

Energy Recovery Systems: ERS 4/6

Export Limiting Feature: Compliance for UK DNO's

The PowerFlow Energy Recovery System (ERS) is designed to proportionally divert exported power into a dump load such as a hot water tank. Should the dump load switch off, ERS contains an export limiting feature which consists of a microprocessor controlled relay output which can be connected to an additional factory manufactured 'add on' module. This module contains the switch disconnection equipment required to isolate the generation source from the supply network. ERS utilizes a hard wired current transformer (CT) device to obtain the power measurement required for both dump load and export limiting operations.

PowerFlow Energy Ltd offer a tailored solution for each network connection. Once the installer receives connection permission from the DNO, a copy of the connection agreement is requested from the installer. PowerFlow Energy Ltd will then factory pre-set the export limit stated on the connection agreement into the device to prevent system owner override. This will then be factory tested and shipped to the installer together with a certificate of conformity matching the device serial number and connection agreement reference. Once installed, the installer should issue a copy of this certificate to the DNO together with the G83/G59 commissioning documentation.

The PowerFlow Export Limiting feature complies with the DNO's requirements as follows:

Requirement: The system must ensure that export limiting occurs within 1 second of exceeding the export limit

Compliance: PowerFlow ERS uses its own Focus Point method of measurement, referred to as F-POINT technology. This is a measurement technique which uses half cycle data capture to obtain a true RMS power value accounting for power quality and inductive skew variations within the sine wave. ERS captures this information within 200 milliseconds, and should the export limit be reached, this in turn activates a relay to achieve a disconnection time of no greater than 400 milliseconds. The F-POINT technology method has been externally tested and verified by the University of Gloucestershire. (Firmware version V3.0 or later is required for the export limiting operation).

Requirement: The system must be fail safe. In other words it must limit export if the export limiter fails or it loses its power supply

Compliance: The export limiting feature of ERS controls a PowerFlow factory manufactured add on enclosure which houses two normally open (N/O) double pole contactors compliant to BSEN 61095 and 60947. ERS continually energises these N/O contactors to complete the AC final circuit to the inverter(s). If the export limit is reached, ERS will de-energise both contactors resulting in a disconnection of the main AC supply to the inverter(s). The internal G83/G59 control will then activate and shut down the inverter(s). **(see appendix 1)**

- If one contactor should fail, the second series connected contactor will provide redundancy.
- If the ERS system fails or the power is cut to the device, the default position is to de-energise the contactors which will in turn disconnect the inverter(s) from the mains supply.
- Should the current transformer line be damaged or broken, the default position is to de-energise the contractors.
- Should a three phase inverter system be connected, ERS will monitor all three phases independently and disconnected all phases if any one phase reaches the export limit.

Requirement: The system must not rely on wireless communications (e.g. Bluetooth, Wi-Fi etc.) between the various components of the export limiter system (e.g. the sensors, the export limiter and the inverters).

Compliance: The Current transformer (CT) measuring device is hard wired back to the control device and does not rely on any form of wireless communication. The relay and all other control wiring is also hard wired and contained within one enclosure for protection.

Requirement: The system and the whole installation must meet all relevant power quality requirements (e.g. G5/4 for harmonics, P28 for flicker, P29 for unbalance)

Compliance: All PowerFlow ERS devices use F-POINT technology control methods and have been certified to the relevant standard of harmonics and flicker through an external testing program with the University of Gloucestershire.

Harmonic Compliance: All ERS devices use half cycle switching at the zero crossing, a method of control that results in very low levels of harmonic distortion, complying to G5/4 and BSEN610000-3. In addition, all ERS products are housed in sealed metal enclosures which control any radiated emissions.

Voltage Fluctuation Compliance: All ERS devices control current flow using a set of empirically derived switching patterns that minimise voltage flicker to within regulatory limits in order to comply with P28/P29, BS61000-2. In addition, once the contactors of the export limiting feature have been de-energised and the inverter is disconnected from the supply network in an export limiting event, a default 5 minute timer will start and not allow re-connection of the inverter for the timed period. The purpose of the timer is to stop the inverter re-connecting and cycling too quickly on the network. This time may be adjusted and can be pre-set to the DNO's requirements at the point of manufacture within the limits of the connection agreement.

I confirm that the above mentioned products adhere to the current requirements of the DNO for export limiting devices.



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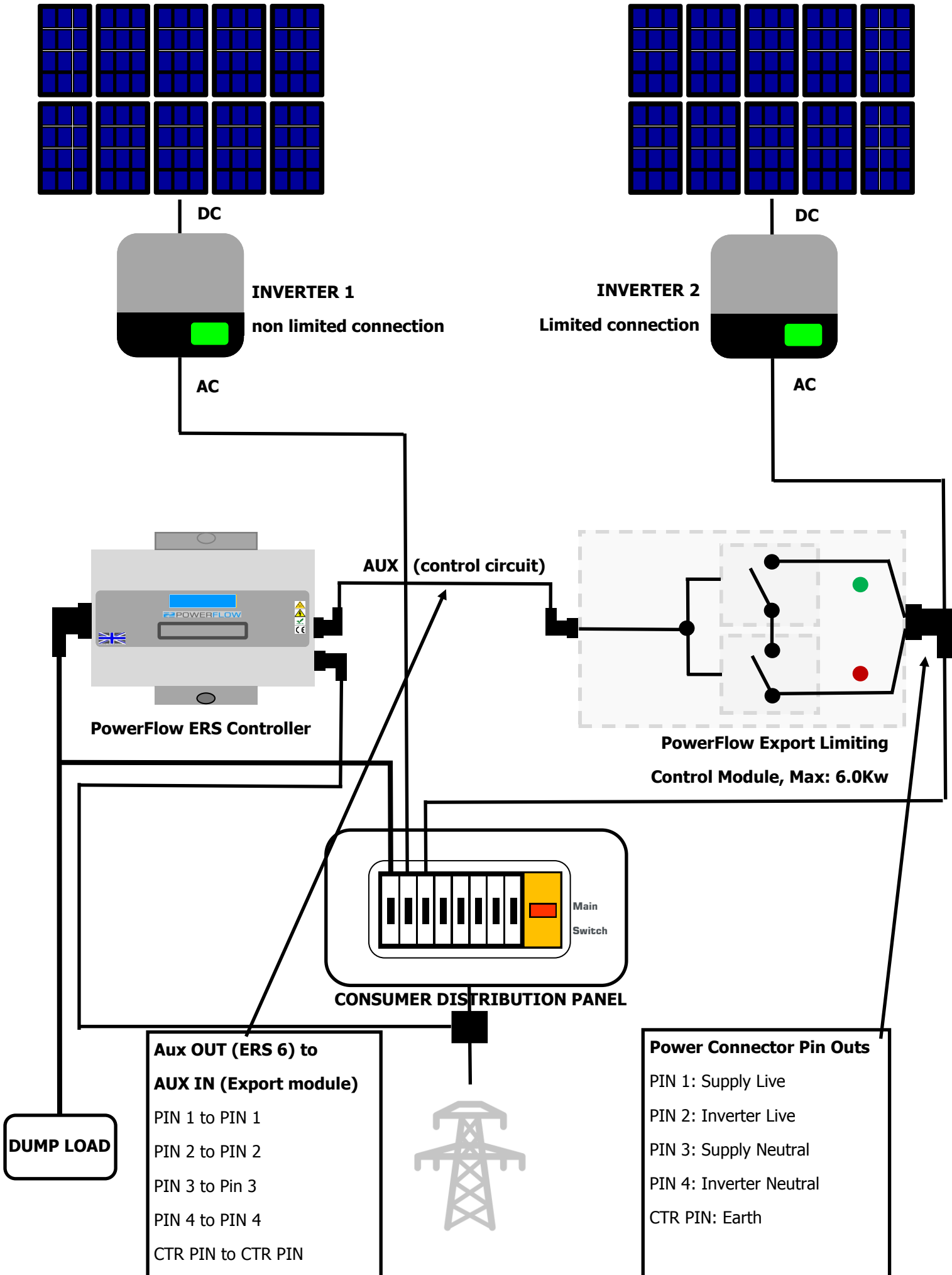
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 POWERFLOW

**PowerFlow Export Limiting Module
Connection Guide (3.60kW Export Limit)**

PV SYSTEM 1

PV SYSTEM 2



**Aux OUT (ERS 6) to
AUX IN (Export module)**

PIN 1 to PIN 1
PIN 2 to PIN 2
PIN 3 to Pin 3
PIN 4 to PIN 4
CTR PIN to CTR PIN

Power Connector Pin Outs

PIN 1: Supply Live
PIN 2: Inverter Live
PIN 3: Supply Neutral
PIN 4: Inverter Neutral
CTR PIN: Earth