



SMA Export Control System: UK compliance

1) System Description

The SMA export control is a sophisticated way of managing the amount of exported energy. This solution requires the SMA Cluster Controller (CCLON-10 or CCLON-S-10), the SMA Energy Meter (EMETER-10) and compatible SMA inverters with Speedwire/Webconnect interface (SWDM-10).

The Active Power Feed-In value can be programmed in the Cluster Controller. If the balance between generation and self-consumption reaches a point where the system might export more than this value, then the Cluster Controller can de-rate the inverters and turn down their production (PV inverters regulate the MPP to match new AC output power level limit). With this solution the amount of power that the PV system generates is maximized matching exactly the local power demand plus the maximum export power. Besides, the Cluster Controller has also the capability to limit the export power down to 0% the inverter nominal value if required.

The SMA Energy Meter is a bidirectional meter that takes measurements of the grid at the point of connection. It communicates the power consumption and export values to the Cluster Controller via Speedwire (Ethernet cable) every second. This meter can be used for single-phase or three-phase systems and its maximum current is 63A (current transformers can be used when the current exceeds this value).

2) Compliance with DNO requirements:

In general, UK DNO's require a fail-safe system, hard wire communications between the components of the export limiter system, specific power quality and operational time.

- **Requirement: The scheme has hard wired communication links between the various component parts of the export limiter scheme.**

Compliance: The communication between the different components (Inverters, Energy Meter and Cluster Controller) is via Speedwire (Ethernet cable RJ45). Not wireless connections.

- **Requirement: The export limitation scheme operates signals to the generation to reduce output within 1 second.**

Compliance: The SMA Energy Meter transmits measurement values, one averaged value per second to the Cluster Controller and this sends new AC power output level command to connected inverters.



- **Requirement: The scheme is fail-safe and limits export in the export limiter fails or it loses its power supply.**

Compliance: Fall-back is an operating mode in the Cluster Controller used for grid management services. It controls the feed-in behaviour of the inverters in the event of a communication failure. The compatible inverters are listed in section 3. There are two types of fallback: Fallback in the event of missing or invalid external set point and Fallback in the event of failure of Speedwire communication between Cluster Controller and SMA inverters.

During Breakdown of communication between inverters and Cluster Controller/Energy Meter, inverters detect breakdown via Speedwire heartbeat and revert to configured "Fall-back" setting for 0% AC power output until communication is resumed. In addition, if any component (Energy Meter or Cluster Controller) fail, the inverters reduce to the established limit export.

- **A reverse power relay is fitted which will disconnect the generation if the export goes above the Maximum Export Capacity** (Not required for fail-safe LV metered connections)
- **The scheme complies to EN Engineering Recommendation G5/4 for harmonics, P28 for flicker and P29 for voltage unbalance.**

Compliance: same as a system which is not limited. Please, check specific G83/2 and G59/3 certificates of our SMA inverters in our website www.sma-uk.com in Downloads area.

- **When the export limitation scheme operates it will reduce the exported Apparent Power to a value equal to, or less than, the Agreed Export capacity.**

Compliance: please see test results in section 5.

With a 0-watt closed-loop control in the PV system, it is always required a base load (self-consumption) of approx. 25 W x number of inverters in the PV system.

3) Compatible inverters:

The compatible inverters with "Fall-back" function and, Speedwire/Webconnect interface and therefore compatible with export limitation using the SMA Cluster Controller and SMA Energy Meter are the following:

- SB 1300TL-10, from V3.11 / SB1600TL-10 from V3.11 // SB 2100TL, from V3 11 // SB 3000TL-21, from V1 50.00R / SB 3600TL-21, from V1 2.10.16R / SB 4000TL-21, from V1 50.00R / SB

5000TL-21, from V1 50.00R / SB 6000TL-21, from V1 2.60.00R // SB 2500TLST-21, from V1 20.00R / SB 3000TLST-21, from V1 20.00R // SB 3600SE-10 / SB 5000SE-10

- STP 15000TL-10, from V1.04.00R / STP 17000TL-10, from V1.04.00R // STP 15000TLEE-10, from V2.01.00.R / STP 20000TLEE-10, from V2.01.00.R // STP 5000TL-20, from V2.26.02.R / STP 6000TL-20, from V2.26.02.R / STP 7000TL-20, from V2.26.02.R / STP 8000TL-20, from V2.26.02.R / STP 9000TL-20, from V2.26.02.R / STP 10000TL-20, from V2.52.00.R / STP 12000TL-20, from V2.52.02.R // STP 20000TL-30 / STP 25000TL-30

4) System Scheme

SMA Export limitation system has been tested to verify the current DNO requirements.

Below the scheme of the components

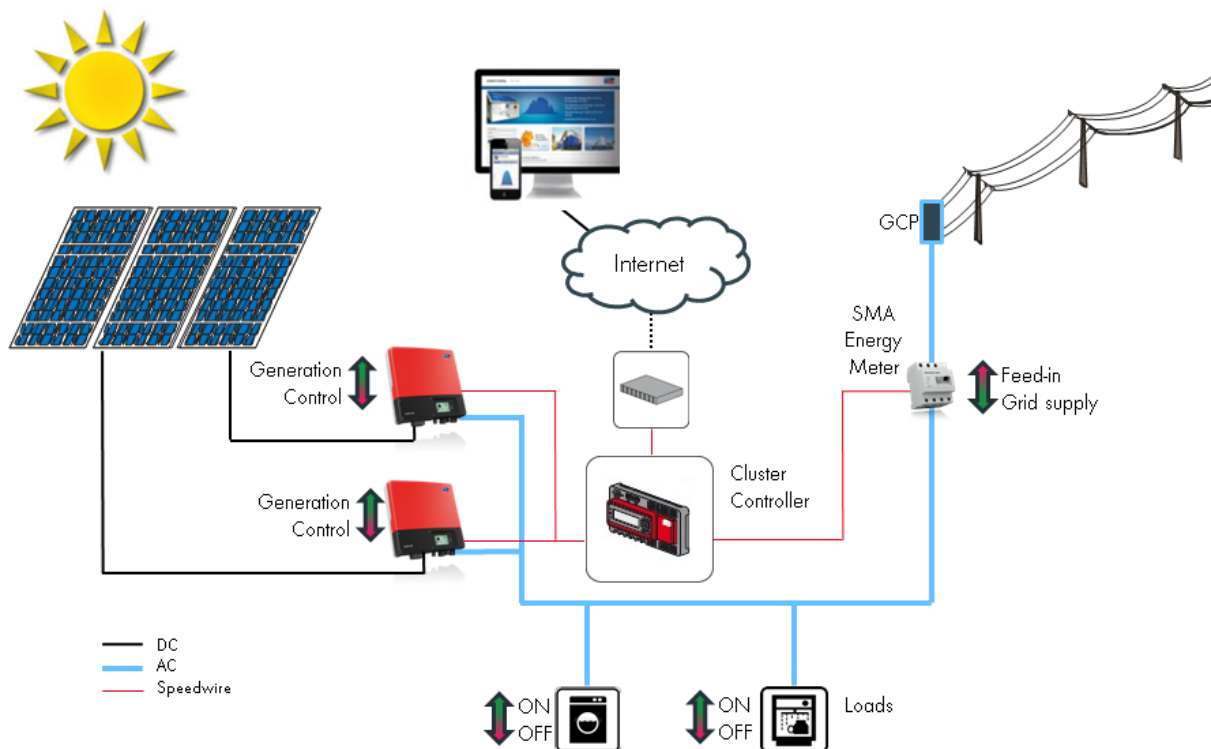
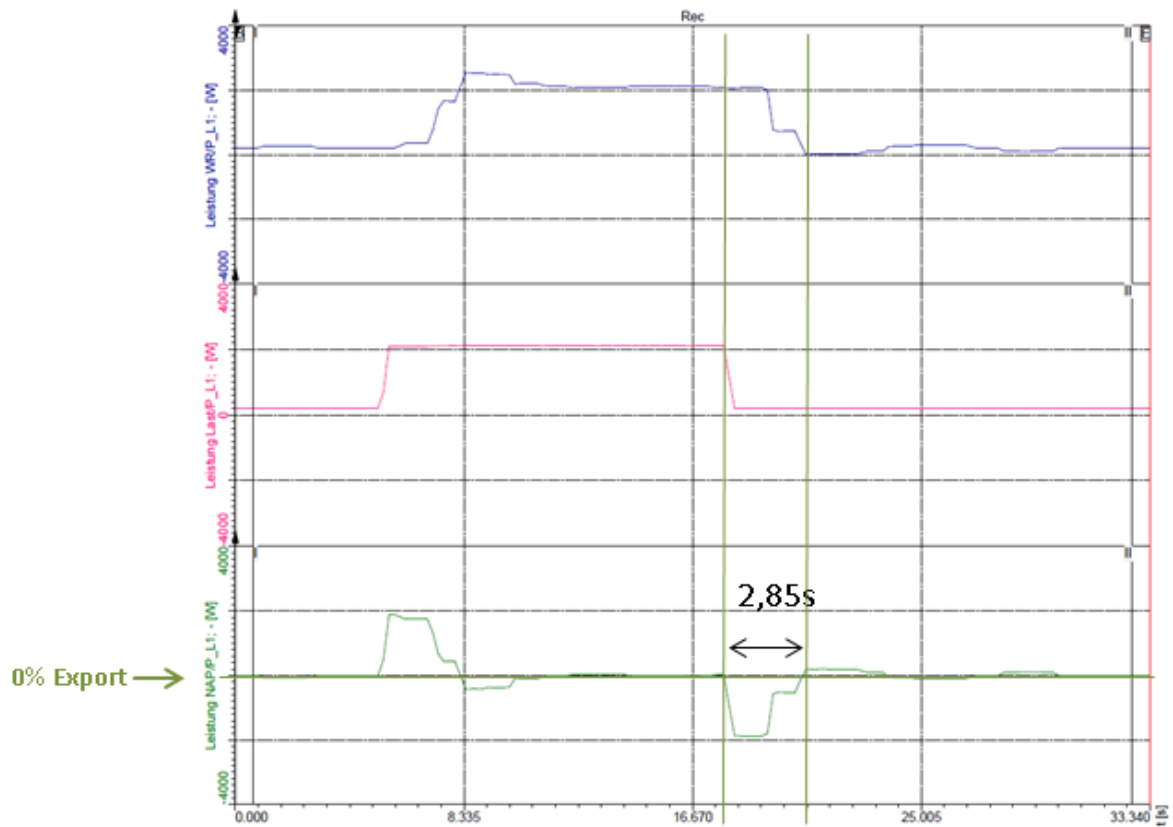
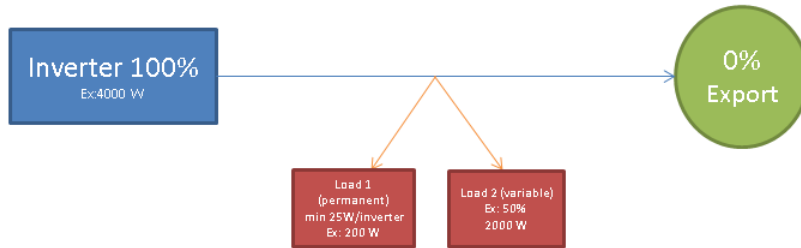


Figure 1- Schematic for export limitation



5) Test Results

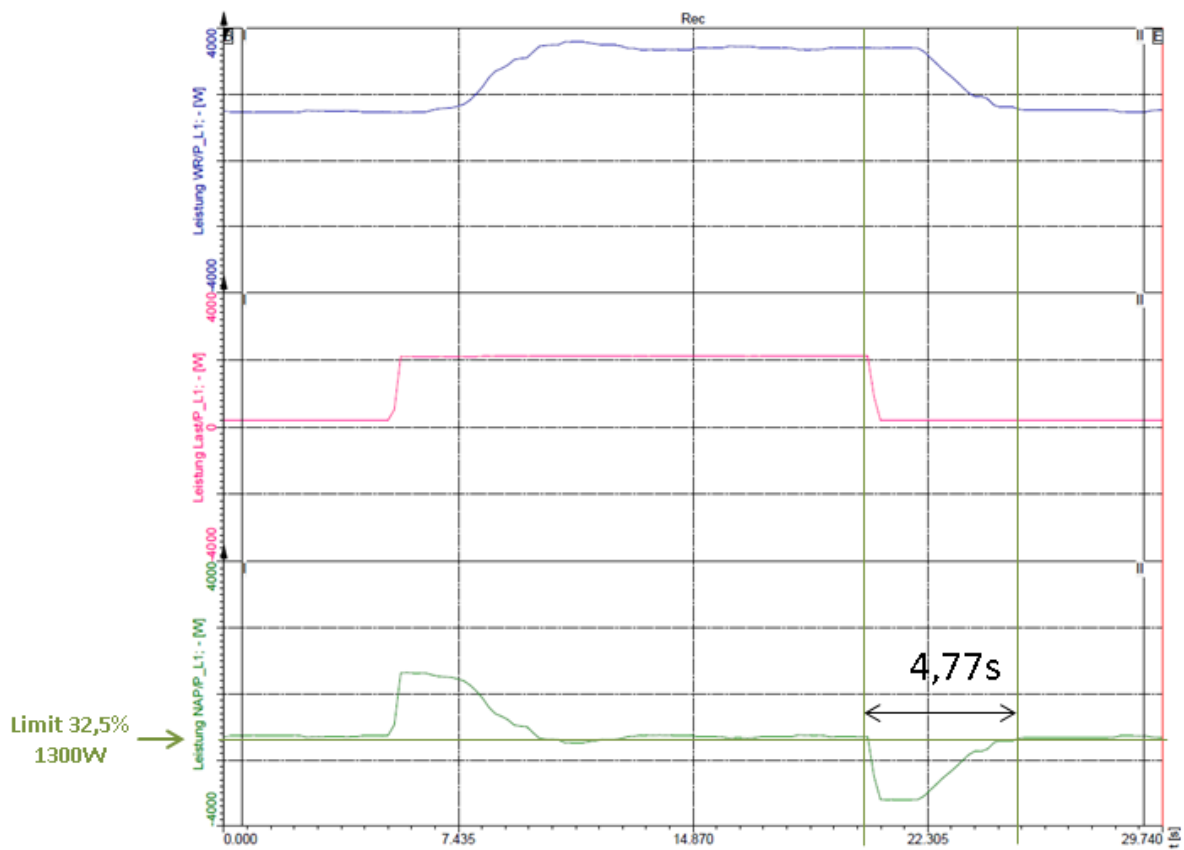
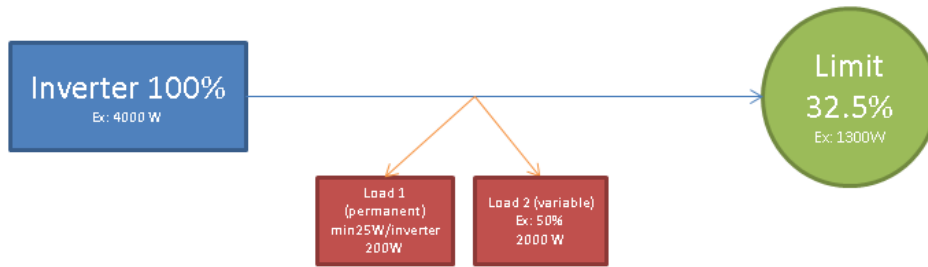
a) Zero Export



The system was tested with a limitation of zero export using SB4000TL-21 for test purposes, but applicable to other SMA inverters expecting similar results since the limitation is done following exactly the same procedure. A constant load of 200W and a variable load of 50% of the inverter power, the inverter adjusts the output power in less than 3 seconds to maintain the DNO restriction.



b) Export limitation



This second test is with an 32,5% export limitation, a constant load of 200W and a variable load of 50% of the inverter power, the inverter adjusts the output power in less than 5 seconds to maintain the DNO restriction.