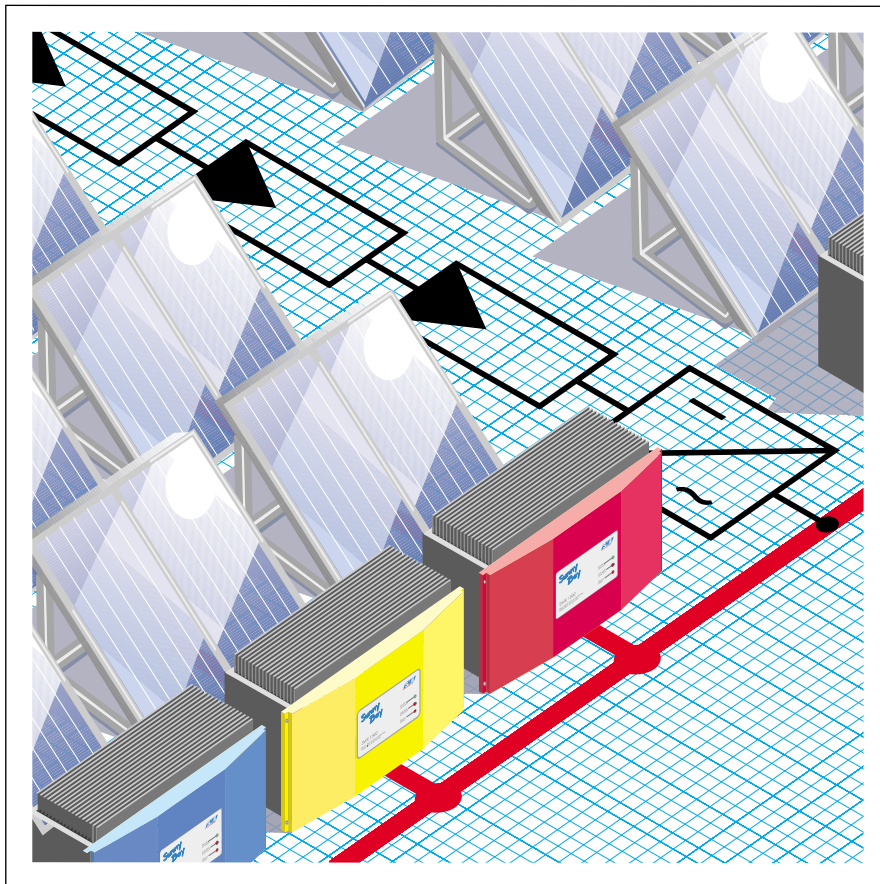


# *Sunny Boy*

**String Inverter Family for Grid Connection  
Sunny Boy 700/850/1100 E/2500/3000**



- **Simplified System Design and Lowest Installation Costs**
- **No DC Distribution necessary**
- **System Diagnosis and Monitoring via Powerline**
- **Extended Temperature Range  $-25\text{ }^{\circ}\text{C}$  to  $+60\text{ }^{\circ}\text{C}$**
- **Protection Class IP65, Stainless Steel Case for Outside Installation**
- **Equipped with MC<sup>®</sup> and AC connectors**



# *Sunny Boy!*

## *The newest generation of photovoltaic system technology*

### ***Optimal Efficiency***

The Sunny Boy inverter family convinces with a real efficiency of more than 93 %. The advantages of the string technology such as connection of the modules in series, missing diode arrays, minimized mismatching losses and so on – even increase the PV-system efficiency by another 1 to 3 % compared with other PV-systems. The Sunny Boy Family provides the best available system efficiency.

### ***Maximum Safety***

Personnel safety and hardware reliability are major issues of the products developed by SMA. The Sunny Boy Family safety strategy includes electric separation, isolation monitoring, surge voltage protection and of course the CE declaration. A MSD (Mains monitoring with allocated Switching Devices, German: ENS) in accordance with VDE 0126 is naturally a standard feature of the Sunny Boy inverters.

### ***Get Ready for the Future!***

The new module oriented design, the perfect sinewave shaped output current, dual processor technology and an integrated one-phase sensitive grid monitoring according to the VDEW regulations define new standards resulting in a new era of supplementary grid feeding with PV-plants.



String inverter Sunny Boy 700

### ***Surge Voltage Protection***

The Sunny Boy inverters are equipped with thermally monitored varistors on the DC side – a main function of these is indicated with a LED and can be supervised with a remote monitoring system.

### ***Reliability***

Highest reliability and a lifetime of over 20 years were major aspects taken into account during the design of the Sunny Boy string inverters.

### ***Overload Capability***

The power electronics and the heat sinks of the Sunny Boys are well dimensioned in order to allow the Sunny Boy to operate continuously even in surroundings with high ambient temperatures. This means: You can rely on the Sunny Boy string inverter.

### ***Flexible***

The Sunny Boy String inverters each process the power from 6 to 24 modules, depending on the inverter type. This leaves you enough freedom for the individual design of your PV-plant.

### ***Simplest Installation***

The modules are switched to a string and then connected to the Sunny Boy. DC distribution cases and connection boxes are no longer necessary any more resulting in drastically reduced installation costs.



### ***Connect it Anywhere***

The Sunny Boy string inverter can be connected to any available part of the AC distribution system of the house, e.g. in an attic or a similar room.

### ***Mount it Anywhere***

The stainless steel case with protection class IP65 and the wide temperature range allow the Sunny Boy to be mounted nearly anywhere. The Sunny Boy can be installed directly on the rack of the PV-modules, on the roof or on the wall of your house. A world-wide usage of the inverter is therefore possible.

### ***Diagnosis and Communication via Powerline – no extra cables!***

Of course you can communicate with your Sunny Boy. Measurement values and messages are transmitted to a PC on the existing powerline with a socket modem. The Windows based program Sunny Data visualizes the system performance and controls the inverters. You are continuously informed about the situation of your PV-plant.

### ***Best Priced System***

The Sunny Boy system technology allows a most reasonably priced plant with simple installation and optimal efficiency.



# Let the sun shine on advanced technology!

## Experience for the Future

SMA has always been a pioneer in developing and producing inverters for photovoltaic applications. More than 30 MW of total installed inverter power from SMA have defined standards in this technology. This experience was the basis for the development of the Sunny Boy string inverter.

## Demanding Objectives

The development of the Sunny Boy string inverters was done in cooperation with the 'Institut für Solare Energieversorgung' (ISET) and subsidized by the BMFT (Federal Office for Science and Technology). All objectives listed below as 'advantages' could be realized without exception.

## Advantages

- ✓ minimal installation costs
- ✓ perfect price / performance ratio
- ✓ highest efficiency: > 93% even with low input power
- ✓ reliability
- ✓ integrated diagnosis and plant monitoring
- ✓ extended temperature range  
(-25°C to +60°C ambient temperature)
- ✓ outside installation with protection class IP65

## Modern Power Electronics

The power section of the Sunny Boy features a simple and robust design with highest efficiency and continuous reliability. The DC voltage from the PV modules is processed by a MOSFET bridge switched with 16 kHz and is passed on to an AC circuit. This voltage is then directly fed to the AC grid with a transformer.

## Digital Monitoring – Digital SCS

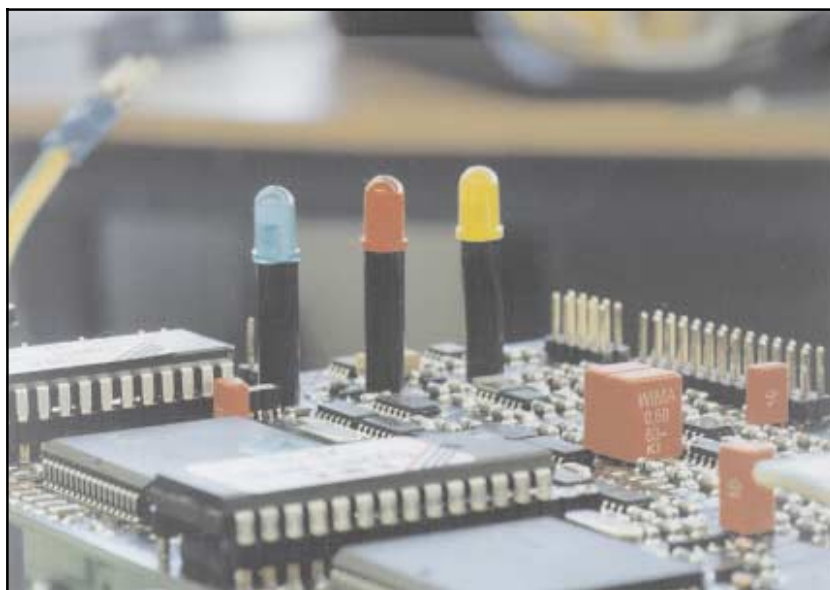
The control of the current fed to the grid is managed by a one-chip computer which guarantees an perfect sinewave shape current and a minimized harmonic distortion. The sequential control system ensures an automatic operation without losses in stand-by mode.

## Integrated Reserves

The large heat sink ensures a continuous operation with nominal power even in surroundings with high ambient temperatures.

## Integrated Communication

The monitoring and the sequential control system are enhanced by the possibility to send and receive data and commands to and from a central monitoring device. This feature allows the Sunny Boy to be a standalone device or single components of large PV-plants.



Electronic of the string inverter Sunny Boy 700





### ***Redundant Grid Monitoring***

The grid is simultaneously monitored by two independent one-chip computers which measure the impedance of the connected grid. This complies fully with the latest regulations of the VDEW and the Berufsgenossenschaft (German employee association). The Sunny Boy can therefore be connected to any place of the house distribution. Simple installation is guaranteed.

### ***Extended Safety***

Personnel safety is a major objective, especially for smaller PV-plants: The electric separation between grid and PV-module, the isolation monitoring and the integrated MSD are the basis of our advanced safety strategy. The Sunny Boy of course complies with all applicable German and European standards concerning EMC and harmonic distortion: This means: the Sunny Boy can be used all over the world.

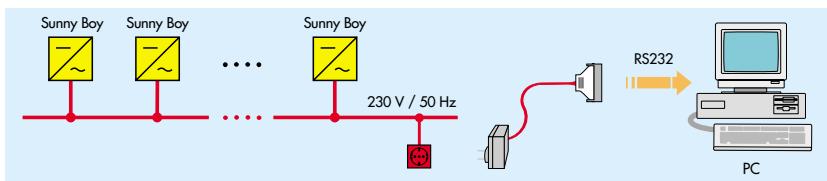
### ***Durable Design***

The Sunny Boys are built into into stainless steel cases (protection class IP65). This protection class and the extended temperature range allow you to mount the inverter nearly anywhere.



# Diagnosis and Communication via Powerline with Sunny Data

The modular design of a PV-plant results in a widely spread out layout of the inverters. A quick and simple monitoring of the operation and the status of every single Sunny Boy is possible with a standard PC and the Sunny Data monitoring and visualization program.



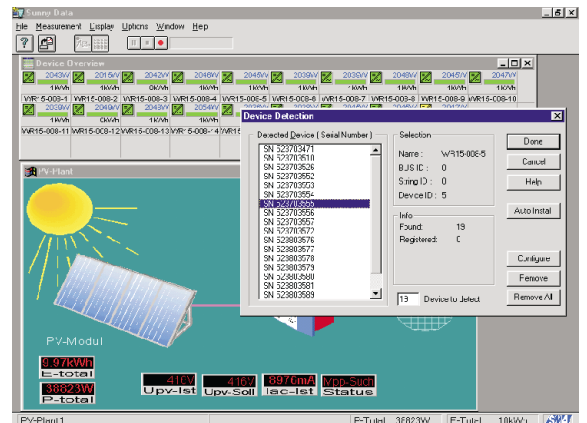
The data from the Sunny Boy inverter is sent through the existing powerline (with an integrated powerline modem), this results in the fact that no additional data cables are necessary. The communication supports the following functions:

## Data from any Electricity Socket

The communication and data processing is done on a PC with a small socket modem which is therefore automatically connected to the Sunny Boy inverters. The PC can be set up at any place in the house or on the site due to the fact that it obtains its data from the electricity grid.

## Comfortable Graphical Windows User Interface

The graphical user interface Sunny Data supports all features you wish: Spot value visualization, PV-plant management, malfunction tracking and many more.



Sunny Data's comfortable Graphical Windows User Interface

## Plant Monitoring of Large PV-Plants

PV-plants with more Sunny Boy inverters are monitored by the Sunny Boy Control.

The Sunny Boy Control is a central measurement data acquisition device for up to 50 inverters. It supports the commissioning and gives you an extended flexibility for your local energy management by automatically connecting and disconnecting special consumers according to the momentary energy yield.

The Sunny Boy Control is the perfect monitoring device for remote sites: Remote diagnostics via modem, automatic performance messages via fax or SMS, external displays, performance data download etc.

## Advantages:

- ✓ continuous acquisition of the data from all connected Sunny Boy inverters and PV-strings
- ✓ monitoring of all operation conditions and failure messages
- ✓ online transmission of spot values of selected Sunny Boys
- ✓ detection of defective PV-strings
- ✓ graphical display of selected Sunny Boys or comparative data on several Sunny Boys
- ✓ status report via fax
- ✓ continuous system monitoring, also from remote sites
- ✓ powerline communication — no additional data cable necessary



Sunny Boy Control

# String Technology: Lower costs and simpler system design!

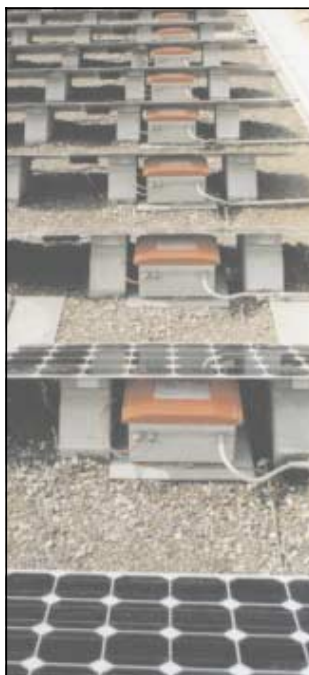
## Classic Technology

Until now PV-plant design was based on the parallel connection of several strings. The output power was increased by a separate DC distribution that was then connected to a central inverter for the conversion to grid compliant electricity. The collection of electricity on the DC resulted in quite a few disadvantages that are listed in the following column.

## Modular System Technology

The modular system design is based on the strategy that single smaller inverters convert the electricity of smaller module groups – the so-called ‘module strings’. The string technology avoids all of the above-mentioned disadvantages and even increases the PV-systems total efficiency. The string inverter is designed for the connection of PV-modules in series and avoids the necessity of expensive DC distribution systems and DC cabling. The Sunny Boy Family string inverters increase the efficiency even further due to the fact that they run a separate MPP-tracking for each single string. Each Sunny Boy inverter is equipped with a separate and autonomous grid monitoring facility which enables the user to hook up the AC output to any point within the electric distribution system of house (e.g. attic or garage).

With the PV-panel prices continuously going down this simplified system design will result in a drastically reduced overall system cost – which will finally become the basis of an extended utilization of photovoltaic energy in the future.



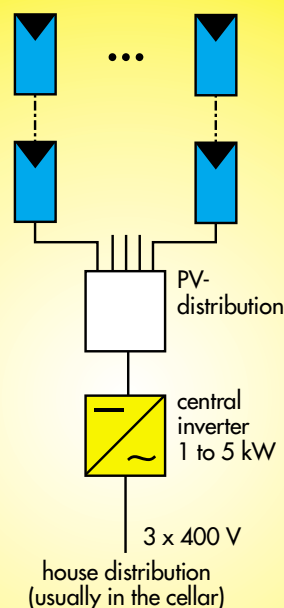
### Previous PV-Technology

- expensive DC distribution and cabling
- expensive peripheral DC circuits and safety facilities
- efficiency losses due to mismatching and partial shadowing
- difficult extendibility
- no standardized system designs

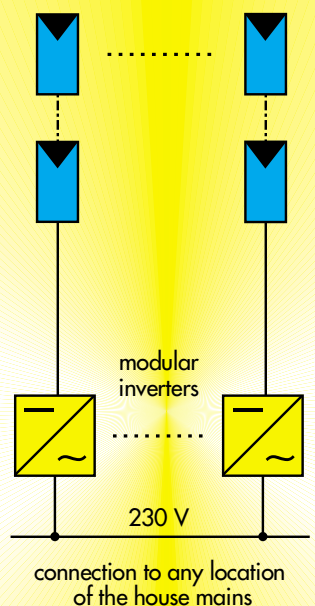
### New modular PV-Technology

- drastically simplified system design and reduction of system costs (no DC distribution)
- minimal DC cabling – only low current cable from each string to separate inverter
- no diode arrays necessary
- produced energy is collected on AC side with standard AC connection facilities
- simple extendibility in variable step size
- reasonably priced technology for small systems (e.g. 300—500W)
- no parallel connection = no mismatching
- separate MPP tracking for every single string

#### Previous PV-Technology



#### New modular PV-Technology



# Technical Data Sunny Boy Family

## Input Values

	Sunny Boy 700			Sunny Boy 850	Sunny Boy 1100 E	Sunny Boy 2500	Sunny Boy 3000
Input voltage range $U_{PV}$	75 ... 150 V DC	100 ... 200 V DC	125 ... 250 V DC	125 ... 250 V DC	150 ... 400 V DC	250 ... 600 V DC	290 ... 600 V DC
recommended peak power of the PV-panels $P_{PV}$	640 Wp	840 Wp (configuration with jumpers)	1000 Wp	1250 Wp	1500 Wp	3450 Wp	4100 Wp
maximum input current $I_{PVmax}$	7 A	7 A	7 A	8 A	8.5 A	11 A	11.2 A

### DC-disconnection facility

SB 700, SB 850 . . . : all pole disconnection  
 SB 1100 E, SB 2500,  
 SB 3000 . . . . . : safe to touch MC<sup>®</sup> snap cable connectors

surge voltage protection: thermally monitored varistors on DC-side

voltage rippel  $U_{pp}$  . . . : < 10 %  
 earth fault monitoring : standard feature  
 pole interchanging  
 protection . . . . . : short circuit diode

## Output Values

	Sunny Boy 700			Sunny Boy 850	Sunny Boy 1100 E	Sunny Boy 2500	Sunny Boy 3000
nominal output power $P_{ACnom}$	460 W	600 W	700 W	850 W	1000 W	2200 W	2600 W
peak power				900 W	1100 W	2500 W	3000 W
Total Harmonic Distortion of output current (with $K_{UAC} < 2\%$ , $P_{AC} > 0.5 P_{ACnom}$ )	THD < 3 %	THD < 3 %	THD < 3 %	THD < 3 %	THD < 4 %	THD < 4 %	THD < 4 %

short circuit proof . . . : grid side with current control  
 grid voltage  $U_{AC}$  . . . : 196 ... 253 V AC  
 grid frequency  $f_{AC}$  . . . : 49.8 ... 50.2 Hz (60 Hz option.)

phase shift  $\varphi$   
 (based on fundamental wave of the current) . . . : 0°

## General Data

	Sunny Boy 700			Sunny Boy 850	Sunny Boy 1100 E	Sunny Boy 2500	Sunny Boy 3000
maximum efficiency	≥ 93 %	≥ 93 %	≥ 93 %	≥ 93 %	≥ 93 %	≥ 93 %	≥ 95 %
internal consumption in operation	≤ 4 W	≤ 4 W	≤ 4 W	≤ 4 W	≤ 4 W	≤ 7 W	≤ 7 W
internal consumption in stand by	≤ 0.1 W	≤ 0.1 W	≤ 0.1 W	≤ 0.1 W	≤ 0.1 W	≤ 0.25 W	≤ 0.25 W
size (w x h x d)	322 x 290 x 180 mm	322 x 290 x 180 mm	322 x 290 x 180 mm	322 x 290 x 180 mm	322 x 320 x 180 mm	434 x 295 x 214 mm	434 x 295 x 214 mm
weight (approx.)	16 kg	16 kg	16 kg	18 kg	21 kg	30 kg	32 kg

### Protection

protection class according to DIN EN 60529 . . . . : IP65

### Ambient Conditions

ambient temperature : -25 °C ... +60 °C  
 ambient humidity . . . : 0 ... 100 %, class 3K6

### Certifications

EMC . . . . . : DIN EN 50081, part 1 (EN 55014, EN 55011 groupe 1, class B); DIN EN 50082, part 1  
 grid compliance . . . : DIN EN 61000-3-2 (EN 60555)  
 grid monitoring . . . : independent disconnection facility (MSD, Mains monitoring with allocated Switching Devices) E DIN VDE 0126  
 low voltage regulations : DIN EN 50178 (VDE 0160) DIN EN 60146 part 1-1 (VDE 0558 part 11)  
 CE-declaration . . . : all appliances

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