Technical Information

SMA Flexible Storage System

1 Safety Concept Explanation

This explanation only applies to the battery inverters of the Sunny Island and Sunny Boy Storage product family (see Section 2, page 4) listed in this document. A proof that the products provide safety is required for the operation of these battery inverters with a battery system. In order to prove this, measures were defined for the safety of the products and safety in the overall system.

Measures for Product Safety

The battery inverter and the battery system are separate products. Each product fulfills the respective requirements for device safety individually. In the system network, all products are jointly responsible for the behavior and safety in the system. This pertains to the minimization of hazards to protect people, the environment and property during the entire period of use.

The following documents serve as proof of safety:

- For battery inverters, device safety is verified by the EU Declaration of Conformity and, if necessary, by the VDE-GS mark of conformity for tested safety (see www.SMA-Solar.com).
- Safety in terms of grid monitoring and grid disconnection by the battery inverters is proven by means of the following documents for the battery inverters (see www.SMA-Solar.com):
  - Product family Sunny Island (SI4.4M-12, SI6.0H-12, SI8.0H-12):

    Assigned test report for the respective product for generators in accordance with F.3 and F.4 VDE-AR-N 4105 und VDE V 0124-100
  - Product family Sunny Boy Storage (SBS2.5-1VL-10, SBS3.7-10, SBS5.0-10, SBS6.0-10):

    Assigned test report for the respective product for generators in accordance with F.3 and F.4 VDE-AR-N 4105
- For the battery system, device safety is verified by the battery manufacturer (declaration, inspection document or test certificate).

Measures for the Overall System Safety

To ensure the highest possible safety of the products and systems, always follow the instructions in the technical documentation regarding all components of the overall system.

Battery inverters of the Sunny Island product family can be operated with an integrated battery management (e.g. for lead-acid batteries) or with an external battery management connected via CAN bus (e.g. for lithium-ion batteries). The interface specification must be followed for external battery management connected via CAN bus. Battery inverters of the Sunny Boy Storage product family can only be operated with an external battery management via CAN bus connection. The relevant interface specification must always be followed for external battery management connected via CAN bus.

Possible hazards during operation of battery inverters with battery systems and the corresponding measures for safety in the overall system are structured as follows:

- Hazards when operating battery inverters with all battery systems - measures by the battery inverter
- Hazards when operating battery inverters with battery systems with an external battery management connected via CAN bus - measures by the battery inverter
- Hazards when operating battery inverters with battery systems with an external battery management connected via CAN bus - measures by the battery system

Hazards when operating battery inverters with all battery systems:

Possible hazards are handled by the battery inverter according to the following table:

Possible hazards	Measures for the overall system safety
Overcharge of the battery system	• Battery voltage control according to the specified setpoints • Continuous monitoring of the battery voltage In case of overvoltage, the battery inverter switches to the error state "Standby".
Deep discharge of the battery system	• Monitoring and control of the battery state of charge (SOC). When the depth of discharge of the battery system for increased self-consumption falls below the maximum permissible value, any further discharge for increased self-consumption is avoided and/or the battery recharged. When a defined battery state of charge is fallen short of, the battery inverter switches itself off. • Continuous monitoring of the battery voltage When the undervoltage limit of the battery system is reached, the battery inverter switches to the error state "Standby". When the minimum DC input voltage of the battery inverter is fallen short of, the battery inverter switches itself off.
Overcurrent and its effects	• Current monitoring and current limitation according to the specified setpoints In case of overcurrent, the battery inverter switches to the error state "Standby". • Installation regulations, in particular requirements for cable protection
Short circuits of the battery cables and their effects	• Installation regulations, in particular requirements for cable protection
Other errors	• Observing the detailed installation instructions for all components • Proper maintenance • Intended use

Hazards when operating battery inverters with battery systems with an external battery management connected via CAN bus:

Possible hazards are handled by the battery inverter according to the following table:

Possible hazards	Measures for the overall system safety
Overcharge of the battery system	• Specification of the setpoint for charging voltage by the battery management and communication of this setpoint to the battery inverter The battery inverter uses this setpoint. • Signaling of the overvoltage fault by the battery management In case of an overvoltage error, the battery inverter switches to the error state "Standby".
Deep discharge of the battery system	• Signaling of the battery state of charge by the battery management The battery inverter uses this information on the battery state of charge to carry out the battery protective functions. • Signaling of a deep discharge fault by the battery management In case of a deep discharge fault, the battery inverter switches to the error state "Standby".

Possible hazards	Measures for the overall system safety
Overcurrent and its effects	• Specification of the maximum charging current and the maximum discharge current by the battery management • The battery inverter observes the specification of the maximum charging current and the maximum discharge current • Signaling of an overcurrent fault by the battery management In case of an overcurrent fault, the battery inverter switches to the error state "Standby".
Short circuit of the battery cables and its effects	• Installation regulations, in particular requirements for cable protection
Other errors of the battery system	• Signaling of errors by the battery management In case of a battery management error, the battery inverter switches to the error state "Standby".
Errors in communication with the battery management	• Use of the CAN bus for communication as secure transmission (CRC*). • Rejection of data outside the permissible range by the battery inverter The battery inverter retains the last set value or uses a set default value as a fall-back level.
Loss of communication with battery management and missing battery management communication	• Monitoring the communication with the battery management system In case of a short-term loss of the communication, the battery inverter switches to the error state "Standby". In case of a long-term absence of the communication, the battery inverter switches itself off. • Use of default values The default values prevent the operation of the battery system in case of loss of communication and missing communication. This results in the battery inverter automatically switching off.

* CRC - Cyclic Redundancy Check

In addition, possible hazards of the battery system are handled as follows: In critical situations, the battery system must perform a self-shutdown with DC disconnection (in addition to the measures taken by the battery inverter). This achieves the so-called fail-safe operation* (also see explanation in "Sicherheitsleitfaden Li-Ionen-Hausspeicher (Version 1.0, Ausgabe 11/2014)").

2 Supported battery inverter types

Type	Firmware version
Sunny Island 4.4M (SI4.4M-12)	From version 1.02.04.R
Sunny Island 6.0H (SI6.0H-12)	From version 1.02.04.R
Sunny Island 8.0H (SI8.0H-12)	From version 1.02.04.R
Sunny Boy Storage 2.5 (SBS2.5-1VL-10)	From version 02.02.01.R
Sunny Boy Storage 3.7 (SBS3.7-10)	From version 1.00.20.R
Sunny Boy Storage 5.0 (SBS5.0-10)	From version 1.00.20.R
Sunny Boy Storage 6.0 (SBS6.0-10)	From version 1.00.20.R

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