

20.02.2018

## Manufacturer's declaration

### Declaration of Conformity in line with Engineering Recommendation G100

#### Reference:

- A. Electricity Networks Association (ENA) Engineering Recommendation G100 Issue 1 2016, Technical Guidance for Customer Export Limiting Schemes.

The manufacturer sonnen GmbH hereby confirms that the sonnenBatterie eco/hybrid 9 storage system complies with Engineering Recommendation G100 Issue 1 (Reference A) when installed in accordance with the Engineering G100 application guidance notes provided at Appendix 1.

The Engineering G100 application guidance notes should be read in conjunction with the sonnenBatterie eco/hybrid 9 installation and operation instructions.

Wildpoldsried, 20/02/2018



Hermann Schweizer (CTO)

#### Appendix:

### 1 sonnenBatterie eco/hybrid 9 – Engineering Recommendation G100 Guidance Notes

## sonnen - sonnenBatterie eco/hybrid 9 series

### Engineering Recommendation G100 – Guidance Notes

#### 1. Introduction.

Engineering Recommendation G100 (EREC G100): *Technical Guidance for Customer Export Limiting Schemes*, published by the Electricity Networks association (ENA), is designed to provide guidance on the connection of Customer Export Limiting Schemes (ELS) to the Distribution Systems of licensed Distribution Network Operators (DNOs).

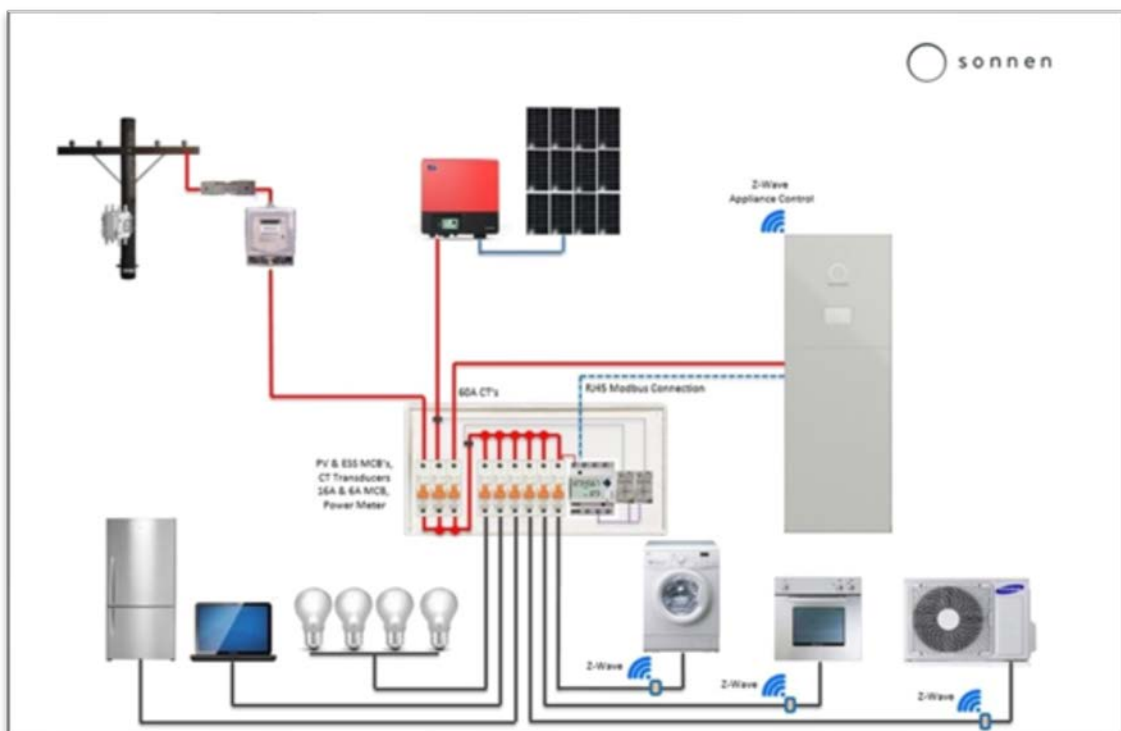
EREC G100 defines the technical design requirements for export limitation schemes which limit the net site export to below an agreed maximum and are installed on the customer's side of the DNO's connection point.

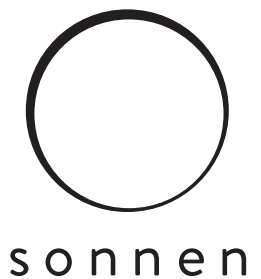
Whilst there is currently no type test procedure for EREC G100, it does detail the tests expected by a DNO during the commissioning of an export limitation systems to prove the correction function of the system. These guidance notes describe how the installation of a sonnenBatterie eco/hybrid 9 meets the key G100 requirements.

#### 2. Operation.

EREC G100 states in Section 5.1 that: "A description of the scheme, its settings, and a single line diagram should be permanently displayed on site". This is also an essential requirement of the EREC G100 forms.

- a. Single Line Diagram. The following diagram provides an overview of the operation of the sonnenBatterie eco/hybrid 9 when installed as an AC-coupled system in conjunction with a solar PV system.





The sonnenBatterie eco/hybrid 9 unit is a fully integrated unit including an inverter, battery module(s) and a control unit (CU) which manages the charge and discharge of the battery system. A revenue grade CT meter and CT clamps are used to monitor the production of the solar PV system as well as the overall electricity consumption in the property.

b. Explanation of operation. The sonnenBatterie eco/hybrid 9 has two modes of operation - self-consumption and time-of-use - which operate as follows:

i. Self-consumption mode.

An sonnenBatterie eco/hybrid 9 operating in self-consumption mode works to keep the import/export at the grid connection point as close to zero as possible. The sonnenBatterie eco/hybrid 9 will only start to charge when there is excess electricity from the solar system; and will only start to discharge when there is load within the property not being covered by the solar.

The main purpose of this system is that energy stored in the sonnenBatterie eco/hybrid 9 is only released to run the loads within the property - at no point is the system trying to export battery energy to the grid.

The sonnenBatterie eco/hybrid 9 uses a revenue grade CT meter as a power monitoring unit (PMU) to monitor the solar PV generation and the property consumption. This is installed near to the consumer unit in the property, is a DIN rail mounted meter and is required to be housed within containment. The PMU is then connected with a hard-wired connection to the main control unit (CU) incorporated within the sonnenBatterie eco/hybrid 9 unit.

ii. Time-of-use mode.

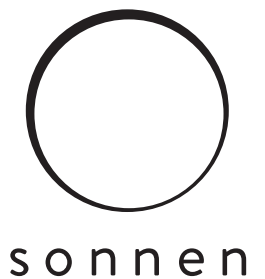
The time-of-use mode is designed to work alongside variable rate electricity tariffs. The customer is able to select a period of time that they would like the system to charge the batteries from the grid while the electricity is at a cheaper rate. Outside of the time period selected by the customer the system will work in default self-consumption mode.

3. Fail-safe functionality. EREC G100 states in Section 5.1 the requirements for the interconnection of system components and the 'fail-safe' functionality. Specifically, the requirements states:

"Irrespective of the media used for interconnecting between the discrete units, if the communication path fails the generation output should be reduced to a nominal value stipulated by the DNO within a set response time to prevent the Agreed Export Capacity from being exceeded."

The sonnenBatterie eco/hybrid 9 is fail-safe and limits export if any of the component parts of the system or communication links fail or lose their source of power.

The sonnenBatterie eco/hybrid 9 has secure communication links between the various component parts of the system in accordance with the stated requirements of EREC G100. The interconnection between the PMU (CT Meter) and the sonnenBatterie eco/hybrid 9 system is only possible by hardwiring between the two using RS485. Unplugging or otherwise interrupting this connection results in the system automatically switching off. The system reaction speed under these conditions is less than 5 seconds.



4. Security of settings. EREC G100 states in Section 5.1 that "once installed and commissioned, the scheme settings should not be capable of being readily altered by the Customer and should only be changed with the written agreement of the DNO." All sonnenBatterie eco/hybrid 9 settings are password protected and cannot be readily altered by the end user.
5. Response times. EREC G100 states in Section 5.5 that "the ELS must detect an excursion and reduce the export to the Agreed Export Capacity or less within 5 seconds."

| System fail-safe tests |   |   |      |       |
|------------------------|---|---|------|-------|
| No                     | Test  | System response   | Time | Pass? |
| 1                      | Remove power to CU  | Loss of 24 V power supplies detected. System switches off | < 5s | Yes   |
| 2                      | Remove Power to meter   | Loss of meter data detected. System switches off          | < 5s | Yes   |
| 3                      | Unplug comms cable between sonnenBatterie eco/hybrid 9 and CU | Comms/Enable signal lost. System switches off             | < 5s | Yes   |
| 4                      | Unplug comms cable between CU and Meter                       | Loss of meter data detected. System switches off          | < 5s | Yes   |

6. Contact information.

sonnen GmbH (UK Branch Office)  
Bristol & Bath Science Park, Bristol BS16 7FR, UK  
Tel: +44 (0) 330 111 4559  
email: [info@sonnenbatterie.co.uk](mailto:info@sonnenbatterie.co.uk)

sonnen GmbH (Head Office)  
Am Riedbach 1, 87499 Wildpoldsried, Germany  
Tel: +49 (0) 8304 92933 400  
email: [info@sonnenbatterie.de](mailto:info@sonnenbatterie.de)

7. Annex.

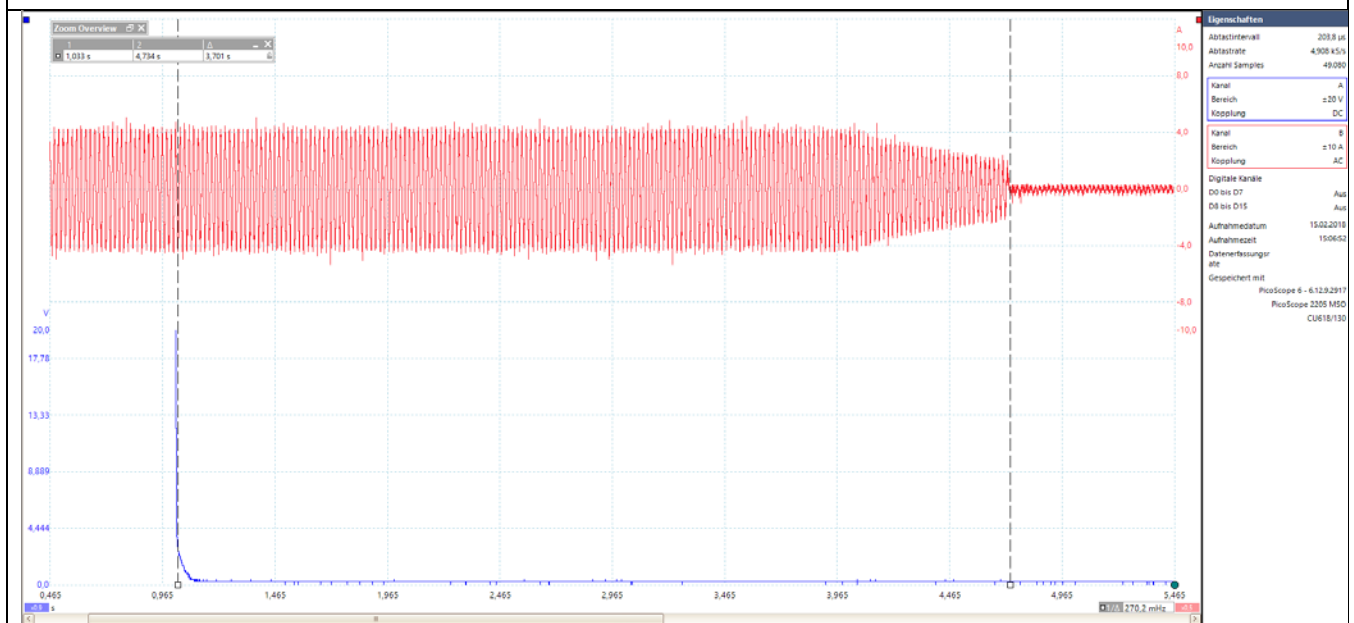
- Annex A: Failsafe tests.

## Annex A: Failsafe tests

### A1. Remove power to CU

|                    |                                   |
|--------------------|-----------------------------------|
| Test Procedure     | Remove power supply to CU         |
| Exposed response   | System turns off                  |
| Pass/fail criteria | System fails safe in less than 5s |

- Test: Remove 20 V DC power supply to CU
- Scope: Red trace is current at output of sonnenBatterie xy, blue shows V DC to CU
- Reaction time: 3.70s
- Pass/fail: **PASS**

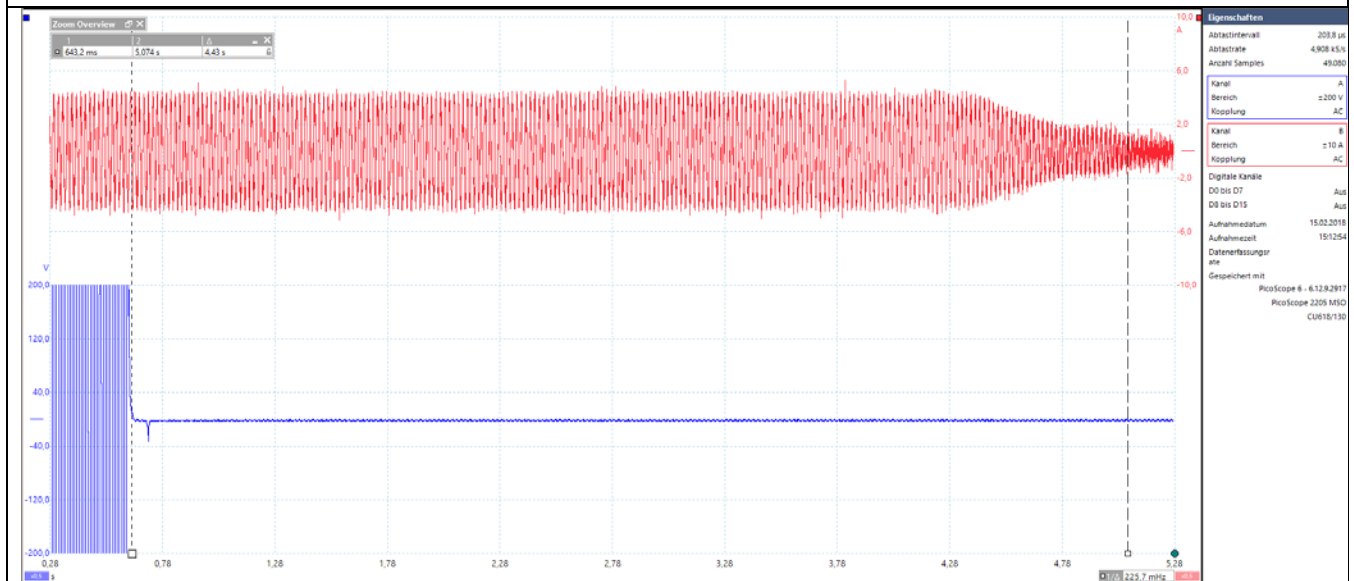


|           |  |               |            |
|-----------|--|---------------|------------|
| Author    | Samuel Challier                          | Creation date | 19.02.2018 |
| File name | G100_Failsafe tests_eco_9.43_hybrid_9.53 | Version       | 1.0        |
| Page      | 1 / 4                                    |               |            |

## A2. Remove power to Meter

|                    |                                   |
|--------------------|-----------------------------------|
| Test Procedure     | Remove power supply to Meter      |
| Exposed response   | System turns off                  |
| Pass/fail criteria | System fails safe in less than 5s |

- Test: Remove 230 V AC power supply to Meter
- Scope: Red trace is current at output of sonnenBatterie xy, blue shows V AC to Meter
- Reaction time: 4.43s
- Pass/fail: **PASS**

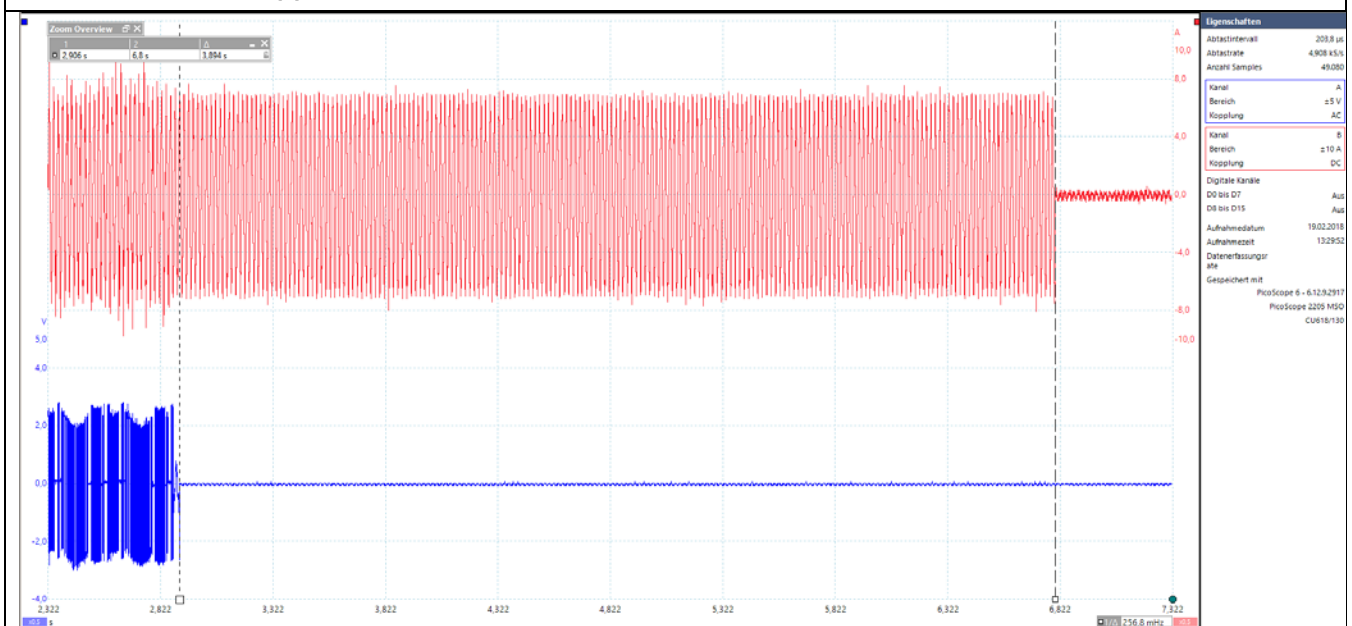


|           |  |               |            |
|-----------|--|---------------|------------|
| Author    | Samuel Challier                          | Creation date | 19.02.2018 |
| File name | G100_Failsafe tests_eco_9.43_hybrid_9.53 | Version       | 1.0        |
| Page      | 2 / 4                                    |               |            |

### A3. Remove communications cable between sonnenBatterie xy and CU

|                    |  |
|--------------------|--|
| Test Procedure     | Unplug communications cable between sonnenBatterie xy and CU |
| Exposed response   | System turns off   |
| Pass/fail criteria | System fails safe in less than 5s                            |

- Test: Unplug communications cable between sonnenBatterie xx and CU
- Scope: Red trace is current at output of sonnenBatterie xy, blue shows communication signal between CU and sonnenBatterie xy
- Reaction time: 3.89s
- Pass/fail: **PASS**

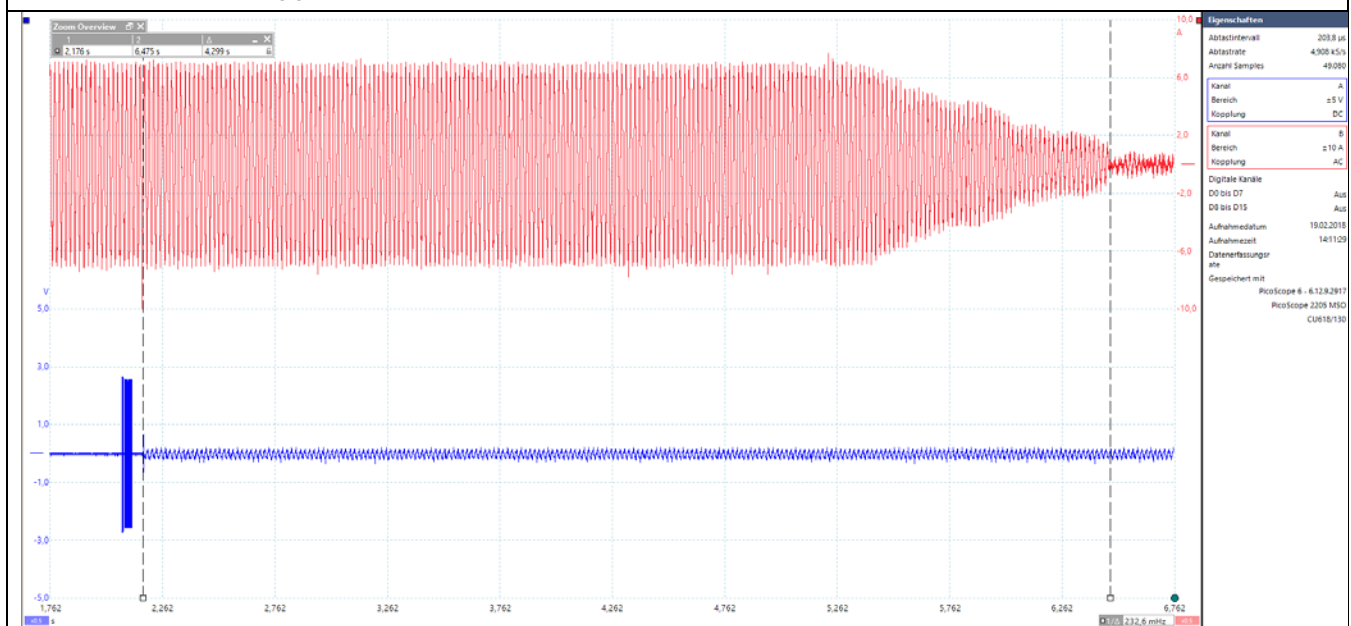


|           |  |               |            |
|-----------|--|---------------|------------|
| Author    | Samuel Challier                          | Creation date | 19.02.2018 |
| File name | G100_Failsafe tests_eco_9.43_hybrid_9.53 | Version       | 1.0        |
| Page      | 3 / 4                                    |               |            |

#### A4. Remove communications cable between CU and Meter

|                    |  |
|--------------------|--|
| Test Procedure     | Remove communications cable between CU and Meter |
| Exposed response   | System turns off                                 |
| Pass/fail criteria | System fails safe in less than 5s                |

- Test: Remove communications cable between CU and Meter
- Scope: Red trace is current at output of sonnenBatterie xy, blue shows RS485 comms from Meter
- Reaction time: 3.06s
- Pass/fail: **PASS**



|           |  |               |            |
|-----------|--|---------------|------------|
| Author    | Samuel Challier                          | Creation date | 19.02.2018 |
| File name | G100_Failsafe tests_eco_9.43_hybrid_9.53 | Version       | 1.0        |
| Page      | 4 / 4                                    |               |            |