
Minimum Inductive (Underexcited) Power Factor (<0)	-0.75
Minimum Capacitive (Overexcited) Power Factor (>0)	+0.75

SA13 Volt/Var Mode (VV) extent of curve range settings				
Settings		Qmax Values - Maximums	Qmin Values - Minimums	Units
Reactive power production setting	Q ₁	21000	0	VAR
Reactive power absorption setting at the left edge of the deadband	Q ₂	0	0	VAR
Reactive power absorption setting at the right edge of the deadband	Q ₃	0	0	VAR
Reactive power absorption setting	Q ₄	-21000	0	VAR

Settings		Maximum	Minimum	Units
The voltage at Q ₁	V ₁	98.00%	45.00%	%Vnom
The voltage at Q ₂	V ₂	100.00%	47.00%	%Vnom
The voltage at Q ₃	V ₃	128.00%	100.00%	%Vnom
The voltage at Q ₄	V ₄	130.00%	102.00%	%Vnom



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