



PCS Certificate of Compliance

February 28, 2024

Project #X1100
Report #LIT02241100

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Subject: UL1741 CRD PCS Battery Power Limiting at Output of PV & Battery Connection (PoC)

Dear Mr. Baligar

This test report represents the results of our evaluation/testing of the PV + Battery Energy storage system to the requirements contained in following standards:

UL1741 3rd Ed CRD for Power Control Systems (PCS), Dated April 8, 2023
UL1741 2nd Ed CRD for Power Control Systems (PCS), Dated March 8, 2019

Compliance with the CRD includes management, control, and limitation of power exchange between Energy Storage Systems and Area EPS/AC utility systems.

The PCS evaluation was conducted on a representative Enphase Energy System 3.0 and the certification applies to the following configurations which were part of the tested system in the PCS modes defined below.

PCS Modes	PV Model ²	ESS Model ²	Max PV Ratings	Max ESS Ratings	Max PV+ESS Rating	Additional Devices needed for PCS functionality	Optional Devices	Range of PCS controlled export power ³	Max Response Time
Battery Power Limiting at Output of PV & Battery Connection (PoC)	Any Line-to-Line UL Listed PV inverter	IQ Battery 5P	64A/ 15.36kVA	128A/ 30.72kVA	192A/ 46.08kVA	IQ Gateway/ CT's	IQ System Controller ²	15,360 to 0 Watts	12.65s
		IQ Battery 3T/10T		64A/ 15.36kVA	128A/ 30.72kVA			15,360 to 0 Watts	

¹ Tested with PCS eSW 1.2.0

² Please see System configuration table further for exact variations of SKU model numbers.

³ The lower limit of the current is limited based on the nameplate of the PV e.g., if the nameplate of the PV inverter is 16A, then the current limit set can be no lower than 16A.

Battery Power Limiting at Output of PV & Battery Connection (PoC):

This is a PCS mode where the system was evaluated for its ability to control per-phase currents from the ESS by monitoring the sum of PV and ESS Currents to limit the total current being produced.

The testing verified that when PV power or system load levels were subjected to step changes the total current of the PV and Battery did not exceed the limit set above documented response time. This mode is applicable only when the PV Nameplate is lower than the current limit set.



The table below describes the System configuration and SKUs associated with tested PCS mode(s)

System Component	Product SKUs	Equipment required in PCS mode?
Enphase PV	Any Line-to-Line UL Listed PV inverter	Required
Enphase Battery	Enphase IQ Battery 5P (Encharge battery 3rd generation): IQBATTERY-5P-1P-NA, B05-T02-US00-1-3-RMA consisting of UL (Listed) IQ8D-BAT/IQ8D-BAT-240 Inverter(s) rated 120/240Vac, intended to be connected to a battery and will charge and discharge the battery. Enphase IQ Battery 3T/10T (Encharge battery 2nd generation): ENCHARGE-3T-1P-NA, ENCHARGE-10T-1P-NA. consisting of UL (Listed) IQ8X-BAT-US/IQ8X-BAT-US-NB Inverter(s) rated 120/240Vac, intended to be connected to a battery and will charge and discharge the battery.	Required
Enphase IQ Gateway	X-IQ-AM1-240-5, X-IQ-AM1-240-5C, ENV-IQ-AM1-240, ENV2-IQ-AM1-240, ENV-S-AM1-120, X-IQ-AM1-240-3, X-IQ-AM1-240-3C, X-IQ-AM1-240-3-ES, X-IQ-AM1-240-3C-ES, X-IQ-AM1-240-4, X-IQ-AM1-240-4C, X2-IQ-AM1-240-4, X2-IQ-AM1-240-4C	Required
CTs	For solar production monitoring: At least 1 unit CT-200-SOLID For consumption monitoring: At least 2 units of CT-200-SPLIT or CT-200-CLAMP For battery monitoring: At least 1 unit of CT-200-SPLIT or CT-200-CLAMP	Required
Enphase IQ System Controller	IQ System Controller 3/3G: SC200D111C240US01, SC200G111C240US01 IQ System Controller 2: EP200G101-M240US01	Optional

This PCS supports:

- Up to 2 ESS inputs, each with up to 8 daisy-chained IQ Battery 5P units (or)
- Up to One ESS with 12 IQ Battery 3T units.

Each ESS circuits' charge/discharge current with IQ Battery 5P can be limited from 64 Amps to 8 Amps continuous.

1. Battery inverter breakers on the combiner box or system controller must be properly sized.
 - a. The maximum breaker size for a single IQ Battery 5P-based branch in a combiner box is 20A.
 - b. The maximum breaker size for the batteries in the system controller input is 80A per circuit.
2. The back feed breaker in the Main Panel must be sized properly based on the main panel busbar and grid breaker, maximum breaker size of 80A is tested with the test setup.
3. Please refer to the equipment installation instructions for system configuration details.

If there are any questions regarding the results contained in this report, please contact me or any Bureau Veritas CPS customer service representative.

Sincerely,

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Reviewed by,

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