SUNNY BACKUP-SET S

Integration of a backup system into a PV plant, designed according to the "Internal consumption of solar power" principle (Section 33, Para. 2 EEG 2009)

This document is valid for a Sunny Backup-Set S with an SBU 2200 from firmware version 1.3 and with an Automatic Switch Box S (AS-Box-S.1).

This documents covers the following topics:

- Increased self-consumption with a Sunny Backup system
- Integration of the loads into increased self-consumption and backup function
- Arrangement of the energy meters and PV inverters in a Sunny Backup system
- Information on the installation of a neutral conductor
- Redundant earthing of the Sunny Backup 2200
- Configuring the Sunny Backup 2200 for increased self-consumption
- Parameters for increased self-consumption in the Sunny Backup 2200

1 Increased Self-Consumption

You can increase self-consumption by buffering the PV energy with a Sunny Backup system. In a Sunny Backup system with increased self-consumption, the Sunny Backup retrieves the data from the connected energy meters via the Sunny Home Manager, and uses it to determine the PV production, feed-in and purchased electricity. Alternatively, you can use a Meter Box for Sunny Backup for retrieving energy meter data.

2 Integration of the Loads into Increased Self-Consumption and Backup Function

When installing the Sunny Backup system, you can connect single-phase loads to the energy supply in two ways:

- between the combined feed-in and consumption meter and the Automatic Switch Box

  or

- at the **X4/Backup Loads** terminal of the Automatic Switch Box

The number of line conductors and type of load connection influence the way in which the loads are integrated into the increased self-consumption and backup functions, as shown in the table below.

Type of load connection	Integration into increased self-consumption	Supply of loads when the electricity grid fails
Single–phase load at terminal **X4/Backup Loads** of the AS-Box-S.1	Yes	Yes
Single–phase loads between feed-in and consumption meter and AS-Box-S.1 via L1	No	No
Single-phase loads between feed-in and consumption meter and AS-Box-S.1 via L2/L3	No	No
Three–phase loads between feed-in and consumption meter and PV production meter	No	No

3 Arrangement of the Energy Meters and PV Inverters in a Sunny Backup System

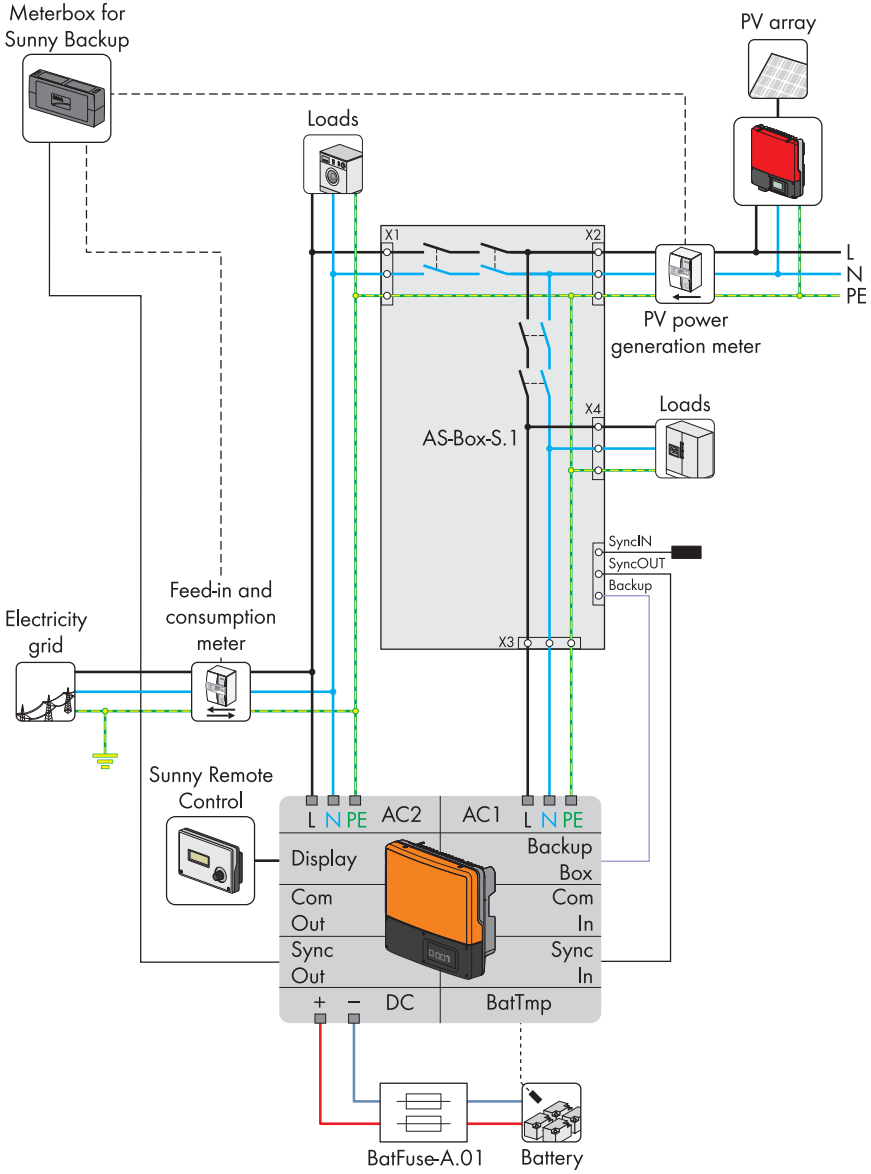

Figure 1: Arrangement of the energy meters and PV inverters in a Sunny Backup system with a single-phase PV inverter

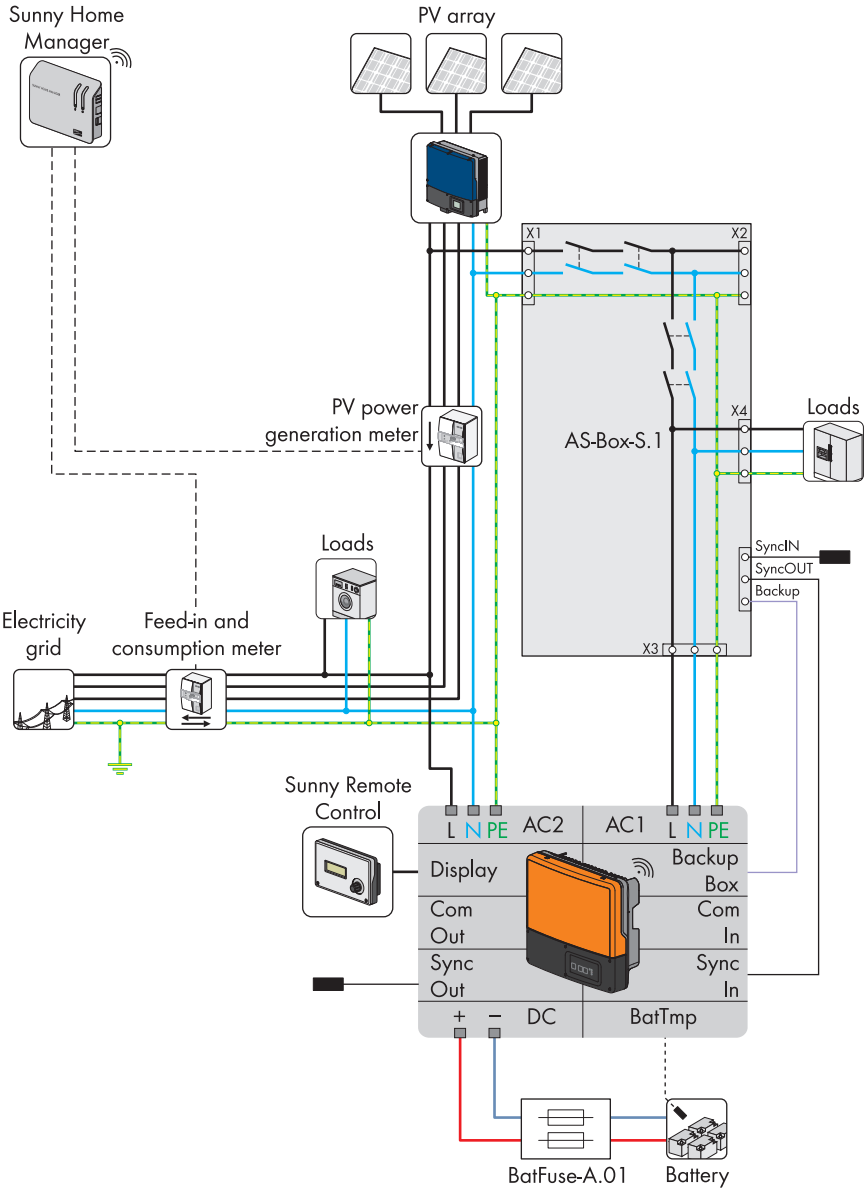

Figure 2: Arrangement of the energy meters and PV inverters in a Sunny Backup system with a three-phase PV inverter

4 Installing the Neutral Conductor

When installing the Sunny Backup system, you need to make sure that the PV plant's neutral conductor is always led through the Automatic Switch Box at terminal **X2/PV-System**. This will prevent the Sunny Backup 2200 from switching off due to asymmetric currents within the Automatic Switch Box.

5 Redundant Earthing

The Sunny Backup 2200 requires redundant (double) earthing. This requirement is met if the plant is installed according to the "grid feed-in of solar power" principle.

If installation is being carried out according to the "internal consumption of solar power" principle, you have two options for providing redundant earthing.

Option 1: Redundant earthing is provided through type of cabling

Under option 1, the Sunny Backup 2200 is earthed once through the Automatic Switch Box and once directly through a grounding cable (see Figure 3). Hence, redundant earthing is given.

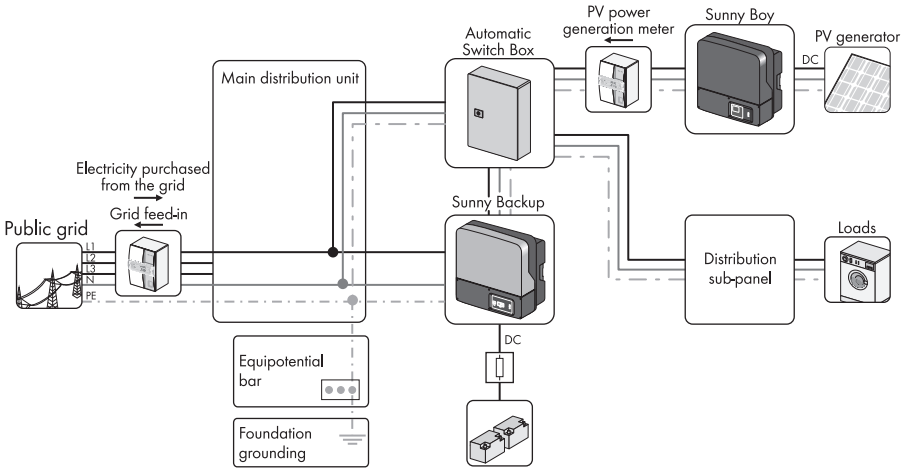

Figure 3: Sunny Backup system according to the "internal consumption of solar power" principle; redundant earthing is provided.

Option 2: Redundant earthing is provided through an additional protective conductor from the main distribution

Under option 2, the connection between the electricity grid, the Automatic Switch Box and the Sunny Backup 2200 is realised in an external enclosure.

This option does not provide redundant earthing. If you use this option, you need to earth the Sunny Backup 2200 by means of a second protective conductor from the main distribution (see Figure 4). Alternatively, you can use just one protective conductor with cross-section ≥ 10 mm².

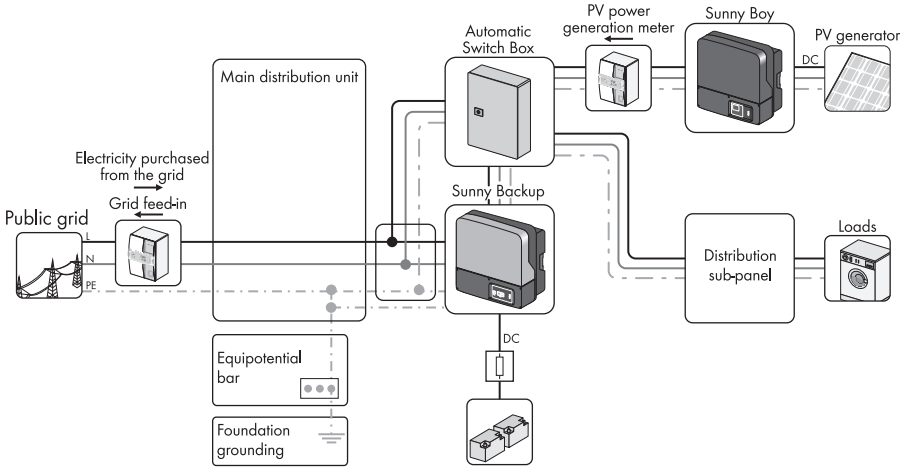

Figure 4: Sunny Backup system according to the "internal consumption of solar power" principle; redundant earthing is realised by additional protective conductor from the main distribution

6 Configuring the Sunny Backup 2200 for Increased Self-Consumption

6.1 Activating or Deactivating the Increased Self-consumption Function

There are two ways to activate or deactivate the increased self-consumption function:

- Activate or deactivate the increased self-consumption function in the Sunny Backup 2200
- Activate or deactivate the increased self-consumption function via Sunny WebBox

Activating or deactivating the increased self-consumption function in the Sunny Backup 2200

1. Enter the installer password (see technical description of the Sunny Backup system).
2. Select the parameter **200# Settings > 230# Set Backup > 236# SlfCsmpInc > 01# SlfCsmpIncEna**.
3. Carry out the desired setting.

Setting	Explanation
Enable	Activates the increased self-consumption function
Disable	Deactivates the increased self-consumption function

4. Save setting.

Activating or deactivating the increased self-consumption function via Sunny WebBox

- To activate the increased self-consumption function, set the **SlfCsmpIncEna** parameter to **Enable** (see the Sunny WebBox user manual).
- To deactivate the increased self-consumption function, set the **SlfCsmpIncEna** parameter to **Disable** (see the Sunny WebBox user manual).

6.2 Setting the Low-Charge Limit of the Battery

When using the increased self-consumption function, the low-charge limit defines the SOC limit to which the Sunny Backup may discharge the battery. The lower the low-charge limit is set, the greater the possible increase in self-consumption and the shorter the battery's service life.

When the state of charge of the battery falls below the lower limit for increased self-consumption, the battery will no longer supply any loads, providing that an electricity grid is available.

SMA Solar Technology AG recommends leaving the setting of the low-charge limit at 50%.

- To set the low-charge limit of the battery, enter a value for the **SlfCsmpSOCMin** parameter on the Sunny Backup 2200. The low-charge limit for increased self-consumption must be higher than the low-charge limit for starting the battery care mode.

6.3 Activating or Deactivating the Overnight Shutdown of the Sunny Backup 2200

The overnight shutdown of the Sunny Backup 2200 is used to minimise power consumption and preserve the battery. During overnight shutdown, the PV inverters are switched off and the connected loads are directly powered by the electricity grid. Once overnight shutdown is over, the Sunny Backup 2200 switches back on (see technical description of the Sunny Backup).

The overnight shutdown can only be active outside of the time frame specified by the Sunny Backup 2200 for the PV inverters to feed into the grid. To activate overnight shutdown, the battery's state of charge must also be lower than the low-charge limit for increased self-consumption.

- In order to deactivate overnight shutdown of the Sunny Backup 2200 when the state of charge of the battery is too low, set the **SlfCsmpStbyMod** parameter to **Off**.
- In order to activate overnight shutdown of the Sunny Backup 2200 when the state of charge of the battery is too low, set the **SlfCsmpStbyMod** parameter to **On**.

6.4 Checking the Number of Remaining Charge Cycles

Regularly check the number of remaining charge cycles.

1. Refer to the battery manufacturer's specifications for the maximum possible number of charge cycles.
2. Read off the **BatCpyThrpCnt** parameter on the Sunny Backup 2200 at regular intervals to determine the number of battery cycles.
3. Subtract the value of the **BatCpyThrpCnt** parameter from the maximum possible number of charge cycles given in the battery manufacturer's specification. This gives you the number of remaining battery charge cycles.
4. Note down the number of remaining battery charge cycles and the date.
5. If the number of remaining charge cycles decreases too strongly during the service life of the Sunny Backup system, increase the low-charge limit of the battery. This will preserve the battery but at the same time reduce the potential self-consumption increase.

7 Parameters for Increased Self-Consumption on the Sunny Backup 2200

7.1 Display Values

7.1.1 Meter Battery (120#)

Number	Name in the Sunny Backup	Name in the Sunny WebBox	Description
12	BatCpyThrpCnt	BatCpyThrpCnt	Battery cycle

7.1.2 Meter SlfCsmp (160#)

161# Meter Power

Number	Name in the Sunny Backup	Name in the Sunny WebBox	Description
01	TotPvPwrAt	PacPV	Generated PV power in kW
02	TotLodPwrAt	TotLodPwrAt	Total power consumption in kW
03	SlfCsmpPwrAt	SlfCsmpPwrAt	Self-consumption in kW
04	SlfCsmpIncPwr	SlfCsmpIncPwr	Increased self-consumption in kW
05	GdCsmpPwrAt	PacConsumption	Power drawn from the electricity grid in kW
06	GdFeedPwrAt	PacFeed-In	Power fed into the electricity grid in kW

162# Meter Energy

Number	Name in the Sunny Backup	Name in the Sunny WebBox	Description
01	PvEgyMtr	kWhPV	Meter reading PV production meter in kWh
02	TotLodEgyCnt	TotLodEgyCnt	Total consumption in kWh
03	SlfCsmpIncEgy	SlfCsmpIncEgy	Total increase in self-consumption in kWh
04	SlfCsmpIncTdy	SlfCsmpIncTdy	Today's increase in self-consumption in kWh
05	SlfCsmpEgy	SlfCsmpEgy	Total self-consumption in kWh
06	GdCsmpEgyMtr	kWhFeed-In	Meter reading purchased electricity in kWh
07	GdCsmpEgyTdy	GdCsmpEgyTdy	Today's purchased electricity in kWh
08	GdFeedEgyMtr	kWhConsumption	Meter reading grid feed-in in kWh
09	GdFeedEgyTdy	GdFeedEgyTdy	Today's grid feed-in in kWh

163# Meter State

Number	Name in Sunny Backup 2200/Sunny WebBox	Description	Value	Explanation
01	PvGdConStt	Grid into which the PV plant should feed	Grid	Electricity grid
			Backup	Stand-alone grid
			Off	No feed-in
02	LodGdConStt	Grid supplying the loads	Grid	Electricity grid*
			Backup	Stand-alone grid**
			Off	No supply
			GridBypass	Electricity grid***
03	BatMntStt	State of full charge or equalisation charge	On	No full charge or equalisation charge in preparation or active
			Wait	Full charge or equalisation charge in preparation
			Off	Full charge or equalisation charge active

* The Sunny Backup 2200 is connected.

** Formed by the Sunny Backup

*** The Sunny Backup 2200 is not connected.

7.2 Adjustable System Parameters

7.2.1 236# SlfCsmpInc

Number	Name in Sunny Backup 2200/ Sunny WebBox	Description	Value	Explanation	Default
01	SlfCsmpIncEna	Self-consumption	Disable	Deactivated	Disable
			Enable	Activated	
02	SlfCsmpSOCMin	Low-charge limit with increased self-consumption	20% ... 90%		50%
03	SlfCsmpStbyMod	Disconnection of the Sunny Backup 2200 when battery SOC falls below the low-charge limit with increased self-consumption	Off	Deactivated	On
			On	Activated	

7.3 Event Messages

Message	Cause and corrective measures
eHZ1ComFail	The Meter Box signals faulty communication with the PV production meter. **Corrective measures:** • Check LED indicators on the Meter Box (see installation manual of the Meter Box for Sunny Backup).
eHZ2ComFail	The Meter Box signals faulty communication with the feed-in and consumption meter. **Corrective measures:** • Check LED indicators on the Meter Box (see installation manual of the Meter Box for Sunny Backup).
MtrBoxFail	The communication between Sunny Backup and the Meter Box has been interrupted for at least 5 seconds. **Corrective measures:** • Check LED indicators on the Meter Box (see installation manual of the Meter Box for Sunny Backup).
MtrBoxTimeout	The Meter Box signals an internal timeout. **Corrective measures:** • If this message occurs repeatedly, contact the SMA Service Line.

Message	Cause and corrective measures
eHz1ProtFail	The measured values of the PV production meter are incomplete or the energy meter is not compatible. **Corrective measures:** • Install compatible energy meter (see installation manual of the Meter Box for Sunny Backup). • Check installation of the energy meter and the reading head.
eHz2ProtFail	The measured values of the feed-in and consumption meter are incomplete or the energy meter is not compatible. **Corrective measures:** • Install compatible energy meter (see installation manual of the Meter Box for Sunny Backup). • Check installation of the energy meter and the reading head.
eHzInFail	Terminals of the reading heads in the Meter Box or feed-through adapter have been swapped, or the terminals of the extension cords have been swapped. **Corrective measures:** 1. Stop the Sunny Backup (see technical description of the Sunny Backup system). 2. Make sure that the cable route between the reading head of the PV production meter and the **PV-Meter** jack is intact (see installation manual of the Meter Box for Sunny Backup). 3. Make sure that the cable route between the reading head of the PV production meter and the **Grid-Meter** jack is intact (see installation manual of the Meter Box for Sunny Backup). 4. Start the Sunny Backup 2200 (see technical description of the Sunny Backup system).