



**Proof of safe TN System Formation and Compliance
with Requirements of IEC 62109-1 and IEC 62109-2
for Clayton Power LPSII in stand-alone mode**

Document Number. : 22PP471-03_0

Date of issue : 2023-06-16

Total number of pages..... : 3

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Test item description : Stationary, rechargeable lithium battery and power back-up with 12 Vdc in- and output, with 230 Vac in- and output, and with solar input

Manufacturer : Clayton Power

Model/Type reference: LPS II 1500 (SE) – CL2204/CL2214

LPS II 1500 – CL2101/CL2111

LPS II 2000 – CL2205/CL2215

LPS II 2500 – CL2102/CL2112

LPS II 3000 – CL2103/CL2113

Ratings

	LPS II 1500 (SE)	LPS II 1500	LPS II 2000	LPS II 2500	LPS II 3000
Model no.	CL2204/CL2214	CL2101/CL2111	CL2205/CL2215	CL2102/CL2112	CL2103/CL2113
AC Input	230 V; 50 Hz; 13 A	230 V; 50 Hz; 13 A	230 V; 50 Hz; 13 A	230 V; 50 Hz; 13 A	230 V; 50 Hz; 13 A
AC Output	230 V; 50 Hz; 13 A	230 V; 50 Hz; 13 A	230 V; 50 Hz; 13 A	230 V; 50 Hz; 13 A	230 V; 50 Hz; 13 A
DC Output	10-14,4 VDC; 180A	10-14,4 VDC; 180A	10-14,4 VDC; 180A	10-14,4 VDC; 180A	10-14,4 VDC; 180A
DC Input	11,5 - 32 VDC; 25 A	11,5 - 32 VDC; 45 A	11,5 - 32 VDC; 45 A	11,5 - 32 VDC; 45 A	11,5 - 32 VDC; 45 A
Solar Input	NO	15-50 VDC; 15A	15-50 VDC; 15A	15-50 VDC; 15A	15-50 VDC; 15A
Battery Capacity	100 Ah	100 Ah	100 Ah	100 Ah	160Ah

Introduction

This document has been written to provide the necessary evidence that the Clayton Power LPSII device forms a safe TN system without the need for an additional external insulation monitoring device. In order to check this, the standard IEC 62109-1 "Safety of power converters for use in photovoltaic power systems – Part 1: General requirements" and IEC 62109-2 "safety of power converters for use in photovoltaic power systems – Part 2: Particular requirements for inverters" and the relevant clauses are taken into consideration. The verification in this case concerns only stand-alone mode. This is presented below.

Protection against electrical shock and energy hazards comply with IEC 62109-1 and IEC 62109-2

- Neutral conductor bonded to earth to create a grounded conductor and an earthed system. The units are provided with a ground relay that automatically connects the neutral output to the chassis if no external AC supply is available. If an external AC supply is provided, the ground relay will open before the transfer relay closes. Output circuit bonding arrangements ensure that in any mode of operation, the system only has the grounded circuit conductor bonded to earth in one place at a time. The safety functionality of PE relays controlled by a hardware logic circuit, that prevent the PE relay to be operated wrong. Testing under single-fault conditions has been performed to demonstrate that no hazards will result under fault conditions such as those that may arise in normal service or from reasonably expected misuse.
- The test "protective equipotential bonding" performed. Test protective bonding conductors have suitable cross section areas with an adequate current carrying capacity. The impedance of the protective bonding at 32 A current no exceed 0,1 Ω during or at the end of the test. Measured impedance is 17,88 m Ω .
- The output 230 Vac protected by internal residual current circuit breaker 30 mA|13 A according to IEC 62109-1 clause 9.3 "Short-circuit and overcurrent protection". The Clayton Power LPSII fully equipped with overcurrent and short circuit protection according to IEC 62109-1 and IEC 62109-2. The output short circuit tests performed. In case short circuit between L to N the system stops operating. Internal integrated RCBO trips. No defects or hazards, after removal of the fault the system operates normally. In case of short circuit between L to PE the system stops operating. Internal integrated RCBO trips. No defects or hazards, after removal of the fault the system operates normally.

Conclusion

Based on the tests and verifications conducted in accordance with IEC 62109-1 and IEC 62109-2, it is confirmed that the Clayton Power LPSII device meets all the necessary requirements for safe operation in a TN system. Safe operation is only guaranteed if the PE conductor is correctly connected via appliance supply cord. The following points serve as evidence:

1. **Electrical Protection:** The device provides effective protection against electrical shock in accordance with the requirements of IEC 62109-1 and IEC62109-2. It ensures user safety by preventing direct contact with live parts and meeting the specified electrical isolation safety standards.
2. **Grounding and Protective Conductor System:** The Clayton Power LPSII device features a reliable grounding and protective conductor system that complies with the requirements of IEC 62109-1 and IEC 2109-2. It ensures the detection of grounding faults and provides a safe path to ground, minimizing potential safety risks.
3. **Insulation Monitoring:** The device is equipped with advanced insulation monitoring functionality that detects and reports potential insulation faults. This function meets the requirements of IEC 62109-1 and IEC 62109-2, enabling timely fault detection and the implementation of maintenance measures to maintain system safety.
4. **Testing:** The Clayton Power LPSII has successfully undergone all relevant tests accordance with the specifications of IEC 62109-1 and IEC 62109-2. This confirms compliance with the standard requirements and demonstrates the reliability of the device in stand-alone mode as a TN system.

Based on this information it can be proven that the Clayton Power LPSII device ensures safe TN system formation and do not require an additional insulation monitoring device. The fulfilment of tests and requirements outlined in IEC 62109-1 and IEC 62109-2 serves as evidence of its reliability in stand-alone mode.