**SMA**

# SMA Home Energy Solution with Sunny Boy Smart Energy-US - Generate solar power, store and use it effectively

The solution for the flexible and effective use of solar energy with added peace of mind in the event of power outage with Sunny Boy Smart Energy-US, SMA Energy Meter-US, SMA backup solution and battery

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## SMA Warranty

You can download the current warranty conditions from the Internet at www.SMA-Solar.com.

## SOFTWARE LICENSES

The licenses for the installed software modules (open source) can be found in the user interface of the product.

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# 1 Information on this Document

## 1.1 Validity

This document is valid for:

- SMA Home Energy Solution with Sunny Boy Smart Energy-US

## 1.2 Target Group

This document is intended for qualified persons and end users. Only qualified persons are allowed to perform the activities marked in this document with a warning symbol and the caption "Qualified person". Tasks that do not require any particular qualification are not marked and can also be performed by end users. Qualified persons must have the following skills:

- Knowledge of how to safely disconnect SMA inverters
- Knowledge of how an inverter works and is operated
- Knowledge of how batteries work and are operated
- Knowledge of how battery-backup and secure power supply operation works in PV systems and is set up
- Knowledge of how energy meters work and are operated
- Training to deal with risks associated with installing, repairing, and using electrical devices, inverters, and batteries
- Training in the installation and commissioning of electrical devices and installations
- Knowledge of all applicable laws, regulations, standards, and directives
- Knowledge of and compliance with this document and all safety information
- Knowledge of and compliance with all documentation related to the products including all safety information

## 1.3 Content and Structure of this Document

This document summarizes the specific information for the system and describes the procedure for installation and commissioning.

System overviews provide the basic principle of how a system must be set up and connected.

The latest version of this document and the comprehensive manual for installation, commissioning, configuration and decommissioning of each SMA product can be found in PDF format or as eManual at www.SMA-Solar.com

This document supplements the documents that are enclosed with each product and does not replace any locally applicable codes or standards. Read and observe all documents supplied with the product.

Illustrations in this document are reduced to the essential information and may deviate from the real product.

## 1.4 Levels of Warning Messages

The following levels of warning messages may occur when handling the product.

| ⚠ DANGER |
| --- |
| Indicates a hazardous situation which, if not avoided, will result in death or serious injury. |

| ⚠ WARNING |
| --- |
| Indicates a hazardous situation which, if not avoided, could result in death or serious injury. |

| ⚠ CAUTION |
| --- |
| Indicates a hazardous situation which, if not avoided, could result in minor or moderate injury. |

| NOTICE |
|---|
| Indicates a situation which, if not avoided, can result in property damage. |

## 1.5    Symbols in the Document

| Symbol | Explanation |
|---|---|
| **i** | Information that is important for a specific topic or goal, but is not safety-relevant |
| ☐ | Indicates a requirement for meeting a specific goal |
| ☑ | Required result |
| ◆ | Example |

## 1.6    Typographies in the document

| Typography | Use | Example |
|---|---|---|
| **bold** | • Messages<br>• Terminals<br>• Elements on a user interface<br>• Elements to be selected<br>• Elements to be entered | • Connect the insulated conductors to the terminals **X703:1** to **X703:6**.<br>• Enter **10** in the field **Minutes**. |
| > | • Connects several elements to be selected | • Go to Settings > Date. |
| [**Button**]<br>[**Key**] | • Button or key to be selected or pressed | • Select [**Enter**]. |
| # | • Placeholder for variable components (e.g., parameter names) | • Parameter **WCtlHz.Hz#** |

## 1.7    Designations in the Document

| Complete designation | Designation in this document |
|---|---|
| SMA Home Energy Solution | System |
| Sunny Boy Smart Energy | Inverter, hybrid inverter |
| SMA Energy Meter-US | Energy meter |
| SMA Backup Start | SMA Backup Solution |
| SMA Backup Select | SMA Backup Solution |

## 1.8 Additional Information

The following table provides some important additional information. Additional documents and language versions are available in the Downloads section on the product pages of the system components (e.g. Sunny Boy Smart Energy product page) at **www.SMA-Solar.com**.

| Title and information content | Type of information | QR code |
|---|---|---|
| "SUNNY BOY SMART ENERGY 3.8-US / 4.8-US / 5.8-US / 7.7-US / 9.6-US / 11.5-US" | Operating manual | |
| "SMA Energy Meter US | Installation Manual | |
| "SMA Backup Start" | Installation Manual | |
| "SMA Backup Select" | Installation Manual | |
| SunSpec Certified Rapid Shutdown Devices<br><br>Overview of approved SMA inverters with SunSpec Certified Rapid Shutdown Receivers | Technical Information | |
| "Approved Batteries and Information on Battery Communication Connection"<br><br>Overview of approved batteries | Technical Information | |
| "Sunny Portal powered by ennexOS" | User Manual | |

# 2    Intended Use

The SMA Home Energy Solution is a PV and storage system, which optimizes self-consumption of PV energy and lowers the energy obtained from the utility grid by the following measures:

- Use of self-generated PV energy
- Intermediate storage of PV energy in the battery
- Energy management of the battery with the inverter as System Manager and the SMA Energy Meter-US
- Visualization of consumption and generation data from the system in the SMA Energy App, in Sunny Portal, and in the SMA 360° app
- Use of self-generated PV energy for selected loads in the event of power outage

Grid feed-in and grid-supplied power are recorded with the SMA Energy Meter. The SMA Energy Meter does not replace the energy meter of the electric utility company.

When using a backup solution (e.g. SMA Backup Select), the SMA Home Energy Solution can be equipped with an emergency or battery-backup function. If necessary, for example, in the event of a power outage, the inverter, depending on the chosen solution, can continue to supply selected loads or electric circuits with electricity from the battery and the PV system.

All components must remain within their permitted operating ranges and their installation requirements at all times.

Use SMA products only in accordance with the information provided in the enclosed documentation and with the locally applicable laws, regulations, standards and directives. Any other application may cause personal injury or property damage.

The documentation must be strictly followed. Deviations from the described actions and the use of materials, tools, and aids other than those specified by SMA Solar Technology AG are expressly forbidden.

Alterations to the SMA products, e.g., changes or modifications, are only permitted with the express written permission of SMA Solar Technology AG. Unauthorized alterations as well as failure to observe the documentation will void guarantee and warranty claims and in most cases terminate the operating license. SMA Solar Technology AG shall not be held liable for any damage caused by such changes.

Any use of the product other than that described in the Intended Use section does not qualify as appropriate.

The documentation supplied is an integral part of SMA products. Keep the documentation in a convenient, dry place for future reference and observe all instructions contained therein.

This document does not replace any regional, state, provincial, federal or national laws, regulations or standards that apply to the installation, electrical safety and use of the product. SMA Solar Technology AG assumes no responsibility for the compliance or non-compliance with such laws or codes in connection with the installation of the product.

# 3    Applications of the SMA Home Energy Solution

The SMA Home Energy Solution is suitable for a number of applications. You can compile a system that suits you best from the individual system components. This document introduces the components and how they interact.

The following applications can be implemented with the SMA Home Energy Solution:

- SMA Home Solar Solution - Generate solar power for optimal consumption: The foundation of your PV solution with
    – Sunny Boy Smart Energy-US
    – SMA Energy Meter-US

- SMA Home Solar Solution with SMA Backup - Generate solar power for optimal consumption: The foundation of your PV solution with added security in case of power outage with
    – Sunny Boy Smart Energy-US
    – SMA Energy Meter-US
    – SMA Backup Solution

- SMA Home Storage Solution - Generate solar power, store and use it effectively: The Solution for the flexible and effective use of solar energy with
    – Sunny Boy Smart Energy-US
    – SMA Energy Meter-US
    – Battery

- SMA Home Storage Solution with SMA Backup - Generate solar power, store and use it effectively: The solution for the flexible and effective use of solar energy with added security in case of power outage with
    – Sunny Boy Smart Energy-US
    – SMA Energy Meter-US
    – SMA Backup Solution
    – Battery

Rapid shutdown components and additional inverters can be added to all applications if needed.

# 4    System Components

## 4.1    Sunny Boy Smart Energy
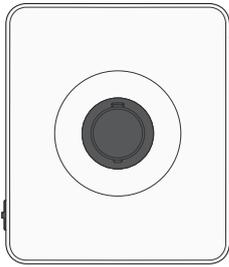
The Sunny Boy Smart Energy is available in the following power classes:

- Sunny Boy Smart Energy 3.8 (SBSE3.8-US-50)
- Sunny Boy Smart Energy 4.8 (SBSE4.8-US-50)
- Sunny Boy Smart Energy 5.8 (SBSE5.8-US-50)
- Sunny Boy Smart Energy 7.7 (SBSE7.7-US-50)
- Sunny Boy Smart Energy 9.6 (SBSE9.6-US-50)
- Sunny Boy Smart Energy 11.5 (SBSE11.5-US-50)

As the System Manager, the Sunny Boy Smart Energy is the central device for energy management in homes with a PV system for self-consumption. The Sunny Boy Smart Energy can perform the following tasks:

- Managing the energy flows in the system
- Managing the energy storage in the system
- Incorporating PV and battery power into the system

Up to 3 Sunny Boy Smart Energy can be used in a PV system.

## 4.2    SMA Energy Meter
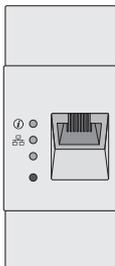
The energy meter SMA Energy Meter (EMETER-US-50) measures the flow of energy out of and into the utility grid. The measured values it produces are used by the Sunny Boy Smart Energy for the purpose of energy management.

The Sunny Boy Smart Energy can perform the following tasks together with the energy meter:

- Collection of energy- and power measured values in the interconnected household
- Energy monitoring: display energy flows via the SMA Energy App and Sunny Portal powered by ennexOS
- Dynamic limiting of the active power feed-in
- Measurement of currents up to 200 A with the supplied electrical current transducers

## 4.3    Sunny Portal powered by ennexOS

Sunny Portal is an Internet portal which enables you to monitor and configure PV systems and to visualize system data. In order to use Sunny Portal, you will need an SMA product that can record your system data and send it to Sunny Portal. Depending on the SMA product that sends the data, various functions are available in Sunny Portal.

## 4.4 Battery

The battery must be used with the SMA Energy Meter in the system. The battery performs the following tasks:

- Storage of surplus energy from the PV system
- Optimization of self-consumption or energy self-sufficiency in parallel grid operation through the energy in intermediate storage
- Supplying of electrical loads with energy from intermediate storage in the event of grid failure, when an SMA Backup solution is installed

An updated list of the batteries approved by SMA Solar Technology AG can be found in the technical information "Approved Batteries and Information on Battery Communication Connection" at www.SMA-Solar.com.

## 4.5 Additional Inverters

The system may contain additional SMA inverters that convert the direct current from the PV modules into grid-compliant alternating current. The Sunny Boy Smart Energy can convert the alternating current generated by the additional inverters into direct current and feed it into the battery. In battery-backup operation mode, power generated by additional inverters cannot be used.

When the Sunny Boy Smart Energy is configured as System Manager, it can control the additional inverters.

Additional inverters must be configured as servers.

## 4.6 SMA Backup Solutions

### 4.6.1 SMA Backup Select
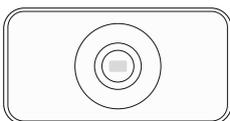
SMA Backup Select (BU-SLCT-US-50) is an automatic transfer switching device that enables single-phase battery-backup operation in the SMA Home Energy Solution together with the Sunny Boy Smart Energy. In the event of a power outage, the hybrid inverter ensures that SMA Backup Select automatically switches to battery-backup operation and the hybrid inverter can supply the loads connected to the backup system with power from the battery and the PV modules connected to the hybrid inverter.

When using SMA Backup Select, SMA Backup Start must be mounted and a rapid shutdown initiator used. This can be an external rapid shutdown initiator or the DC load-break switch of the inverter, configured as a rapid shutdown initiator.
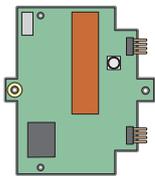
### 4.6.2 SMA Backup Secure
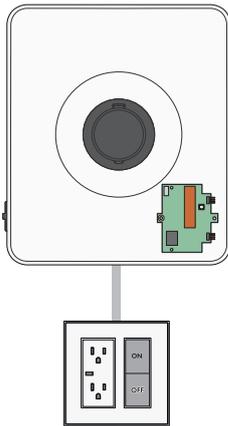
The system can be equipped with the manual secure power supply function SMA Backup Secure when SMA Backup Start is installed. In the event of a power outage, the inverter can continue to supply selected loads with power from the battery and the PV modules connected to the Sunny Boy Smart Energy. The loads are connected to the inverter via a socket. SMA Backup Secure is started manually, if needed, via a switch connected to the inverter. SMA Backup Secure can be activated in case of a power outage when AC voltage is no longer being applied to the inverter. Switch and socket are not sold by SMA Solar Technology AG.
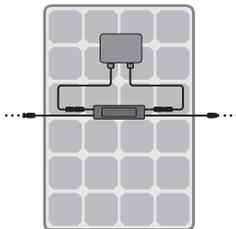
SMA Backup Secure must be combined with a rapid shutdown initiator. This can be an external rapid shutdown initiator or the DC load-break switch of the inverter, configured as a rapid shutdown initiator.

### 4.6.3 SMA Backup Start

SMA Backup Start (BU-STRT-US-50) is required in order to use secure power supply and battery-backup operation (e.g., SMA Backup Secure) in the SMA Energy System Home. SMA Backup Start is equipped with a battery that can be charged to start the system when energy is present in the PV system or the system battery.

## 4.7 PV Modules with Rapid Shutdown Devices

The PV modules convert sunlight into electrical energy. If required for your system, you must equip the PV modules with rapid shutdown devices. An updated list of rapid shutdown devices approved by SMA Solar Technology AG can be found in this document: SunSpec Certified Rapid Shutdown Devices.

## 4.8 Rapid Shutdown Initiator
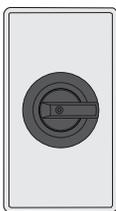
The DC load-break switch of the inverter is a system shutdown initiator, which also switches off the battery. It can be configured as a rapid shutdown initiator. If a rapid shutdown initiator is required in your system and the DC load-break switch of the inverter is not easily accessible, an external rapid shutdown initiator (e.g. SMA Rapid Shutdown Initiator RSI-US-50) must be installed in the system. Up to 3 inverters can be connected to this rapid shutdown initiator using an adapter matched to the Sunny Boy Smart Energy.

## 4.9 Approved PID Boxes

Only PID Boxes (Potential Induced Degradation Boxes) that galvanically isolate the inverter and the PV modules from each other may be used with the Sunny Boy Smart Energy.

# 5 SMA Home Energy Solution - System Overview


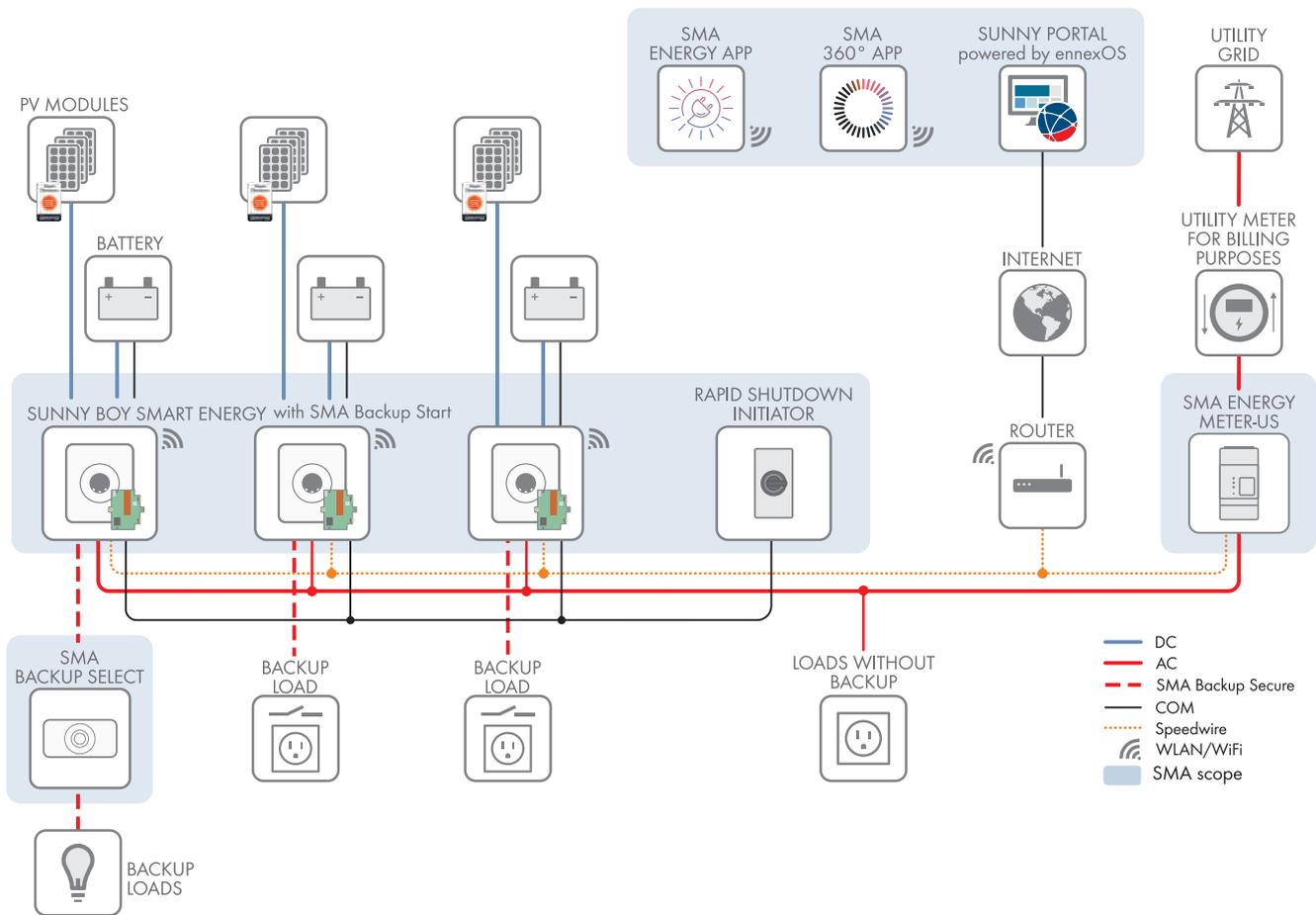
Figure 1: System with 3 Sunny Boy Smart Energy, SMA Backup Start und SMA Backup Select (example)

# 6  Procedure for the Initial Installation and Commissioning of the System

The procedure for installation, electrical connection, and commissioning of the system is described in the following. It provides an overview of the steps, which must be performed in the prescribed sequence.

| Procedure | | See |
|---|---|---|
| 1. | Ensure that the requirements for the installation of the system components are fulfilled. | Manuals of the system components |
| 2. | Install rapid shutdown devices at the PV modules. | Manual for the rapid shutdown devices |
| 3. | Mount the inverter. | Manual of the inverter |
| 4. | Mount SMA Backup Start. | Manual for SMA Backup Start |
| 5. | Mount the backup solution SMA Backup Select or switch and socket for SMA Backup Secure. | Manual of SMA Backup Select or manual of switch and socket |
| 6. | Mount the energy meter. | Manual for the energy meter |
| 7. | Mount the battery. | Manual for the battery |
| 8. | Ensure that the requirements for the electrical connection are fulfilled. | Manuals of the system components |
| 9. | Connect the utility grid along with signal and power cables for backup operation. | Manual of the inverter |
| 10. | Connect the inverter to the backup solution. | Manual of the backup solution |
| 11. | Connect backup loads to the backup solution. | Manual of the backup solution |
| 12. | Connect the network cables to the router and other inverters to the inverter. | Manual of the inverter |
| 13. | Connect the energy meter to the inverter via Ethernet. | Manual of the inverter |
| 14. | Connect the data cables of the battery. | Manual of the inverter |
| 15. | Connect the rapid shutdown initiator. | Manual of the inverter |
| 16. | Connect to the multifunction relay (optional). | Manual of the inverter |
| 17. | Connect the PV modules to the inverter. | Manual of the inverter |
| 18. | Connect the battery power cables. | Manual of the inverter |
| 19. | Connect the additional grounding to the inverter. | Manual of the inverter |
| 20. | Commission the system. | Manual of the inverter |
| 21. | Make additional settings. | Manual of the inverter |
| 22. | Test backup operation. | Manual of the inverter |

# 7 Electrical Connection

## 7.1 Information on Connection of the Energy Meter

Along with the energy meter, 2 electrical current transducers must be installed between the grid connection point and the feed-in point of all loads and feed-ins in the system. Observe all specifications and safety information in the energy meter manual when installing the energy meter. The energy meter is not a replacement for a revenue grade meter (RGM). The energy meter data may not be used for billing purposes. For more details, refer to the manual for the energy meter.
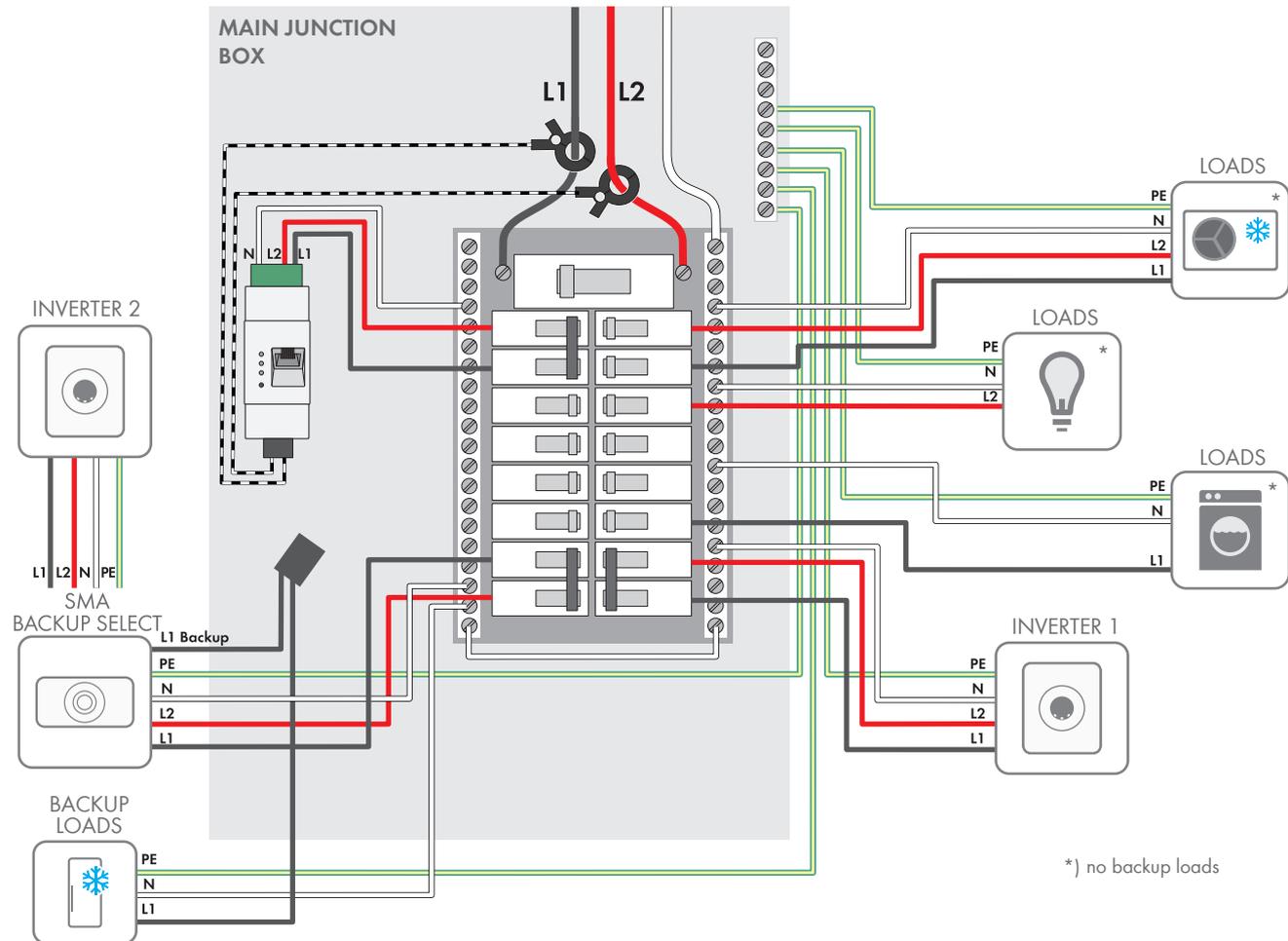
## 7.2 Circuitry in the junction box



Figure 2: Circuitry in the junction box of the household in split-phase system (example)

# 8 Contact

If you experience any technical problems with our products, please contact the Service. The following data is required in order to provide you with the necessary assistance:

- Device type
- Serial number
- Firmware version
- Device configuration (System Manager or subordinate device)
- Special country-specific settings (if available)
- Event message
- Installation site and mounting height
- Type and number of PV modules
- Optional equipment (e.g. accessories used)
- Use the name of the system in Sunny Portal (if available)
- Access data for Sunny Portal (if available)
- Operating mode of the multifunction relay (if used)
- Detailed description of the problem

You can find your country's contact information at:

https://go.sma.de/service

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